PD BAW034

SOMALI DEMOCRATIC REPUBLIC
MINISTRY OF MINERAL AND WATER RESOURCES
Water Development Agency

COMPREHENSIVE GROUNDWATER DEVELOPMENT

Project 104

FINAL REPORT

VOLUME III

Appendix

LOUIS BERGER INTERNATIONAL, INC.
ROSCOE MOSS COMPANY

MARCH 1985

VOLUME III

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A1 PHYSICAL CHARACTERISTICS OF CGDP BOREHOLES

PHYSICAL CHARACTERISTICS OF CGDP BOREHOLES

Well Number	Location	Date Completed	Total Depth Drilled (m)	Static Water Level (m)	Electrical Conductivity Mmhos/cm	Blank Casing Setting (m)	Casing Diameter & Type	Screen Setting (m)	Pumping Test (hours)	Pumping Rate (m3/hr)	Installed Pump Type	Remarks
1	Bonkay	4/2/82	18.5	Dry	-	-	-	-	-	-	-	Abandoned
2	Bonkay	27/2/82	201	48.5	2,300	0-30	8" Steel	-	-	-	-	Monitoring well
3	Bonkay	13/4/82	160	30	2,700							Well rehabilitative
4	Tugerew I	11/6/82	42	3	1,700	0-37	8" PVC	1)	-	-	H	
5	Gasarta	21/3/82	42	12	-	0-6	6" Steel	-	-	-	-	Abandoned
6	Waraji I	23/3/82	80	67	-	0-6	6" Steel	-	-	-	-	Abandoned
7	Waraji II	25/3/82	39	Dry	-	0-1	8" PVC	-	-	-	-	Abandoned
8	Tugerew II	29/3/82	45	Dry	-	-	-	-	-	-	-	Abandoned
9	Bur Halab	30/3/82	35	Dry	-	-	-	-	-	-	-	Abandoned
10	Sarman Dheere	27/4/82	84	12.92	3,300	0-32[2]	8" PVC	32-54.4	24	26.6	M	
11	Min. Agric Cmpd	2/6/82	140	7	3,000	0-48 0-51.6	8" Steel	-	11	13.3	-	
12	Hareero Jiifo	7/7/82	166	29.5	2,800	73.2-84	8" PVC	51.6-73.2	5	11.4	M	
13	Shabelle Dugsilow	13/7/82	172	11	24,000	0-44	8" Steel	-	-	-	-	Abandoned
14	Warta Jaalay	3/8/82	92	17.5	10,000	0-2	8" PVC	-	-	-	-	Abandoned
15	Qansax Omane	19/8/82	174	16.5	24,000	-	-	-	-	-	-	Abandoned
16	Taflow	16/8/82	153	35.4	1,480	0-72	8" Steel	-	24	15.6	M	
17	Robay Gaduud	6/10/82	142	22.71	1,280	-	8" PVC	48-91[1]	0.67	11.4	H	
18	Gaduudo Dhunte	6/10/82	73	23.48	3018-5245	0-16	8" Steel	16-64	24	11.4	M	
19	Buulo Puur	14/9/82	94	Dry	-	-	-	-	-	-	-	Abandoned
20	Durei Ali Galle	14/10/82	117	59.42	2,000	0-82	8" PVC	82-100	0.33	11.4	-	

Table A1 (Cont.)

Well Number	Location	Date Completed	Depth Drilled (m)	Water Level (m)	cal Conductivity Mmhos/cm	Blank Casing Setting (m)	Casing Diameter & Type	Screen Setting (m)	Pumping Test (hours)	Pumping Rate (m3/hr)	Installed Pump Type	Remarks
21	Min. Agric CMP Baid.		42	2	2,500	0-19.6[2]	8" PVC	19.6-36.4	24		M	3 HP Submersible pump installed
22	Buulo Gaduud	5/1/83	189	Dry	-	-	-	-	-	-	-	Abandoned
23	Kurman	22/1/83	148	20	2,400	0-30[2]	8" PVC	30-54	-	-	H	
24	Yaaq Braawe	26/1/83	10	1	-	0-5	8" PVC	5-10	-	-	-	
25	Dodole	13/1/83	24	12	900	0-17	8" PVC	-	-	-	-	Low yield Abandoned
26	Shiidalow I	20/1/83	67	36	33,000	0-3	8" PVC	-	-	-	-	Abandoned
27	Shiidalow II	22/1/83	80	37	32,000	0-2	8" PVC	-	-	-	-	Abandoned
28	Bur Akaba I	25/1/83	54	22	14,000	0-1	8" PVC	-	-	-	-	Abandoned
29	Bur Akaba II	26/1/83	24	7	34,000	0-1.5	8" PVC	-	-	-	-	Abandoned
30	Bur Akaba III	1/2/83	30	22	42,000	0-1	8" PVC	-	-	-	-	Abandoned
31	Bur Akaba IV	2/2/83	63	19	49,000	0-1	8" PVC	-	-	-	-	Abandoned
32	Bur Akaba V		89	13	1,140	0-7	8" Steel	7-30	-	-	H	
33	Bur Heibi I	10/3/83	26	Dry	-	0-2	8" PVC	-	-	-	-	Abandoned
34	Bur Heibi II	22/2/83	73	16	1,300	0-8[2]	8" PVC	8-20	-	-	H	
35	Bur Heibi III	23/2/83	60	Dry	-	0-2	8" PVC	-	-	-	-	Abandoned
36	Bur Heibi IV	15/3/83	25	Dry	-	0-1	8" PVC	-	-	-	-	Abandoned
37	Bur Heibi V	15/3/83	26	Dry	-	0-1	8" PVC	-	-	-	-	Abandoned
38	Bur Heibi VI	16/3/83	36	Dry	-	0-2	8" PVC	-	-	-	-	Abandoned
39	-		-	-	-	-	8" PVC	-	-	-	-	No well drilled
40	Limestone Depression 'A'	23/2/83	32	Dry	-	0-1.5	8" PVC	-	-	-	-	Abandoned
41	Dolondole		166	1.9	1,040	0-5.4	8" PVC	5.4-10.8	-	-	-	Well should be deepened
42	Buulo Fuur II	3/5/83	130	56.16	2,150	0-64.5	8" PVC	64.5-98	24	11.4	M	
43	Aborey I	3/5/83	120	Dry	-	0-2	8" PVC	-	-	-	-	Abandoned
44	Afar Irdood	June '83	174	Dry	-	0-37.8	8" PVC	37.8-81	-	-	-	Abandoned
45	Min. Agric CMP Baidoa		120	6	1,770	0-65	8" PVC	65-120	.4	10.9	-	

Table A1 (Cont.)

Well Number	Location	Date Completed	Total Depth Drilled (m)	Static Water Level (m)	Electrical Conductivity Mmhos/cm	Blank Casing Setting (m)	Casing Diameter & Type	Screen Setting (m)	Pumping Test (hours)	Pumping Rate (m3/hr)	Installed Pump Type	Remarks
46	Qansax Dheere (Road well)	May '83	103	27	2,000	0-60	8" PVC	-	24	11.4	-	
47	Awshiini	31/7/83	143	29.8	3,200	0-56	8" PVC	56-90[1]	24	11.4	M	
48	More Ari	28/6/83	102	36	3,700	0-64.2	8" PVC	64.2-102[1]	-	-	-	PVC ruptured
49-1	Maxaas (Jeejo)	9/9/83	190	Dry	-	0-9	8" PVC	-	-	-	-	Abandoned
49-2	Maxaas (Jeejo)	15/10/83	180	Dry	-	0-6	14" Steel	-	-	-	-	Abandoned
50	Bonkay Seed Farm	22/9/83	200	30.05	11,400	0-100	8" PVC	-	0.33	11.4	-	Abandoned
51	Mintaano	Nov. 83	132	40.18	1,492	0-56.5	8" PVC	56.5-99[1]	12	15.6	H	Abandoned
52	Maleel	Nov. 83	130	48.5	1,100	0-55	8" PVC	55-99 [1]	11.5	25.2	M	Abandoned
53	Aborey II	19/12/83	133	Dry	-	0-3	18" Steel	-	-	-	-	Abandoned
54	Isgeed	19/12/83	150	37.10	1,500	0-36	8" PVC	36-120[1]	24	17.0	H	Abandoned
55	Marti Moog	23/1/84	147	32.82	1,000	0-76	8" PVC	76-120[1]	24	22.7	H	
56	Jimacada Dheen	3/3/84	41	Dry	-	0-3	14" Steel	-	-	-	-	Abandoned
57	Hagarka	9/3/84	154	19.26	2,000-6,400	0-54	8" PVC	54-120[1]	0-18	11.4	H	Abandoned
58	Bur Akaba VI	25/3/84	27	20	49,000	-	-	-	-	-	-	Abandoned
59	Shawka	18/3/84	138	30	12,300	0-45.8[2] 51.5-91.6	8" PVC	45.8-51.6 9.16-132.2	0.17	11.4	-	Abandoned
60	Kannanax	27/3/84	15	8.6	-	0-9	8" Steel	9-15	-	-	-	Well must be deep
61	Hubay	5/4/84	152	17	-	0-60	8" Steel	60-108	-	-	-	
62	War Asha	29/4/84	200	120	1,250	0-117	-	-	-	-	-	Abandoned
63	Bonkay Seed Farm	25/4/84	153	25.58	2,200	147-153	8" Steel	117-147	1.33	9.1	-	Possible windmill
64	Buulo Yussef		85	18.5	2,985	0-58	8" Steel	-	-	-	-	
65	Aborey III	18/5-84	210	Dry	-	-	-	-	-	-	-	
66	Buulo Hawa		133.5	33.5	1,500							Plugged back depth 85 meters
67	Wargoleh											
68	Dumbal Aalin			13								

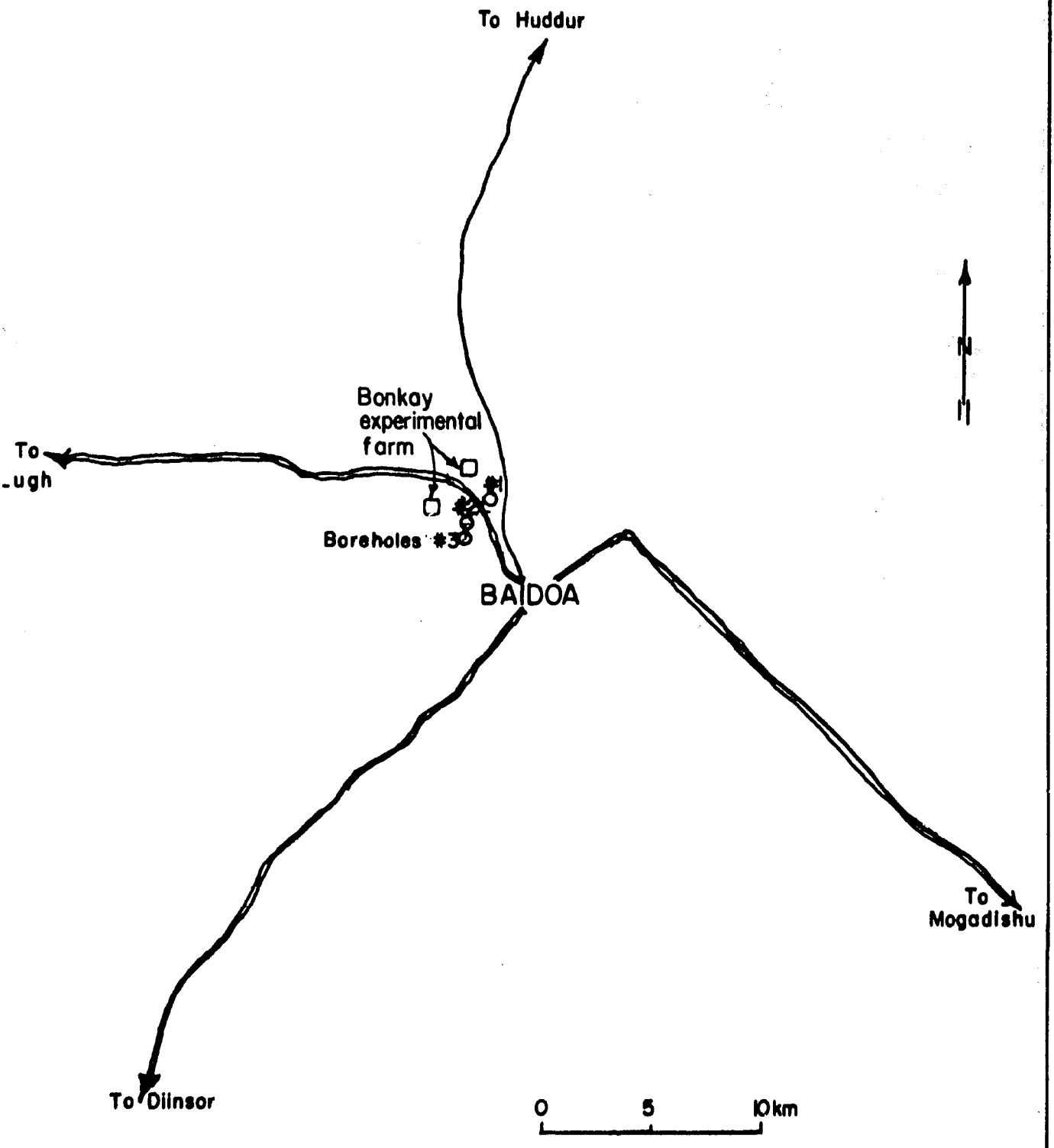
[1]Alternating sections of screen and blank casing

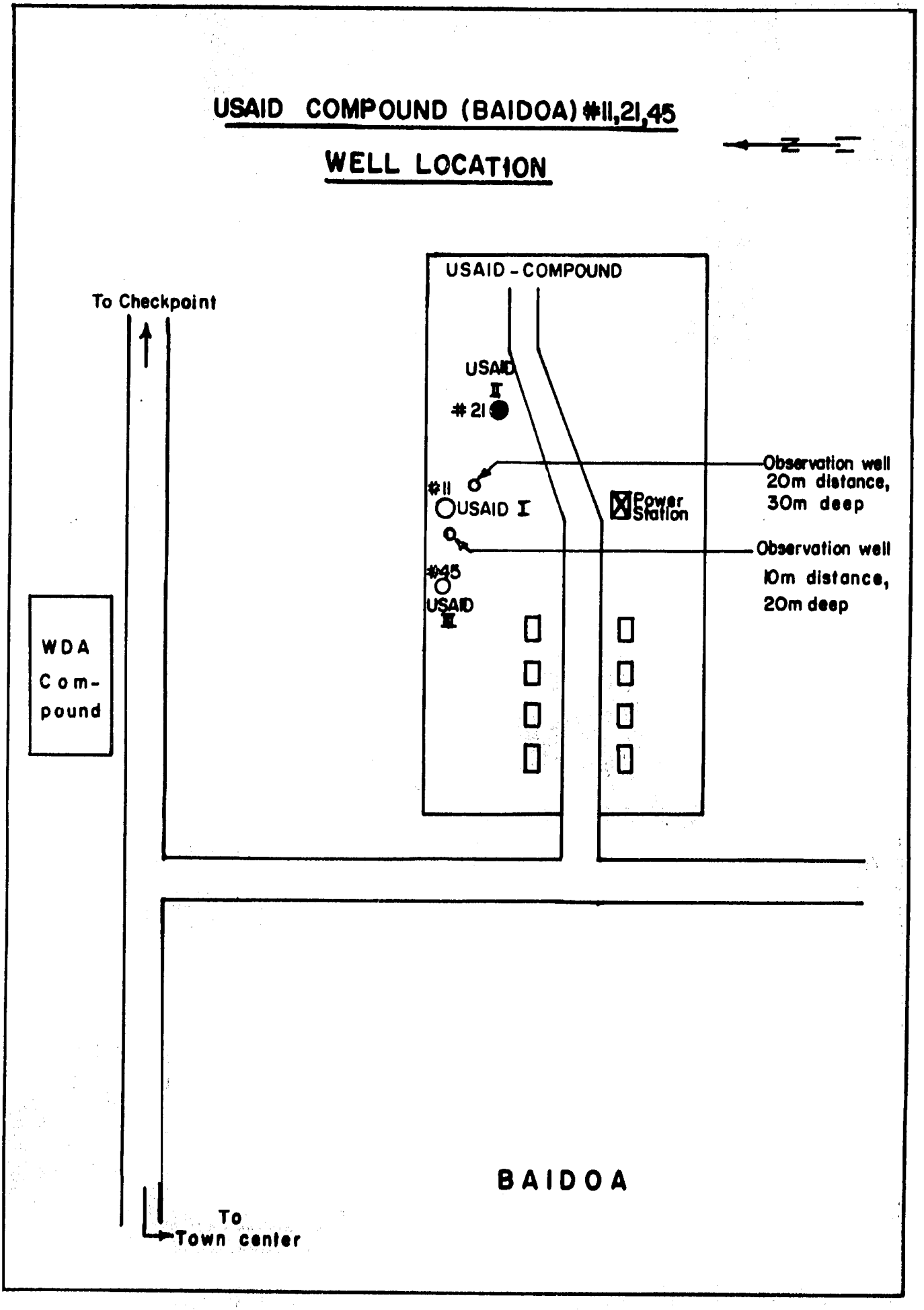
[2]Well siting completed with one section of blank casing installed below screen.

A2 LOCATION OF MAPS FOR SELECTED BOREHOLES

LOCATION MAP

BONKAY BOREHOLE #1, #2, #3

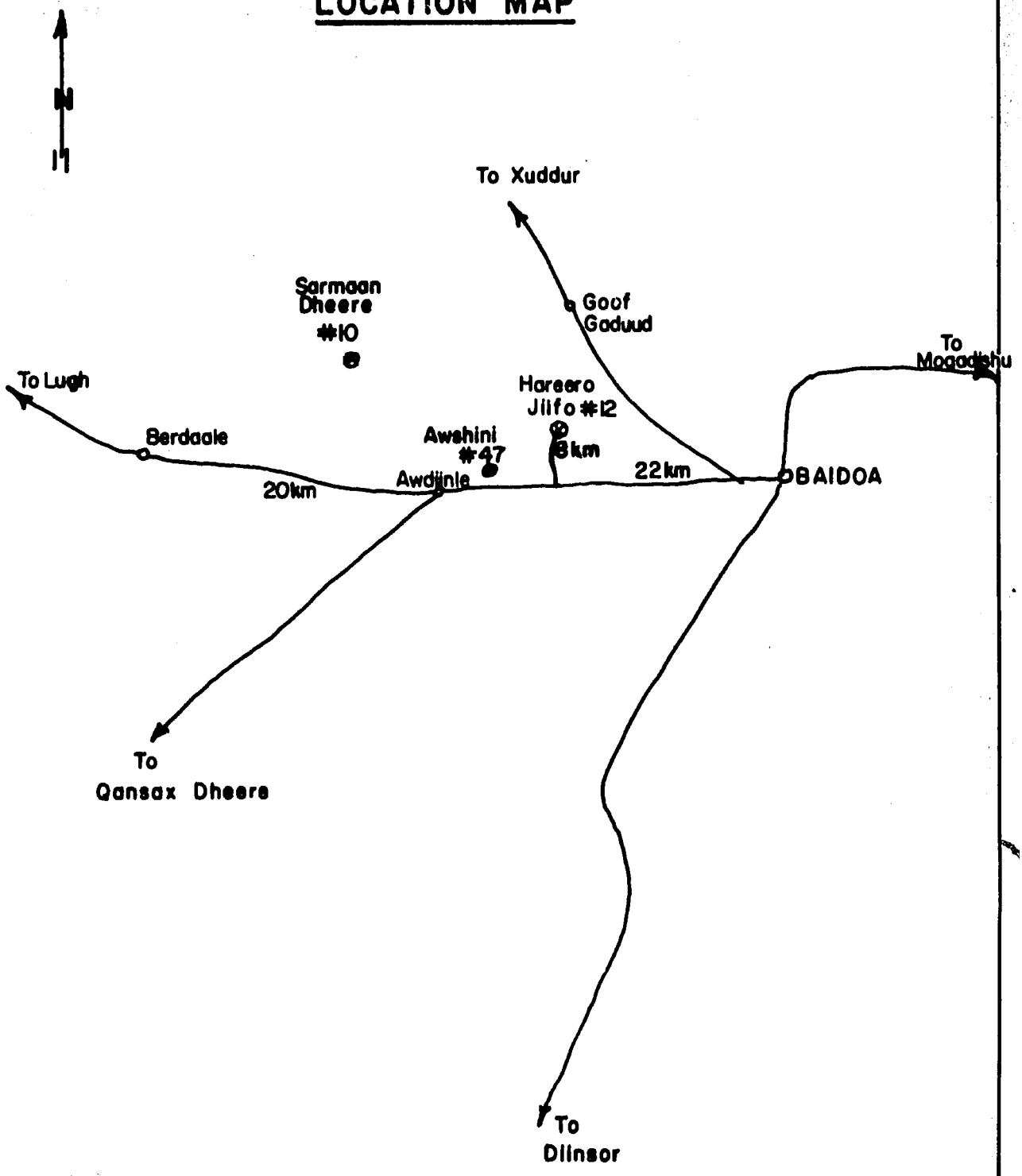



USAID COMPOUND (BAIDOA) #11,21,45
WELL LOCATION
N
USAID - COMPOUND
To Checkpoint
USAID II
#21
#11
USAID I
Power Station
Observation well 20m distance, 30m deep
Observation well 10m distance, 20m deep
#45
USAID II
WDA Com-pound
BAIDOA
To Town center

12

HAREERO JIIFO # 12

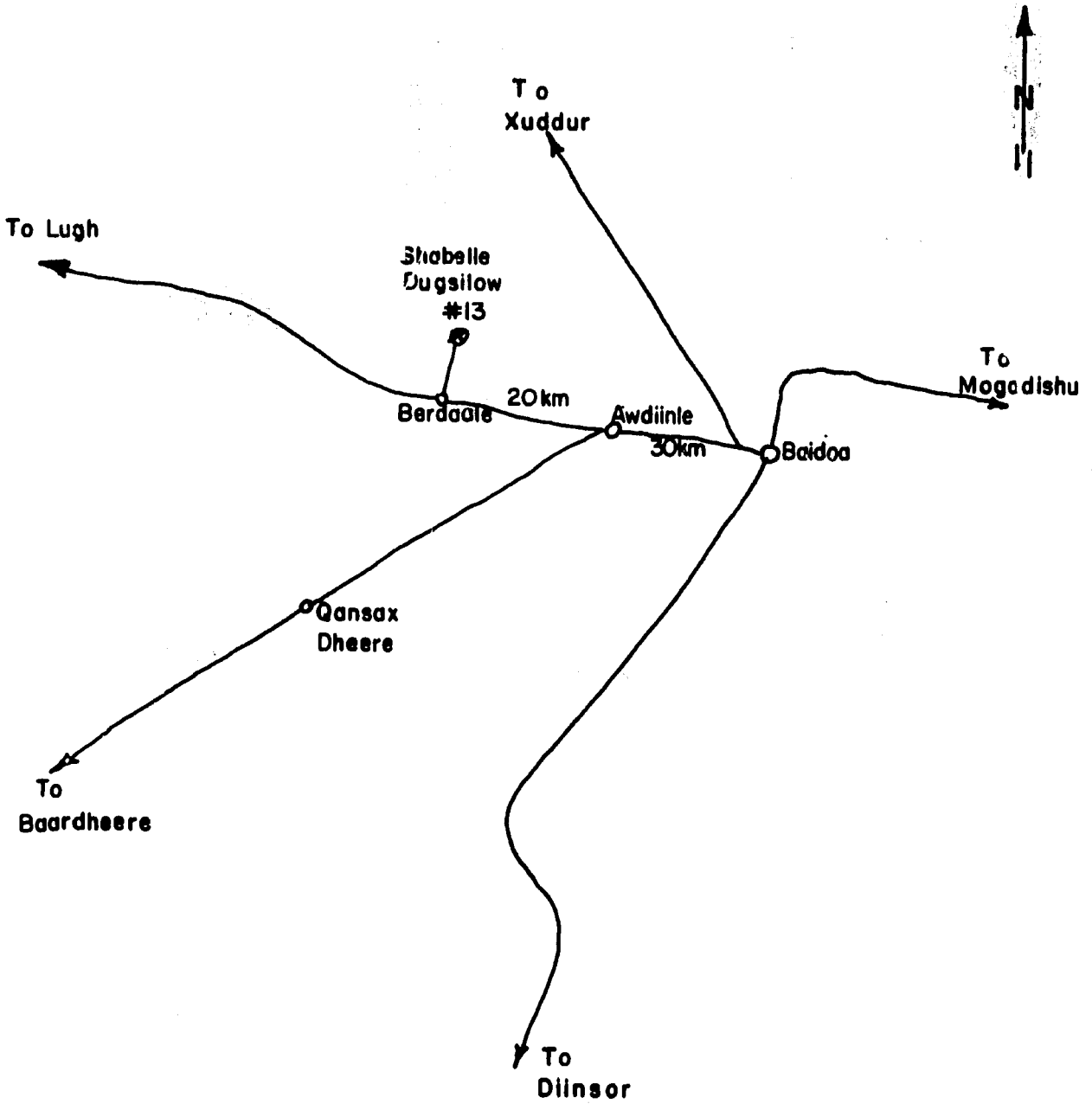
LOCATION MAP



Not to scale

SHABELLE DUGSILOW #13

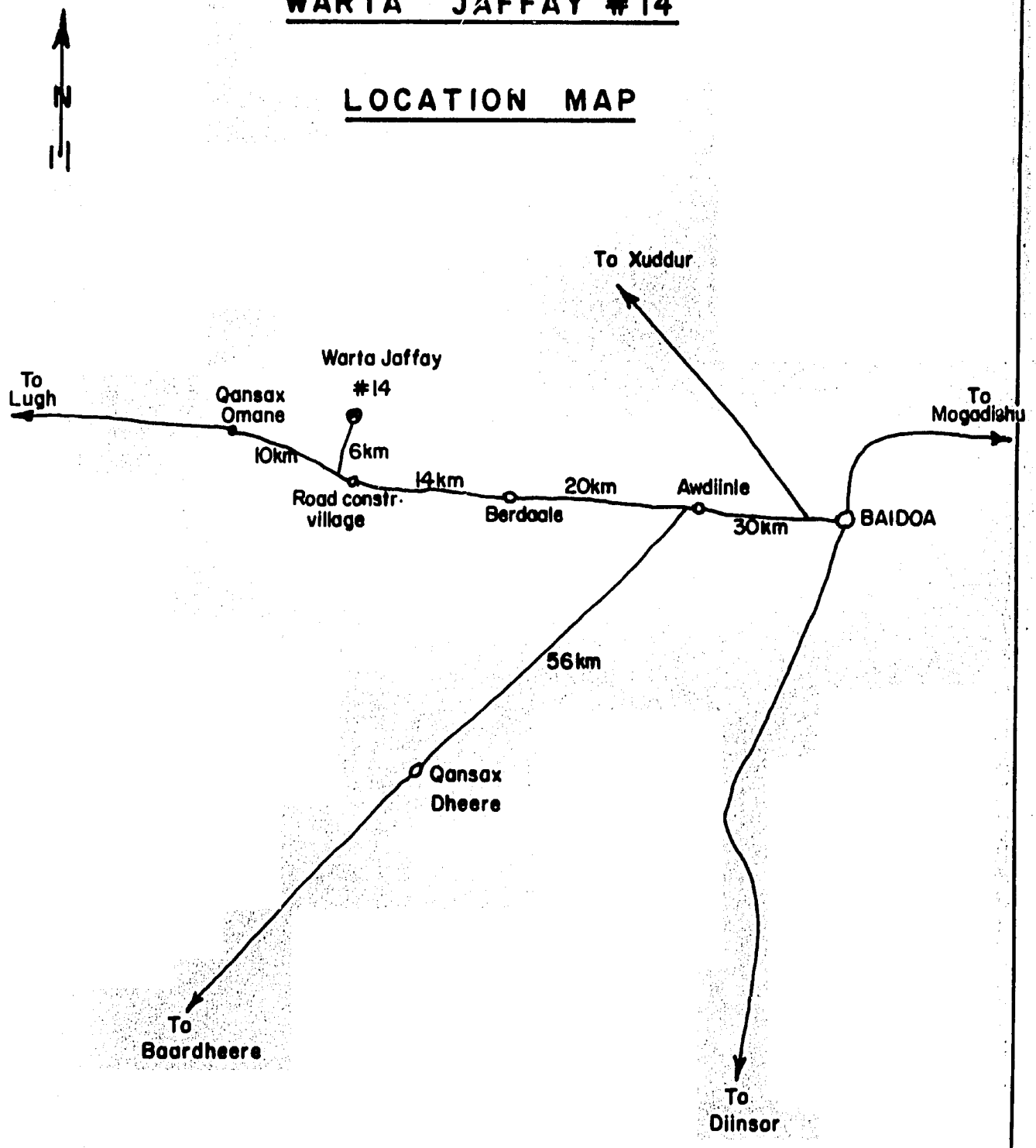
LOCATION MAP



Not to scale

WARTA JAFFAY #14

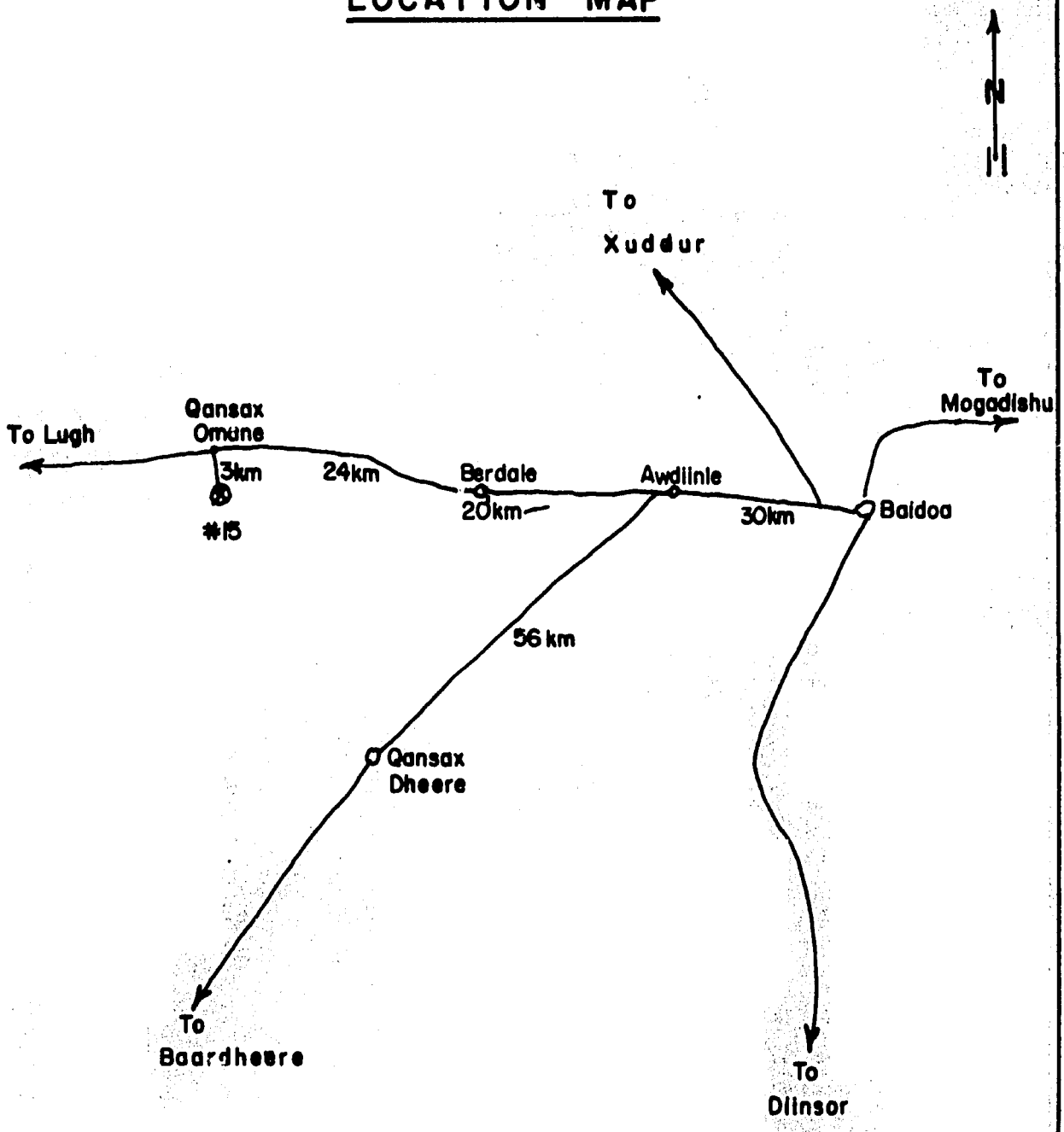
LOCATION MAP



Not to scale

QANSAX OMANE #15

LOCATION MAP



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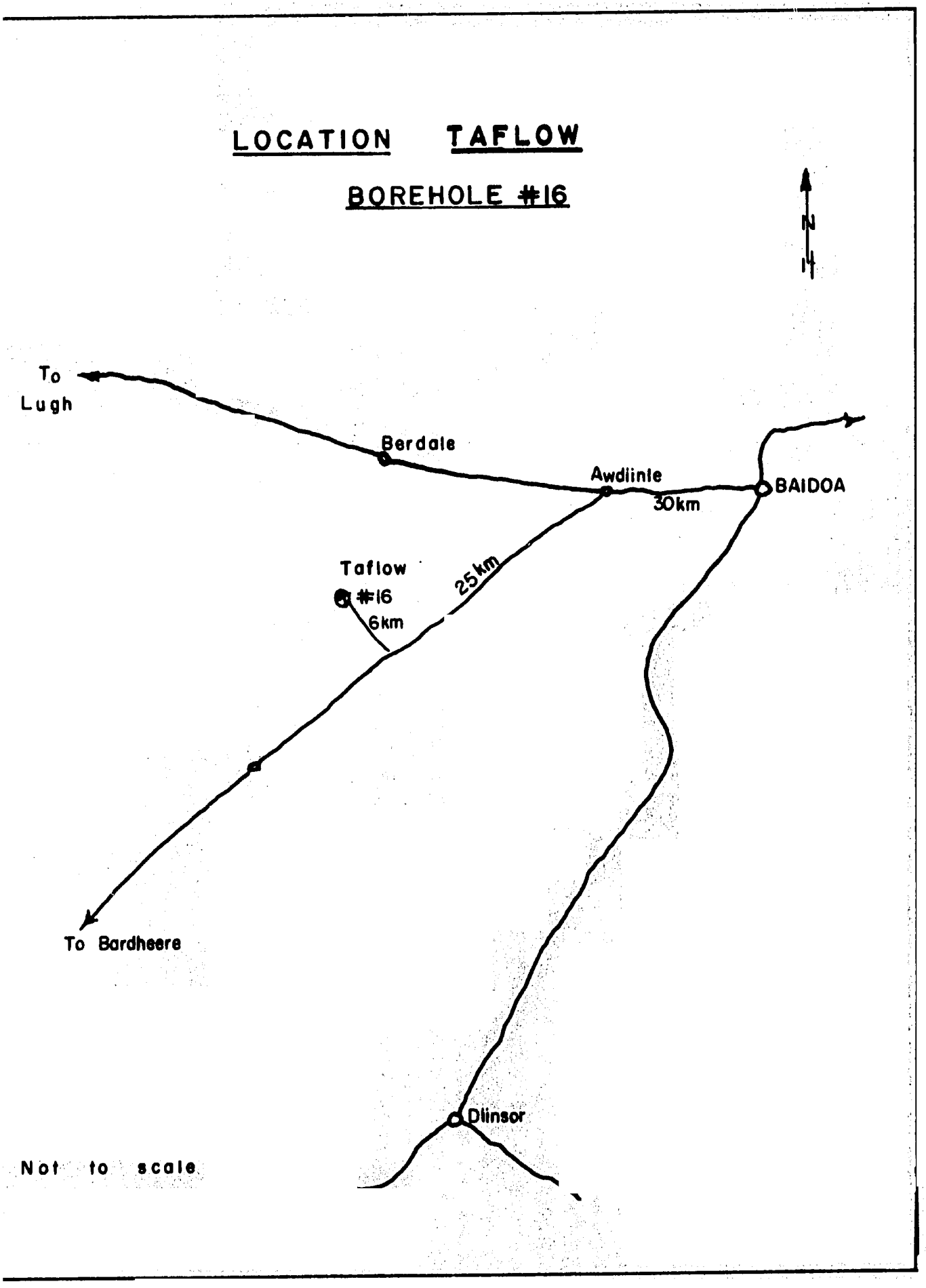
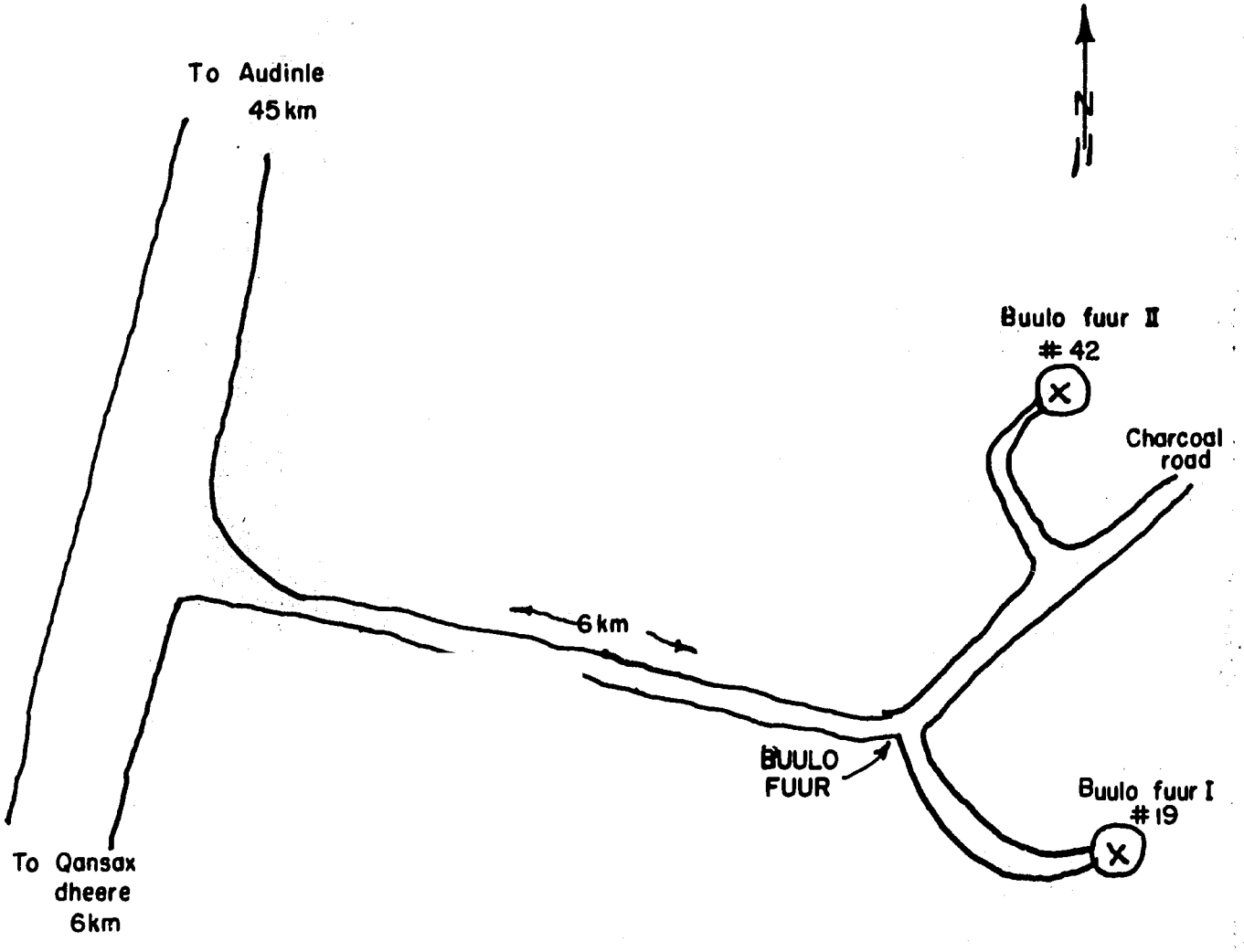

LOCATION TAFLOW
BOREHOLE #16
N
To Lugh
Berdale
Awdiinie
30km
BAIDOA
Taflow
#16
6km
25km
To Bardheere
Diinsor
Not to scale

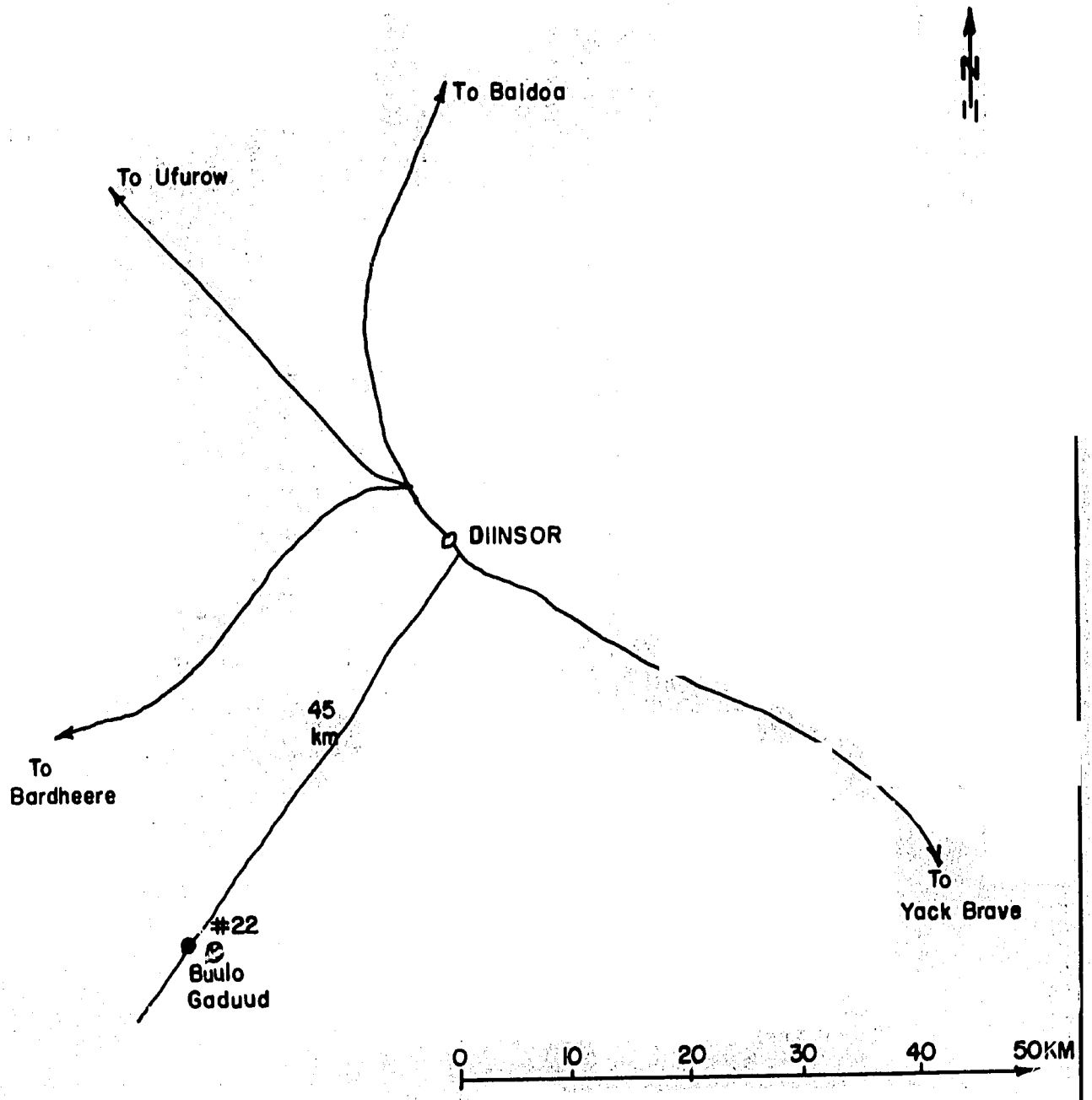
LOCATION MAP DRILLING SITES

NEAR BUULO FUUR



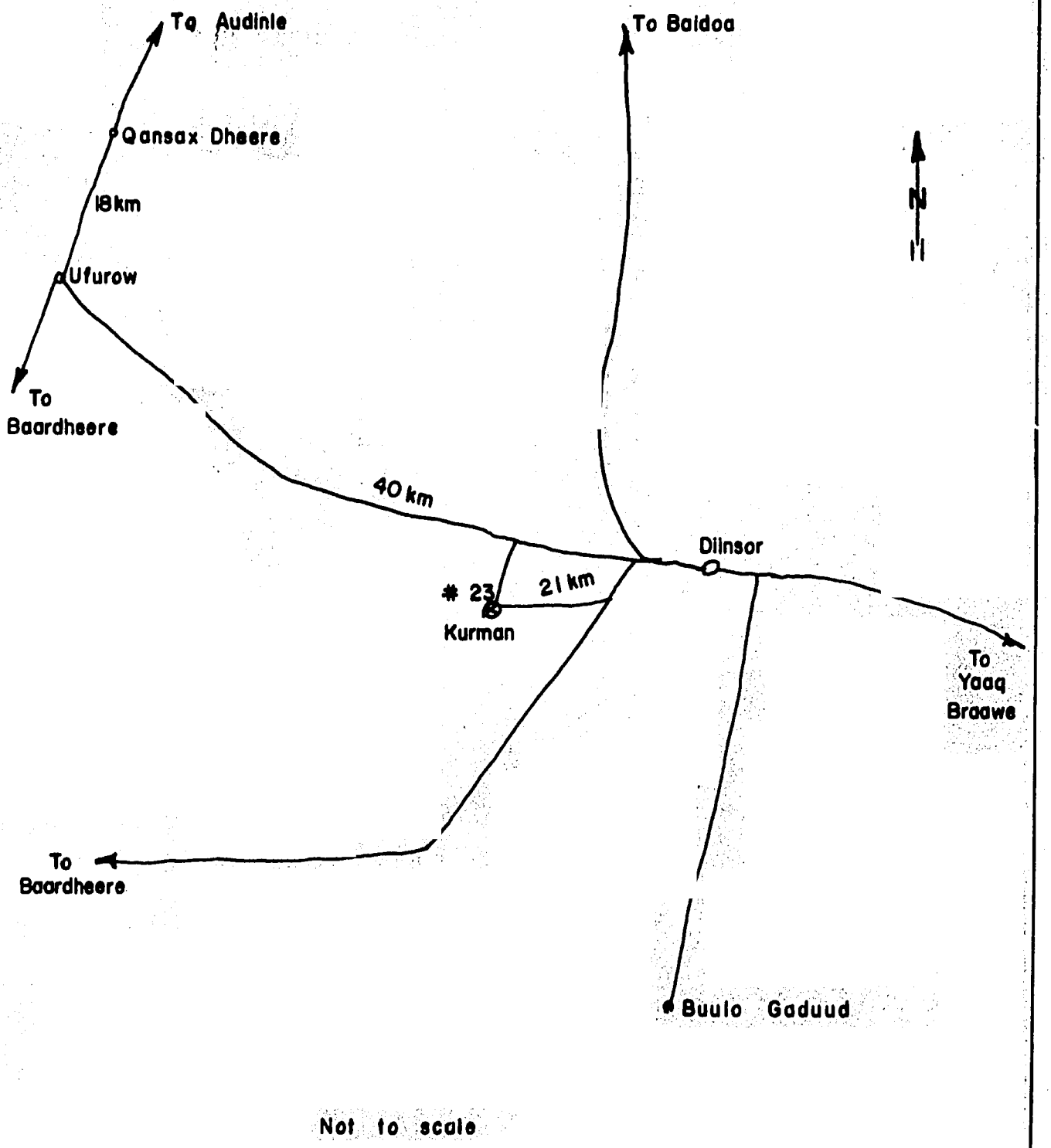
BUULO GADUUD #22

LOCATION MAP



KURMAN # 23

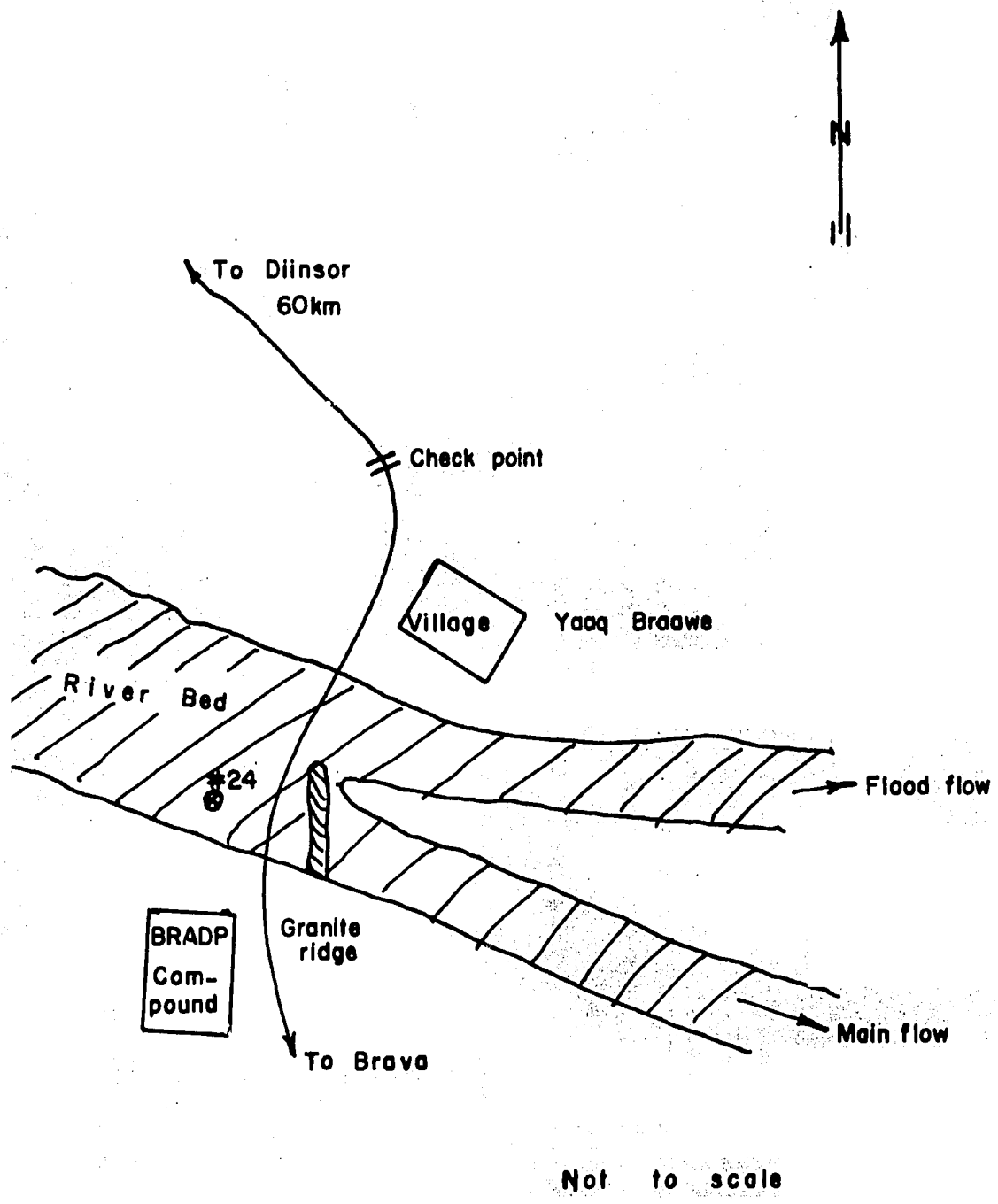
LOCATION MAP

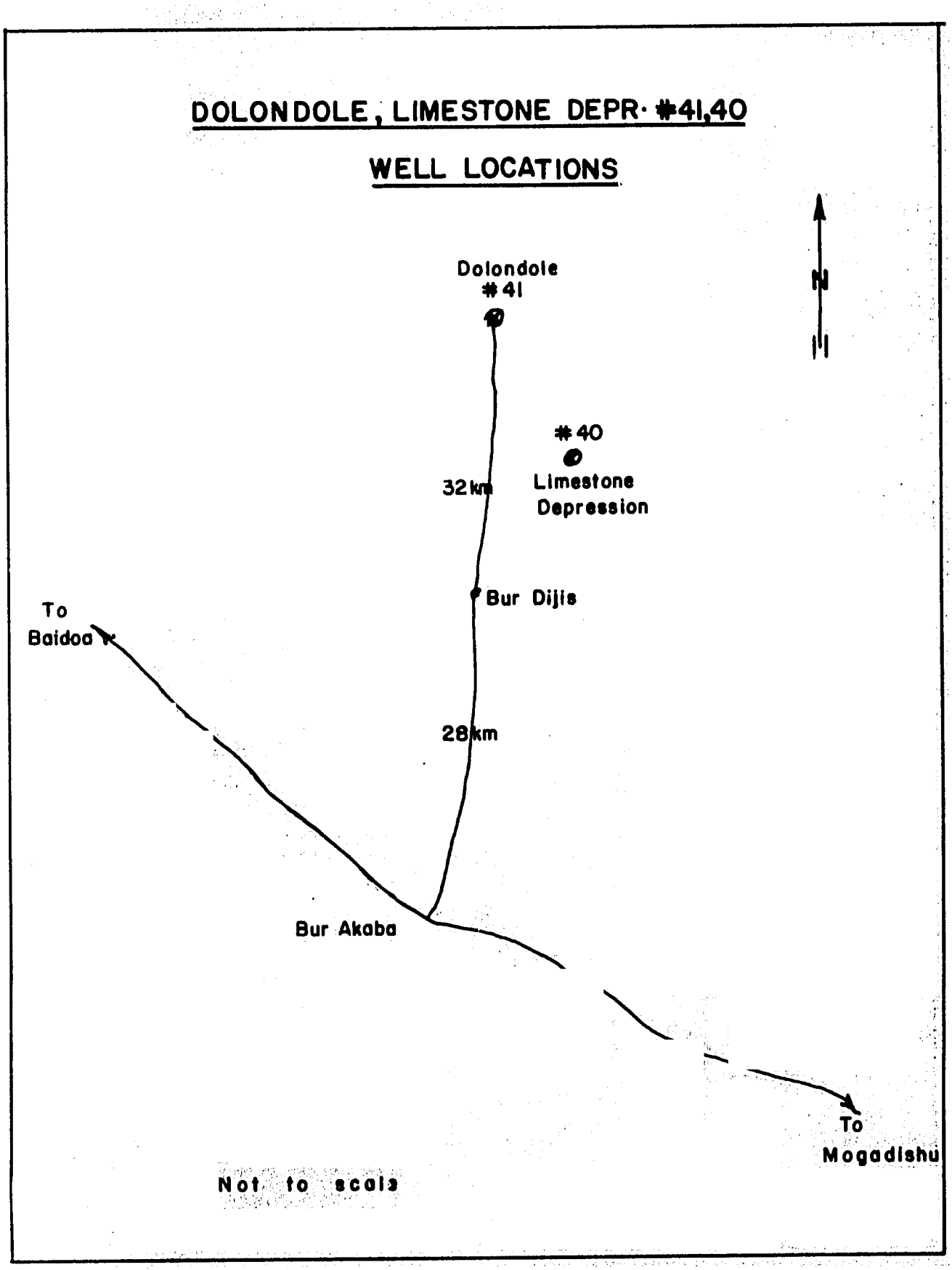


Not to scale

YAAQ BRAAWE #24

LOCATION MAP

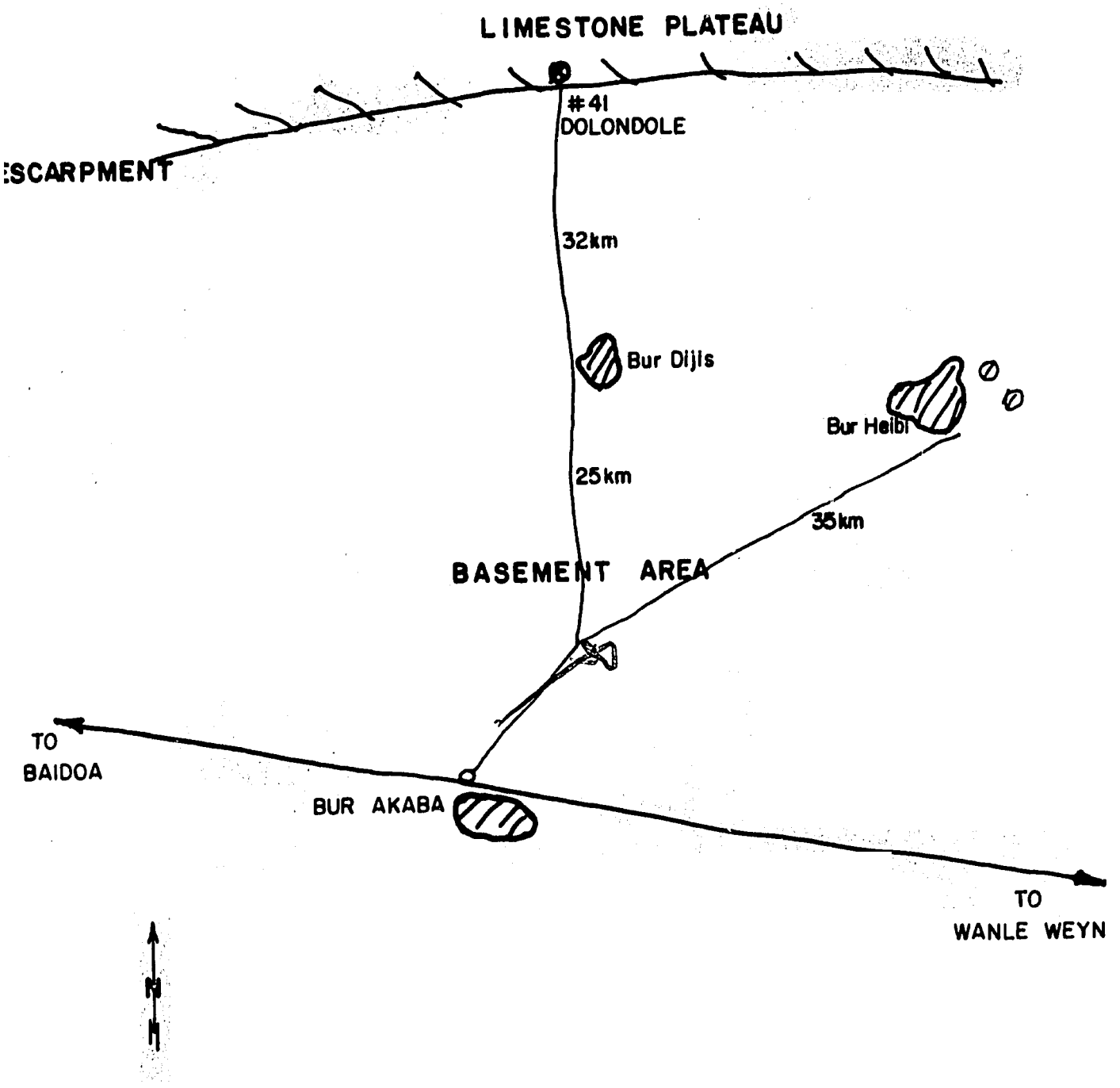



DOLONDOLE, LIMESTONE DEPR· #41,40
WELL LOCATIONS
N
Dolondole
#41
#40
Limestone
Depression
32km
Bur Dijis
To
Baidoa
28km
Bur Akaba
To
Mogadishu
Not to scale

22

DOLONDOLE #41

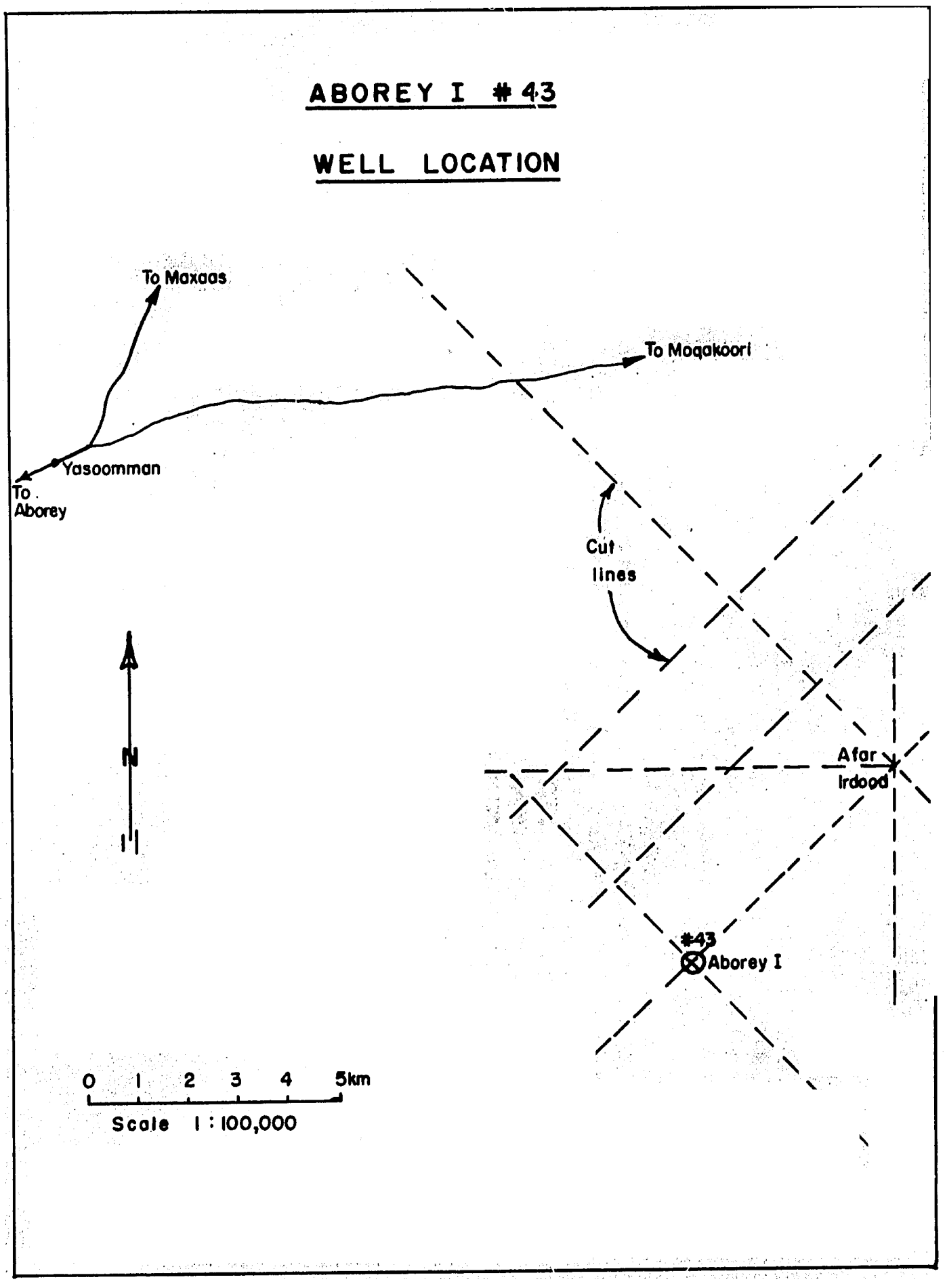
LOCATION MAP



23

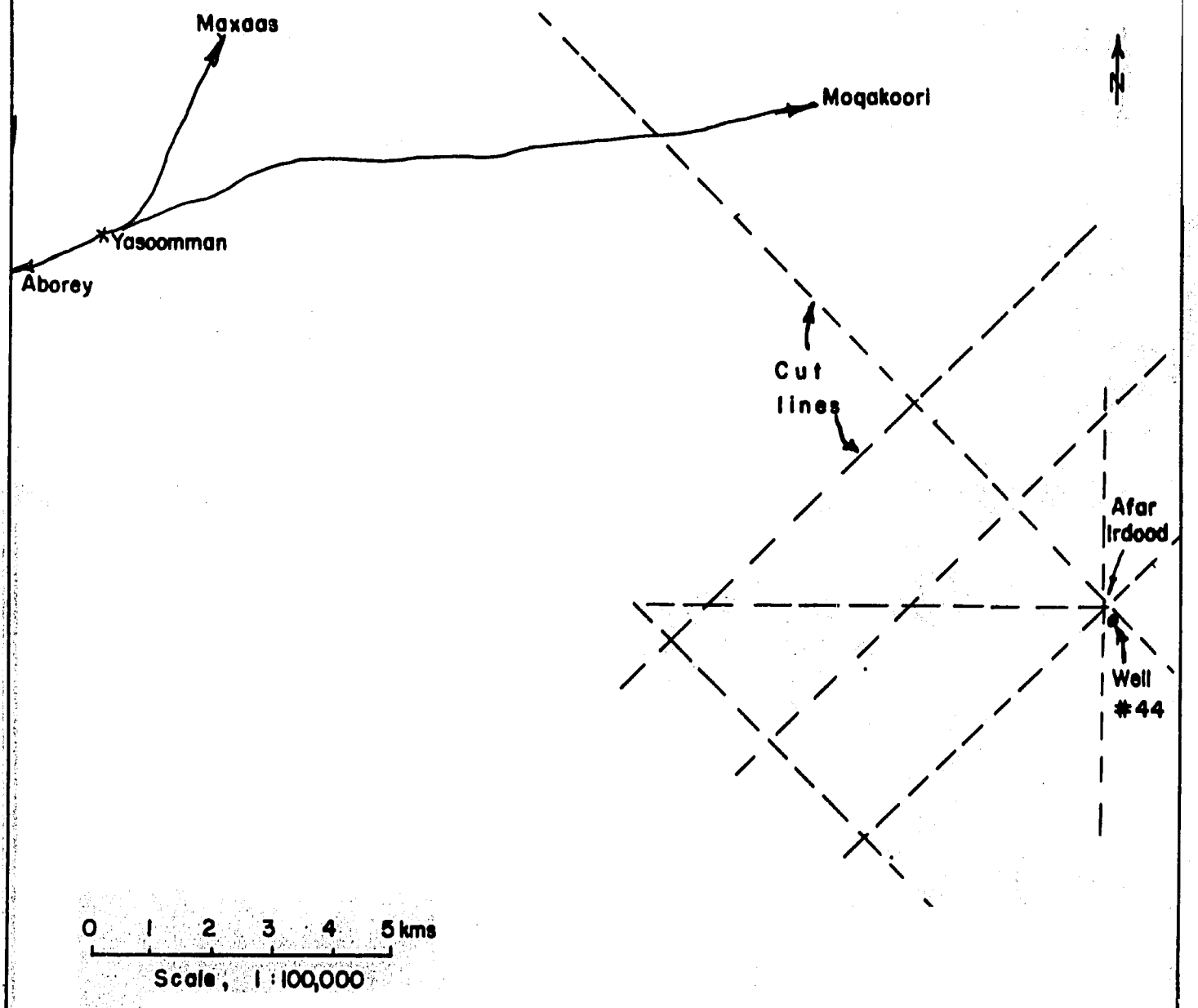
ABOREY I #43

WELL LOCATION



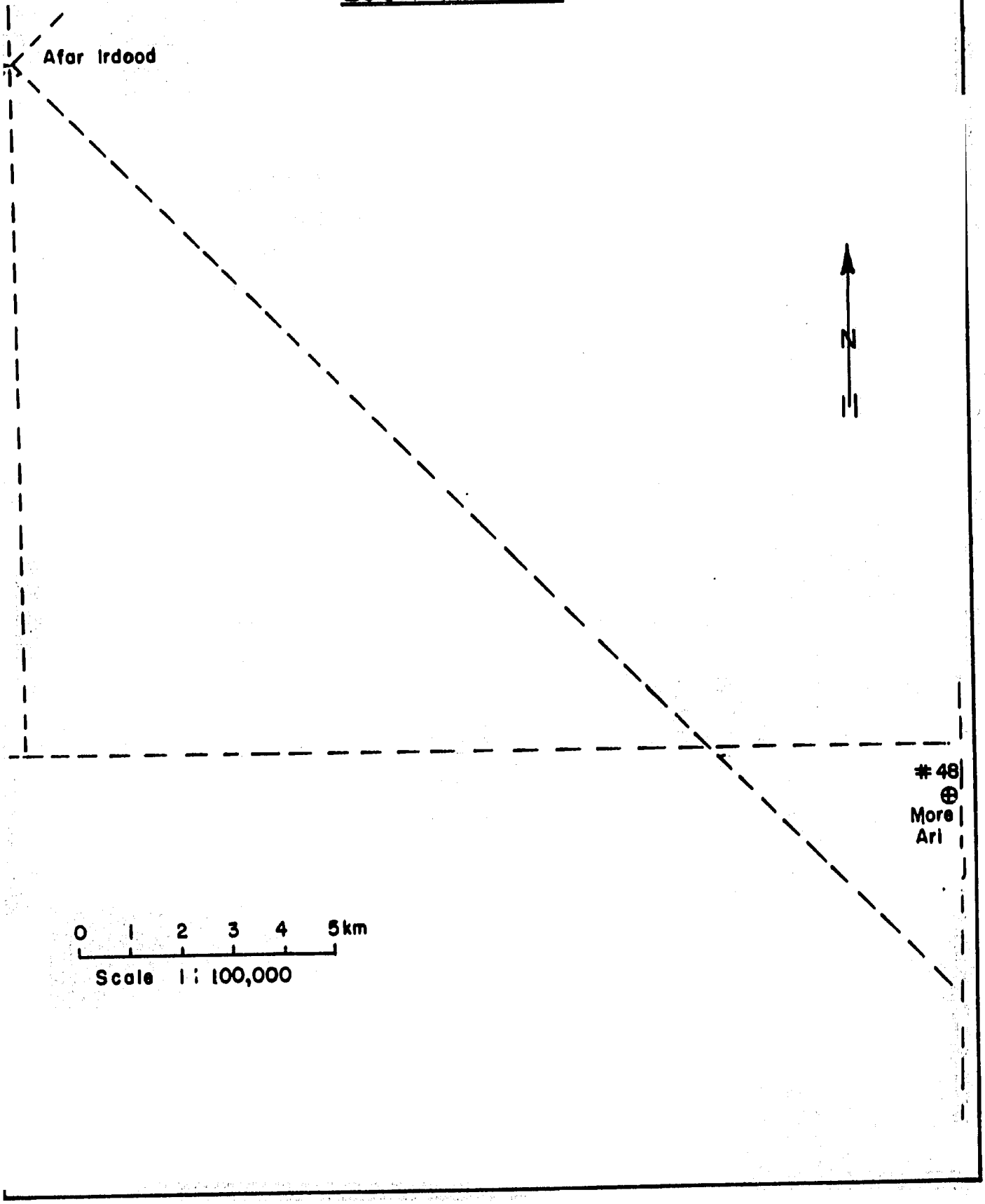
LOCATION MAP WELL #44

AFAR IRDOOD



MORE ARI WELL #48

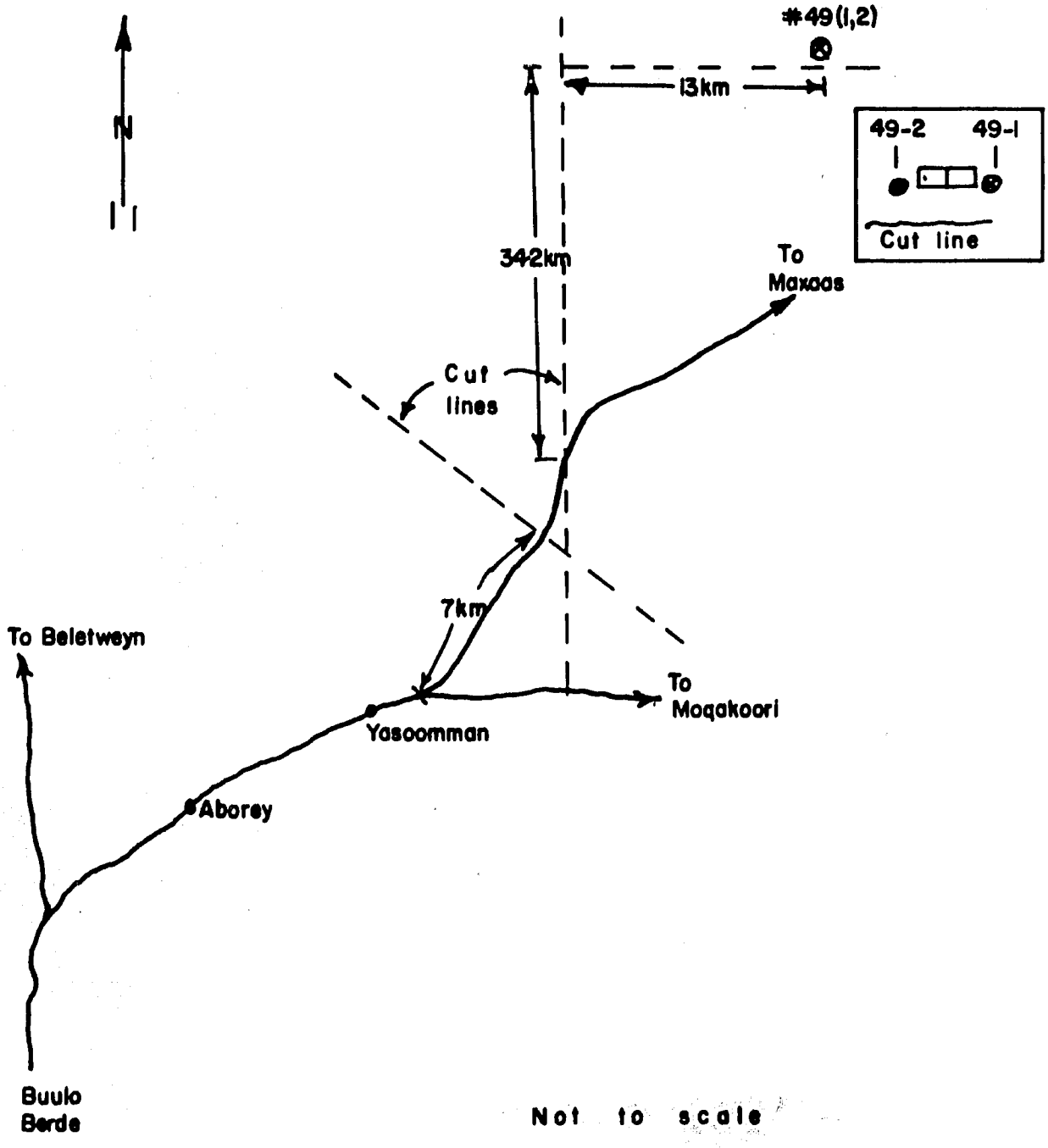
LOCATION MAP



WELL LOCATION

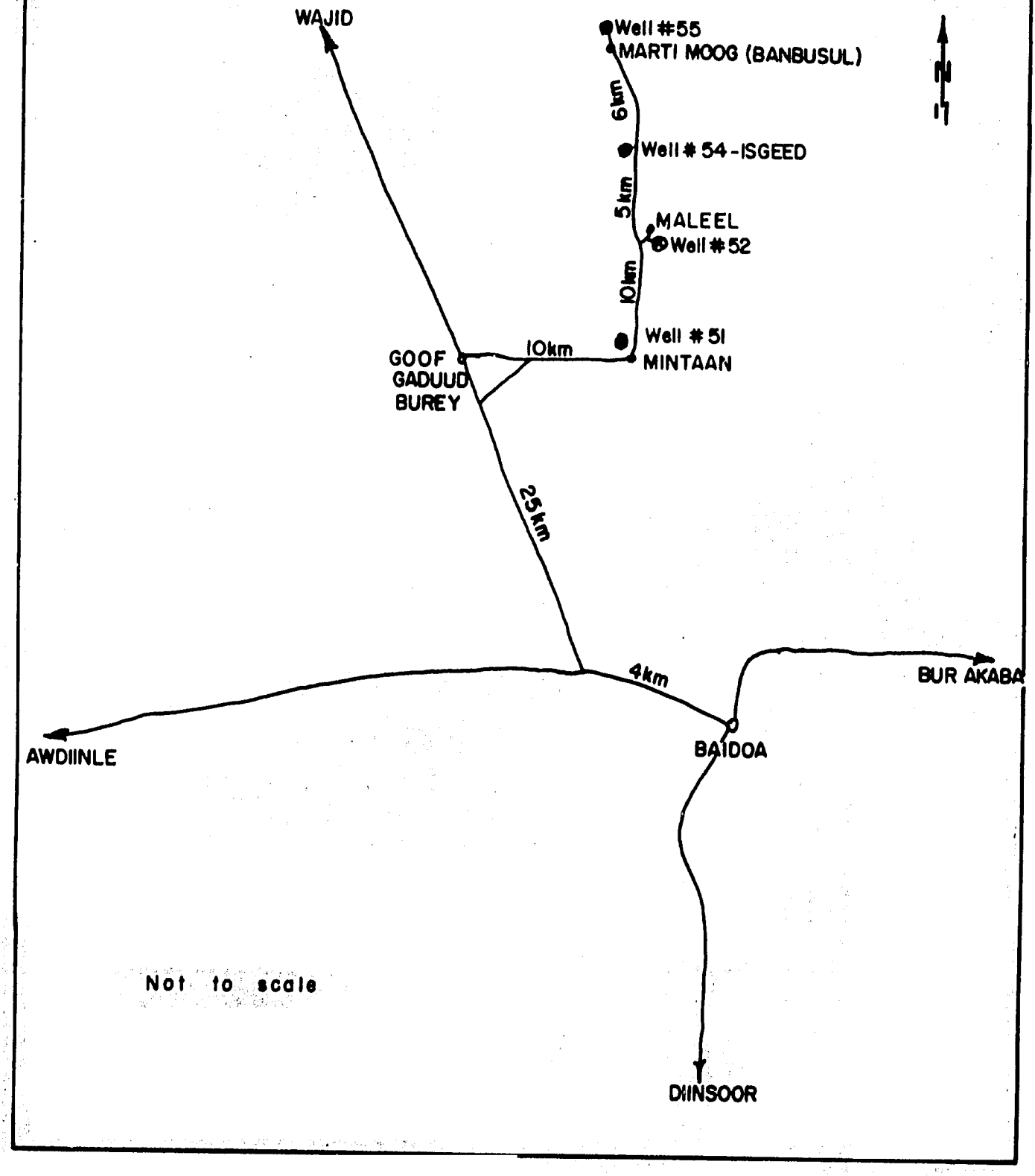
MAXAAS BOREHOLE # 49

(Wells 1 & 2 Located 15m apart - opposite sides of the mud pits)



WELL LOCATION SKETCH MAP

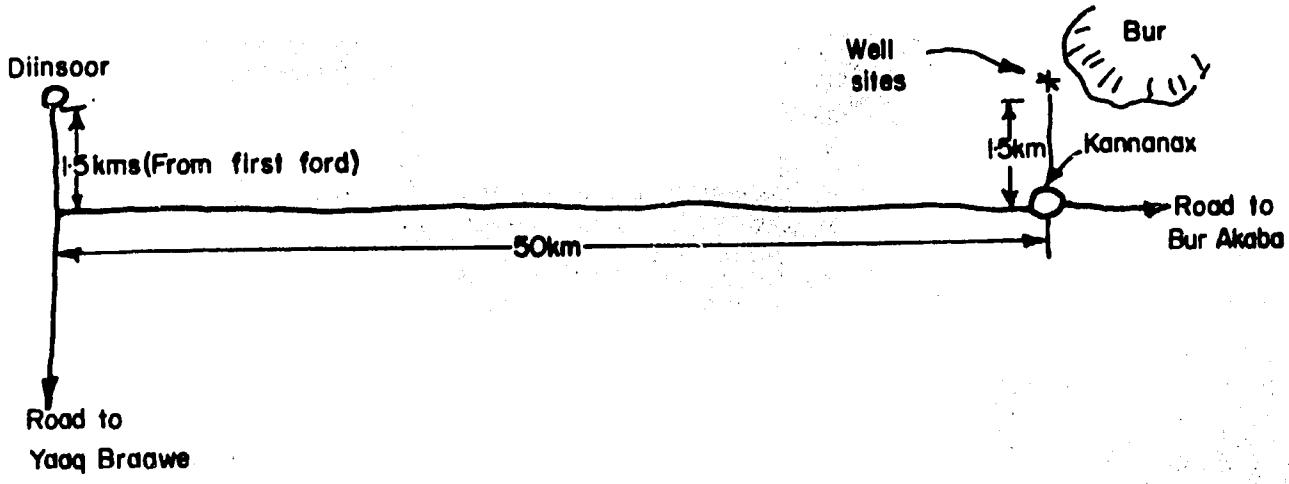
BOREHOLE NUMBERS 51,52,54,55

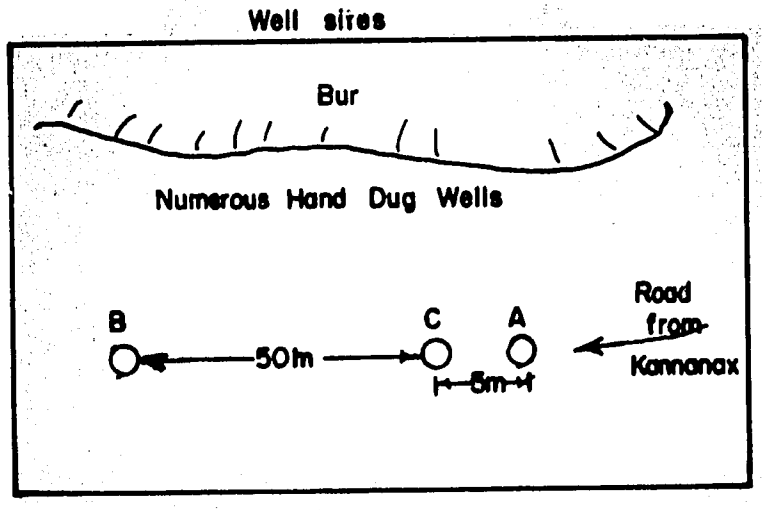


28

KANNANAX WELL #60

LOCATION MAP

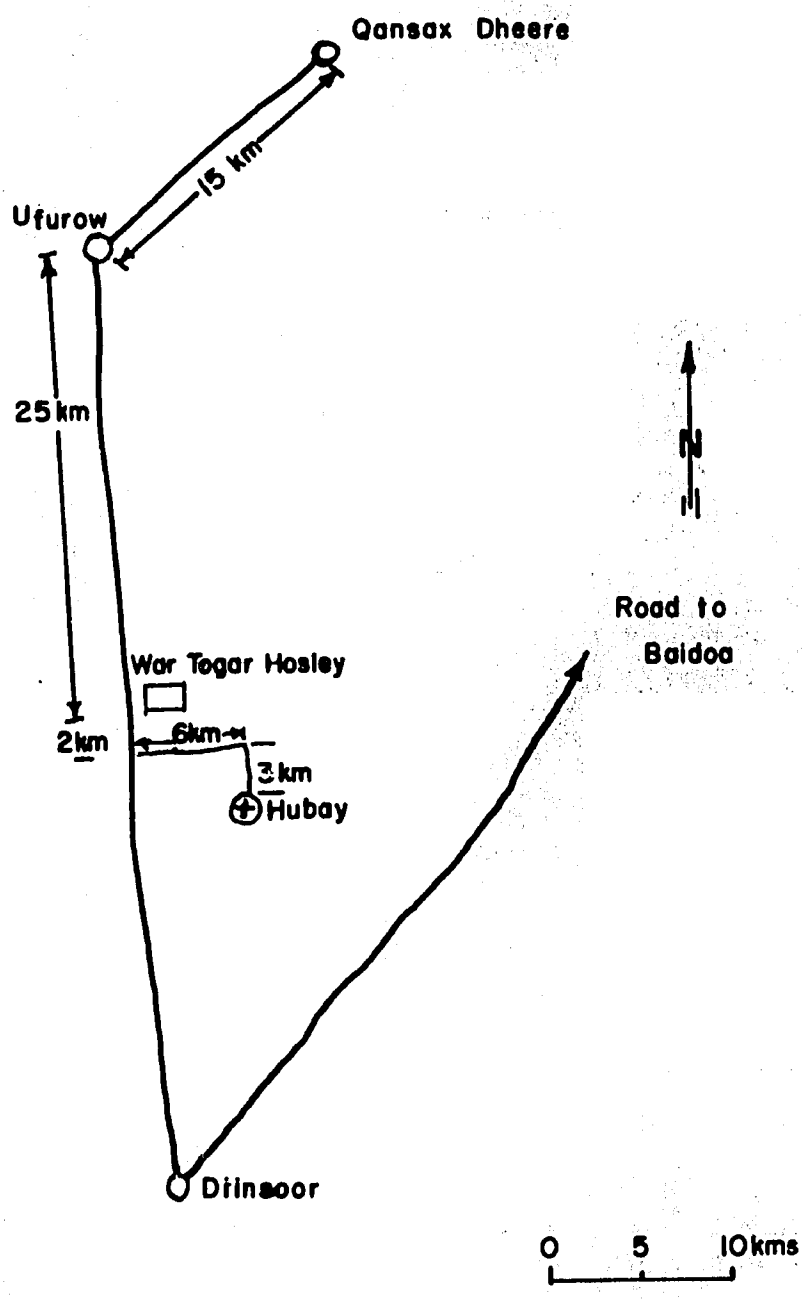




Not to scale

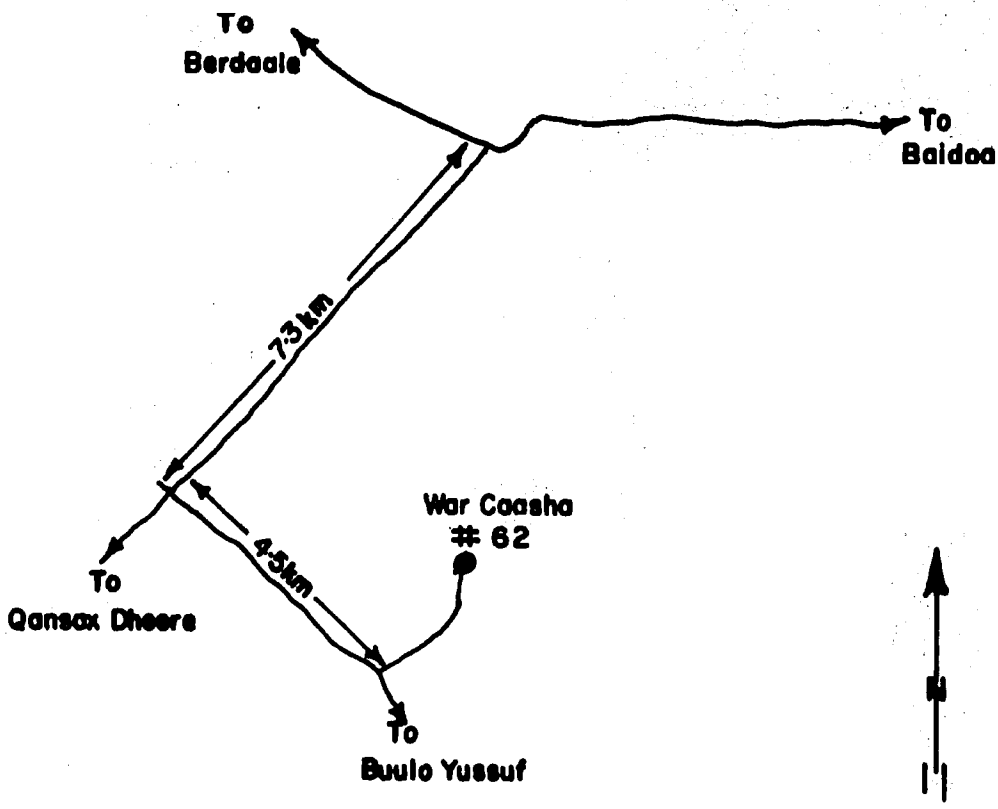
HUBAY WELL # 61

LOCATION MAP



WAR CAASHA WELL #62

LOCATION MAP

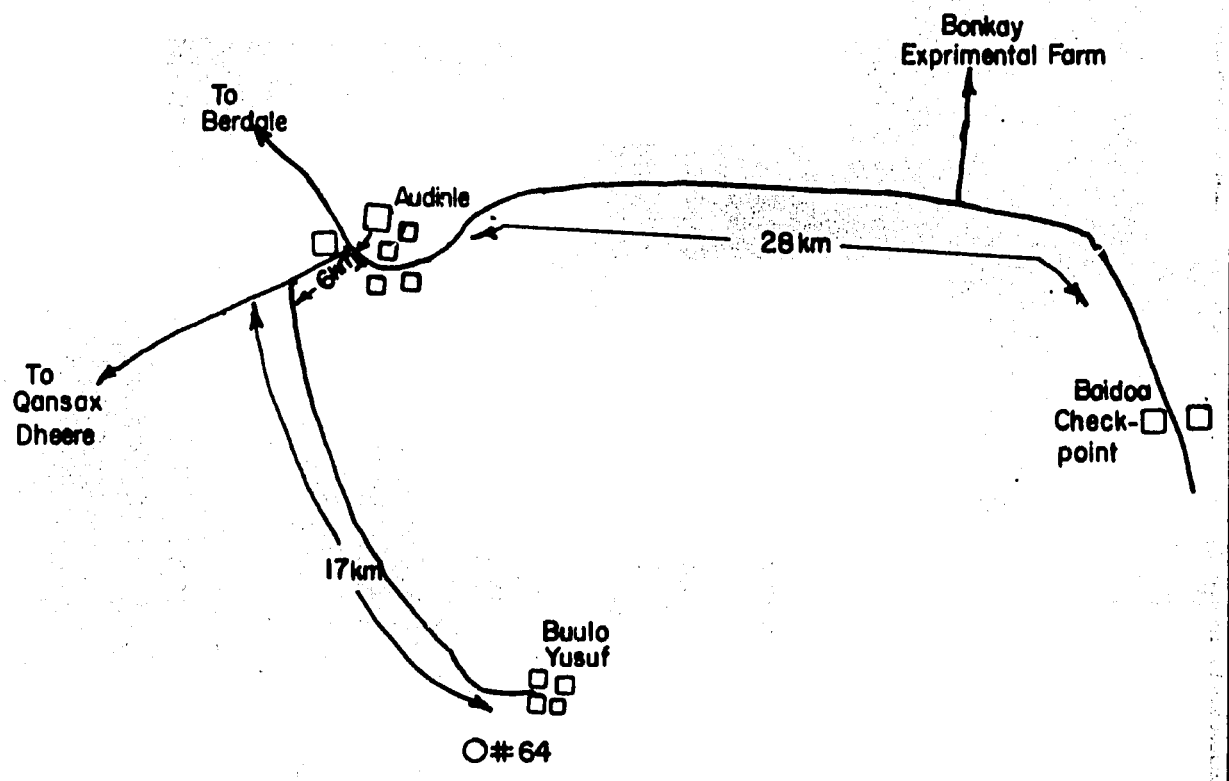


Not to scale

LBII / RM

BUULO YUUSUF WELL #64

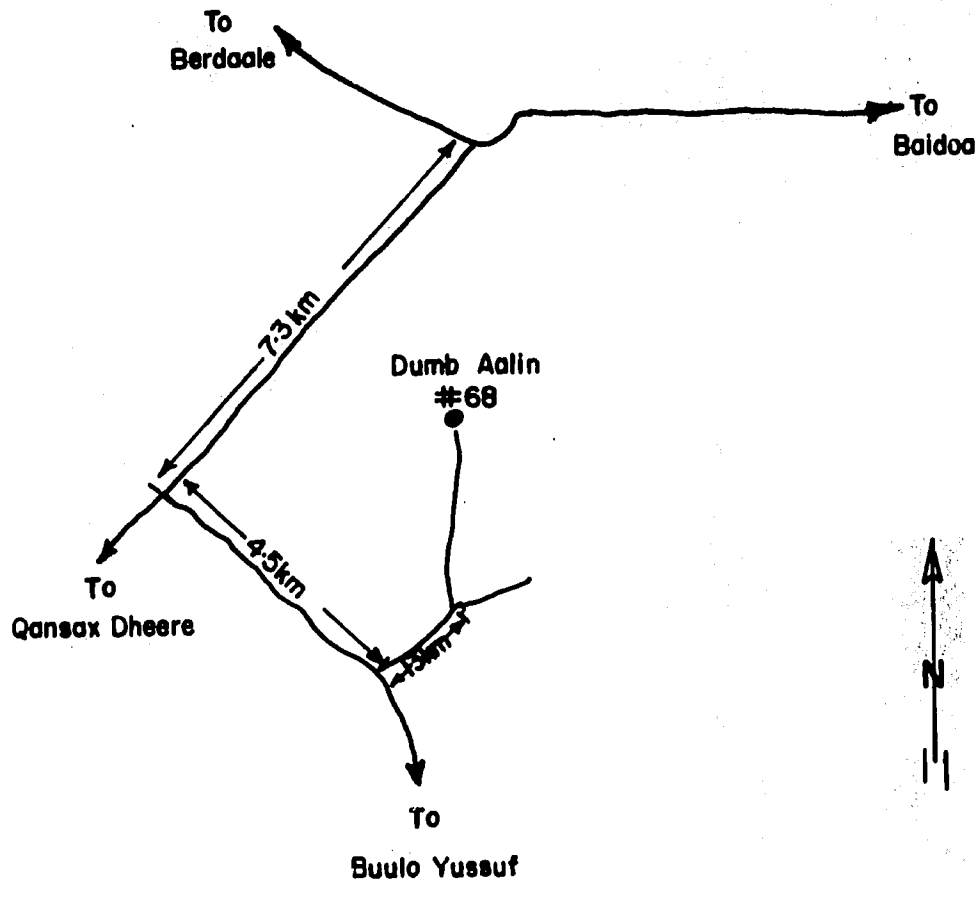
LOCATION MAP



Not to scale

DUMBAL AALIN WELL #68

LOCATION MAP



Not to scale

LBII / RM

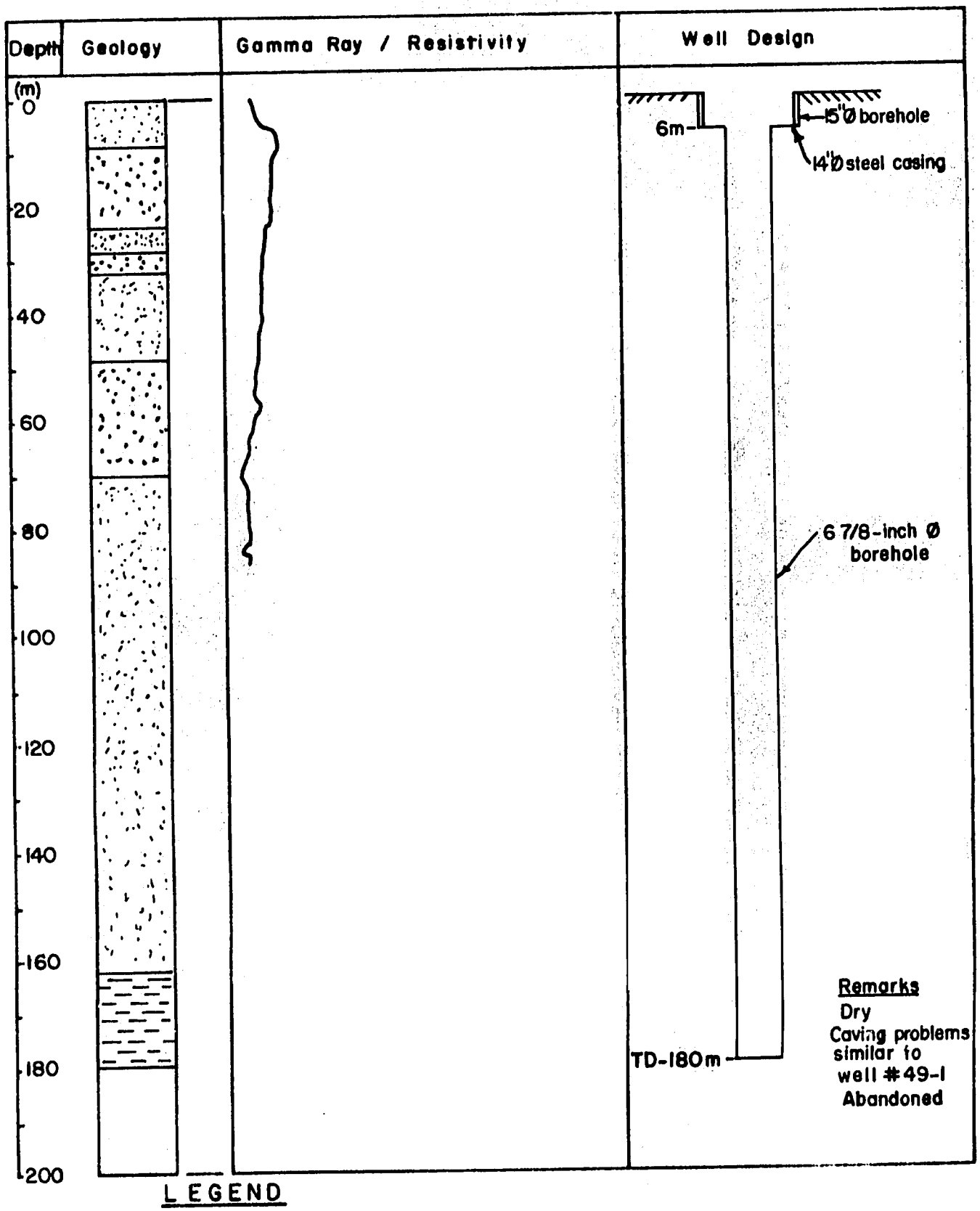
A3 ELECTRIC LOGS AND WELL DESIGNS

Water Development Agency

CGDP - 104

Well Nº 49-2

Location Maxaas



LEGEND

Clay or Shale | Sand | Limestone | Marl

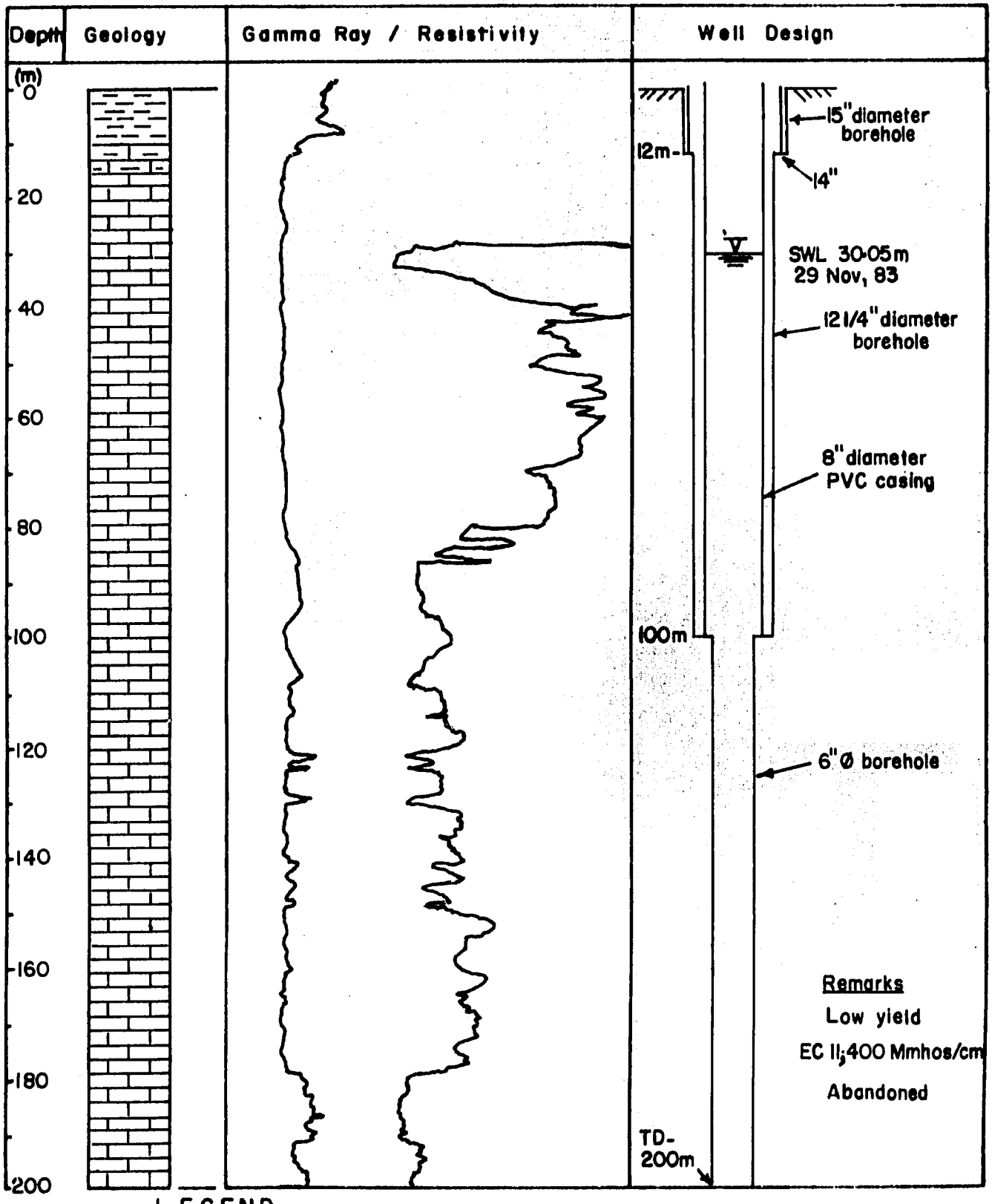
Clayey Sand | Sandstone | Karst Limestone | Basement

Water Development Agency

CGDP - 104

Well Nº 50

Location Seed Farm Bonkay



LEGEND

Clay or Shale | Sand | Limestone | Marl

Clayey Sand | Sandstone | Karst Limestone | Basement

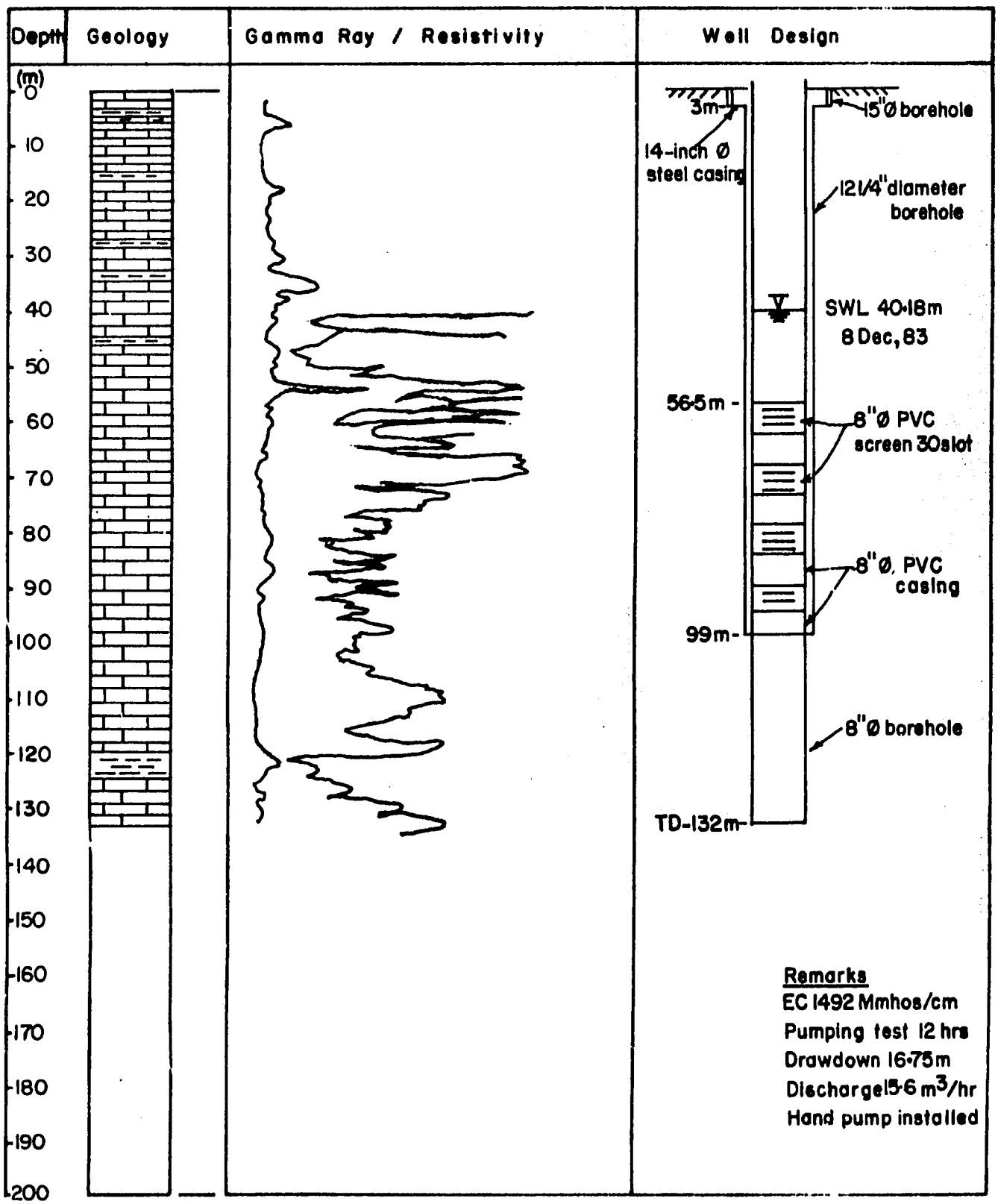
36

Water Development Agency

CGDP - 104

Well Nº 51

Location Mintaan



LEGEND

Clay or Shale | Sand | Limestone | Marl

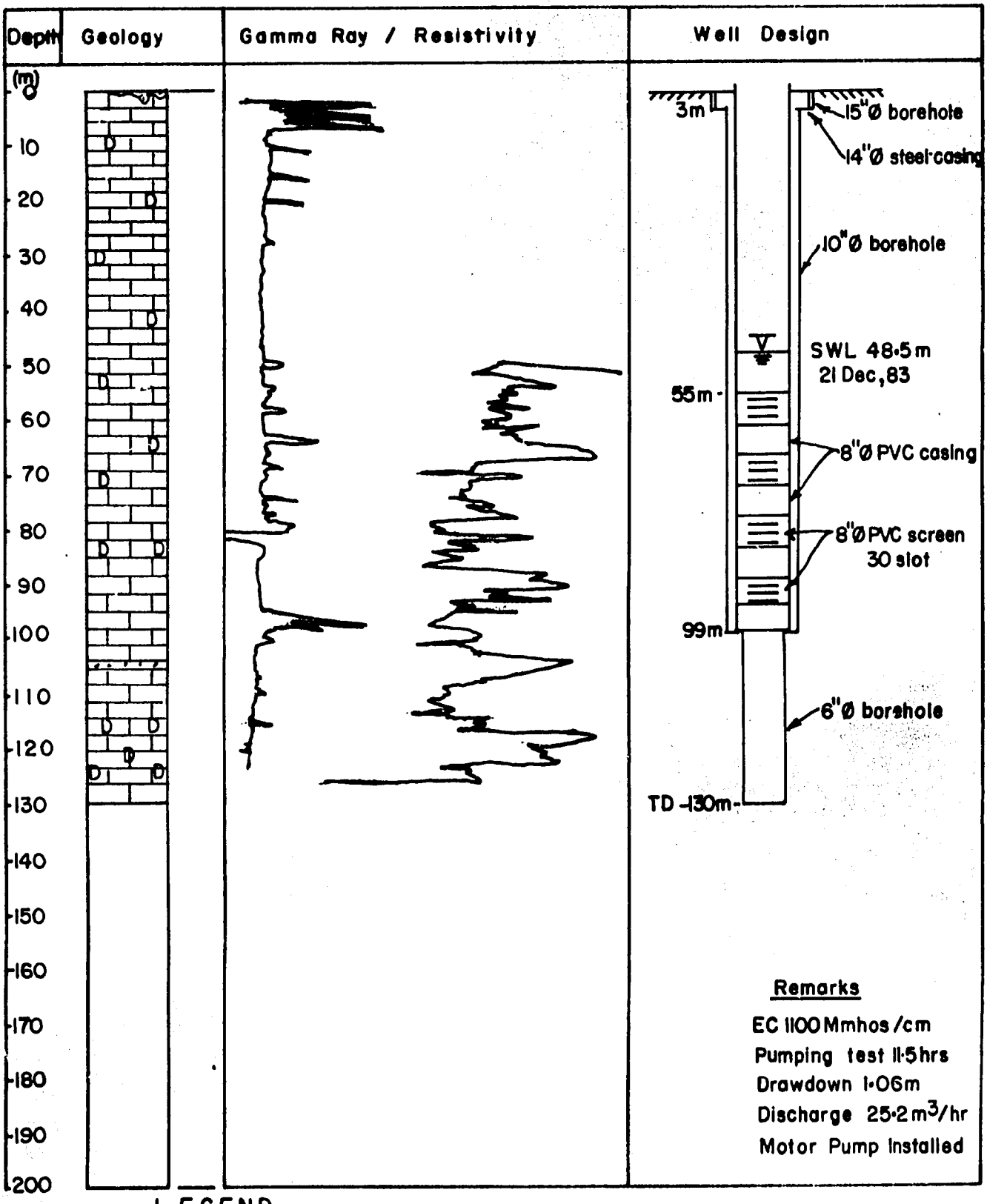
Clayey Sand | Sandstone | Karst Limestone | Basement

Water Development Agency

CGDP - 104

Well Nº 52

Location Maleel



LEGEND

Clay or Shale | Sand | Limestone | Marl

Clayey Sand | Sandstone | Karst Limestone | Dolomite

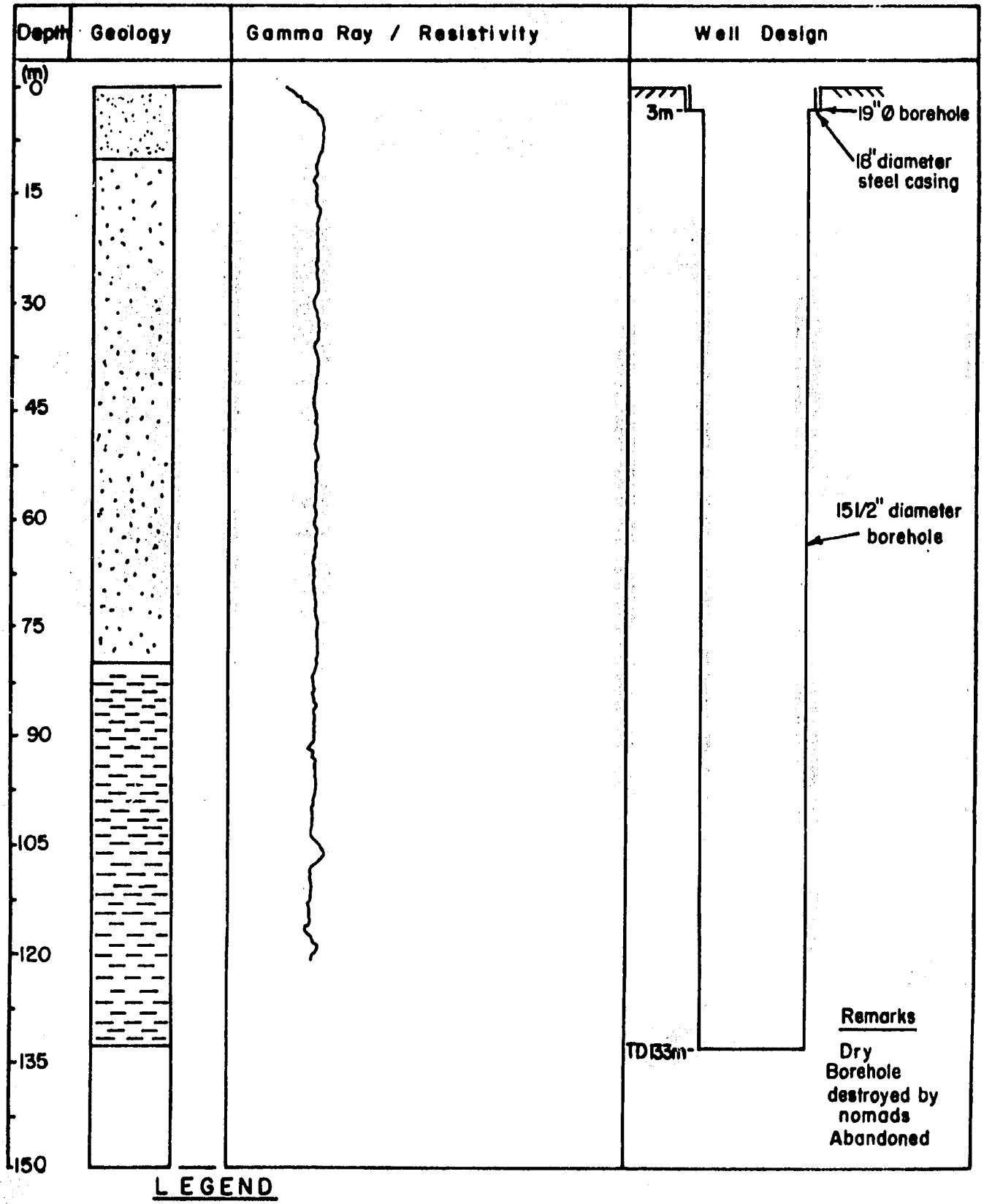
36

Water Development Agency

CGDP - 104

Well Nº 53

Location Aborey II



LEGEND

Clay or Shale | Sand | Limestone | Marl

Clayey Sand | Sandstone | Karst Limestone | Basement

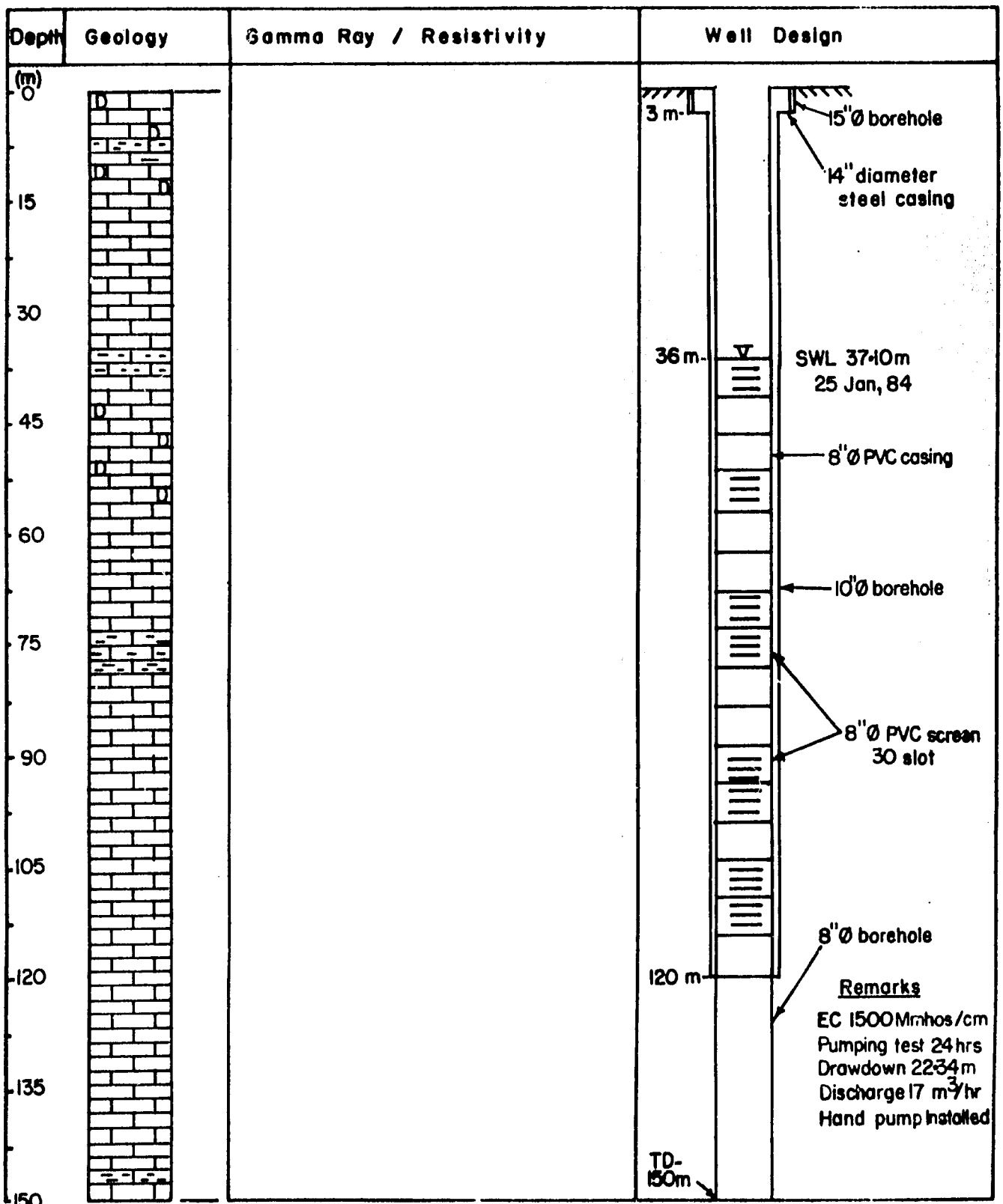
29

Water Development Agency

CGDP - 104

Well Nº 54

Location Isgeed



LEGEND

Clay or Shale | Sand | Limestone | Marl

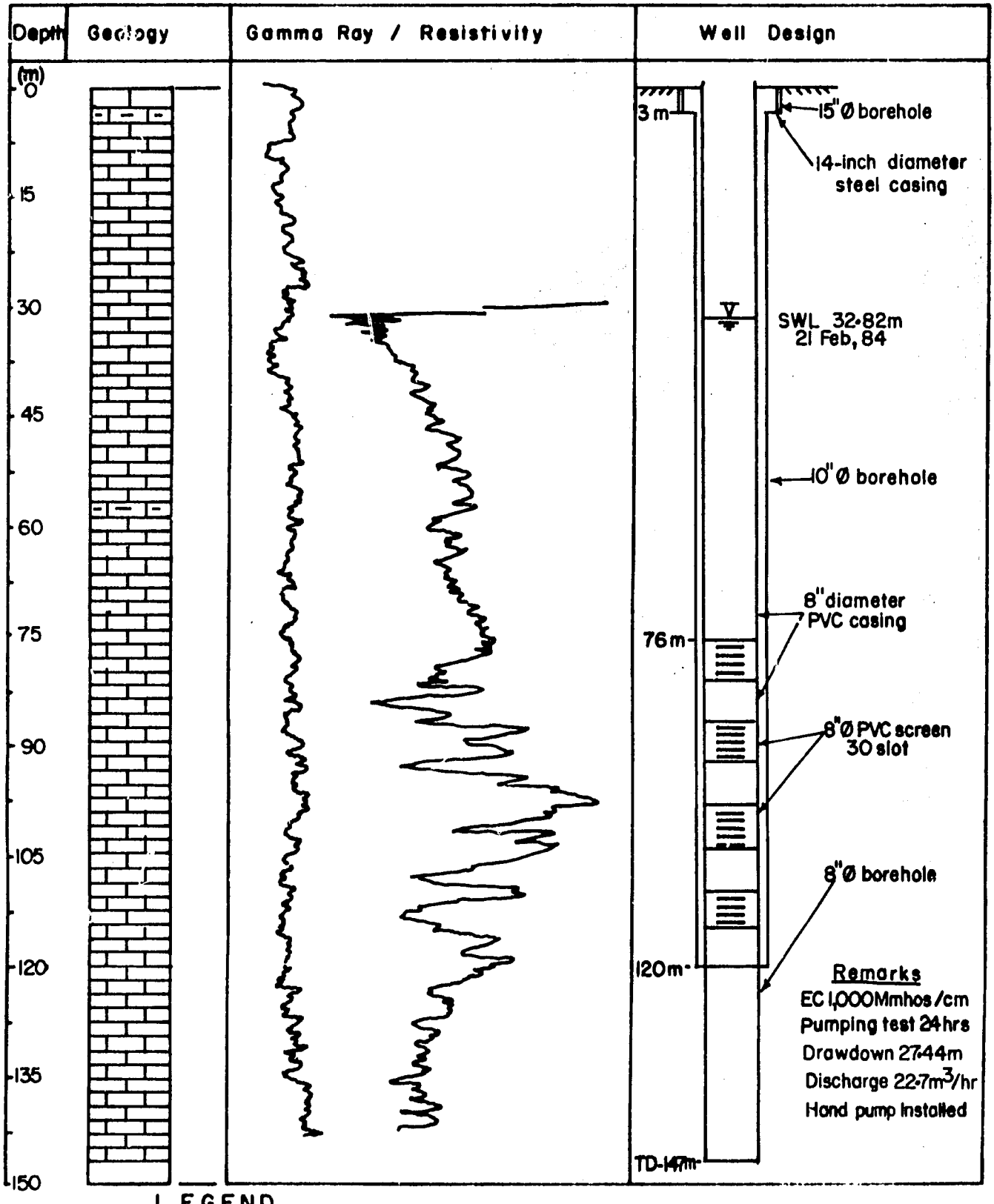
Clayey Sand | Sandstone | Karst Limestone | Dolomite

Water Development Agency

CGDP - 104

Well Nº 55

Location Banbusul



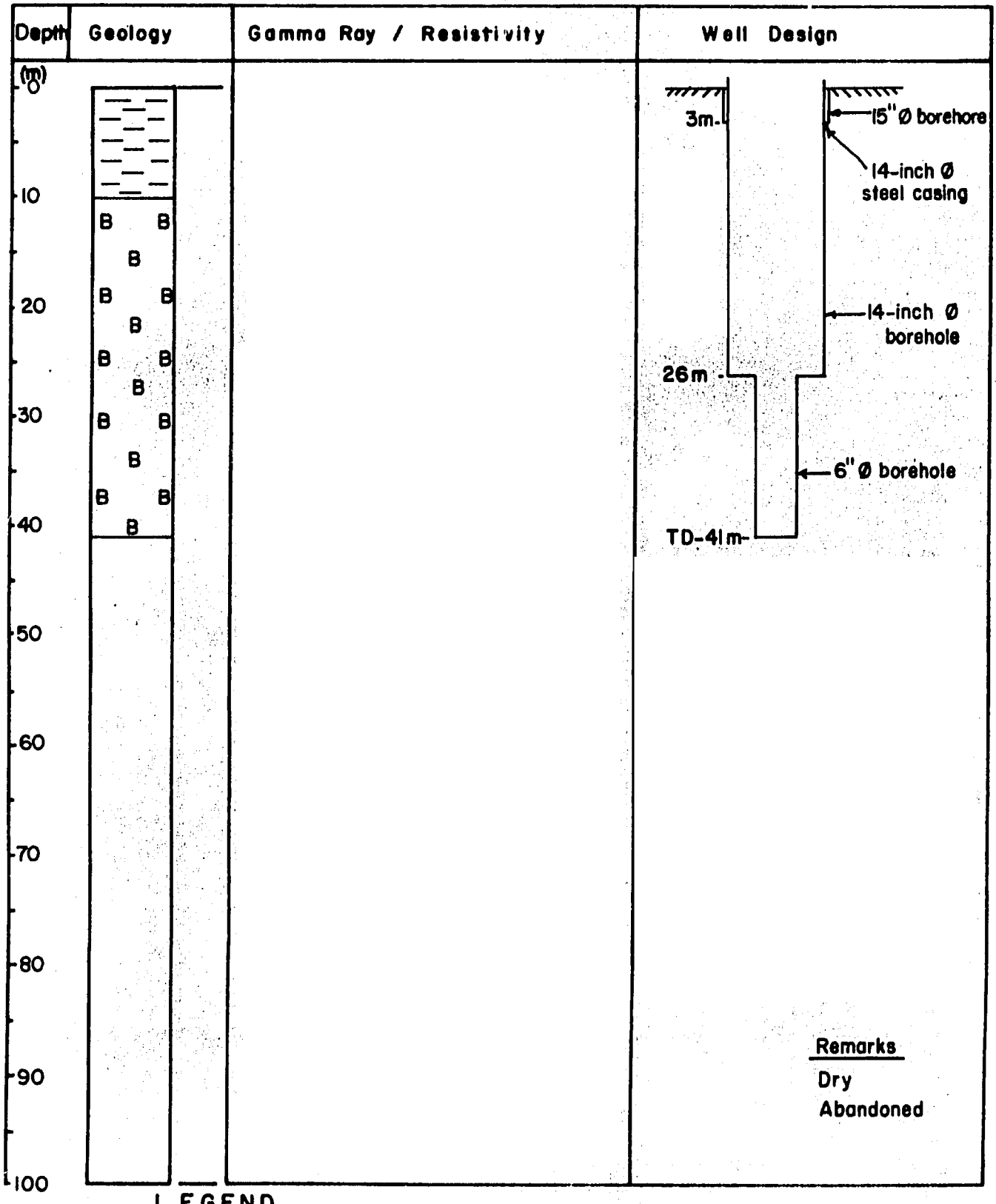
41

Water Development Agency

CGDP - 104

Well Nº 56

Location Jimcada dheen



LEGEND

Clay or Shale | Sand | Limestone | Marl

Clayey Sand | Sandstone | Karst Limestone | Basement

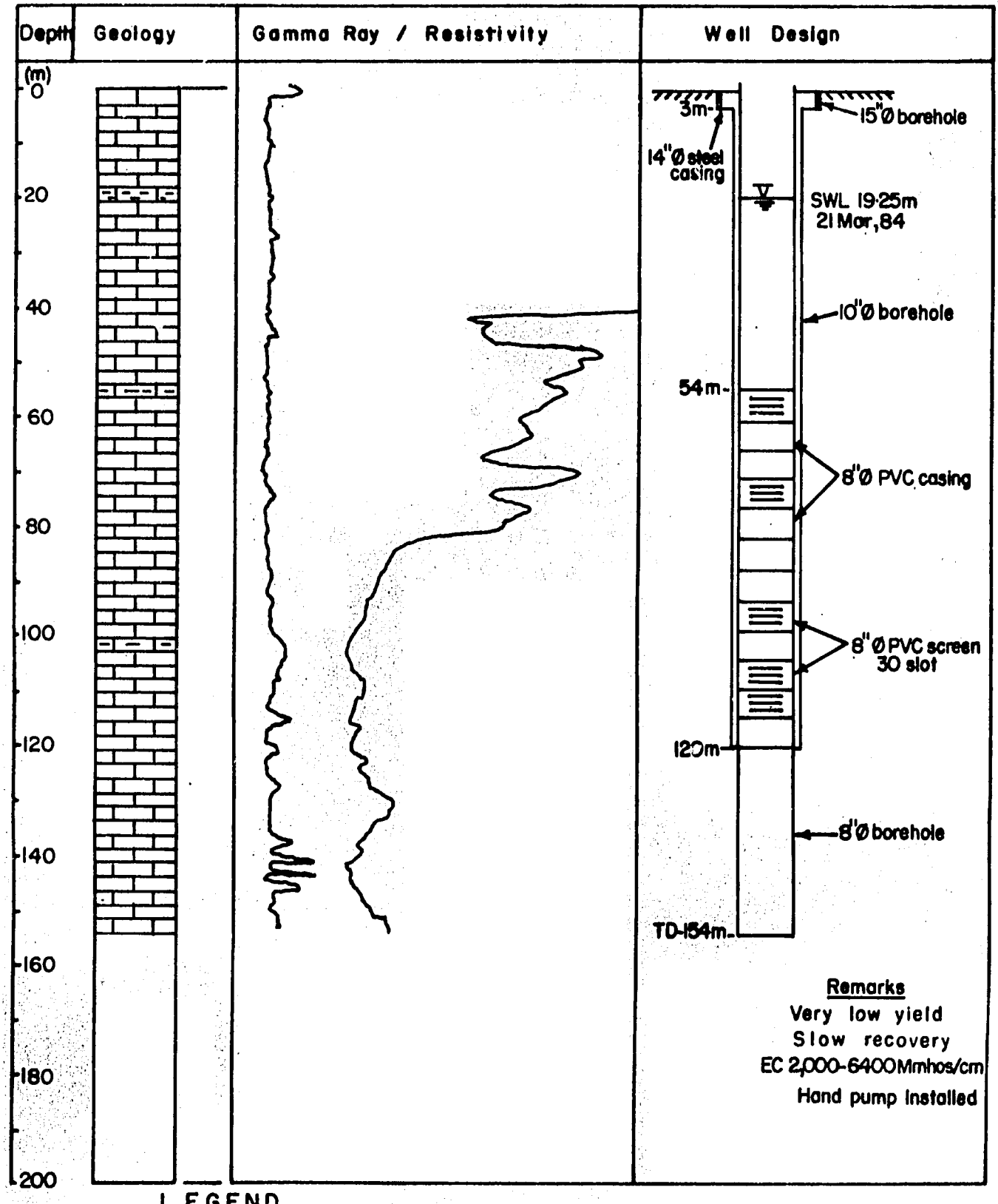
42

Water Development Agency

CGDP - 104

Well Nº 57

Location Hagarka



LEGEND

Clay or Shale | Sand | Limestone | Marl

Clayey Sand | Sandstone | Karst Limestone | Basement

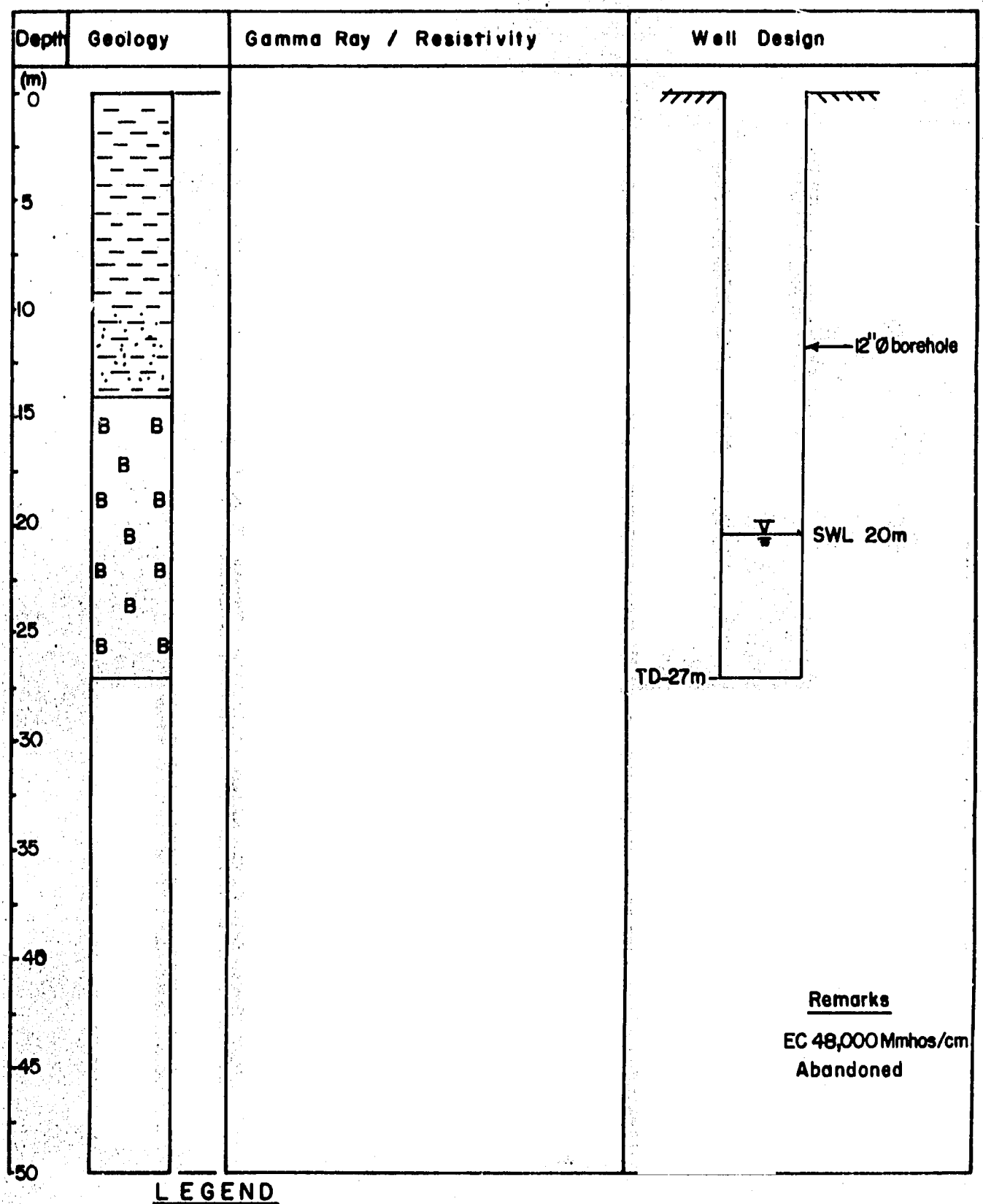
43

Water Development Agency

CGDP - 104

Well № 58

Location Bur Akaba VI



LEGEND

Clay or Shale | Sand | Limestone | Marl

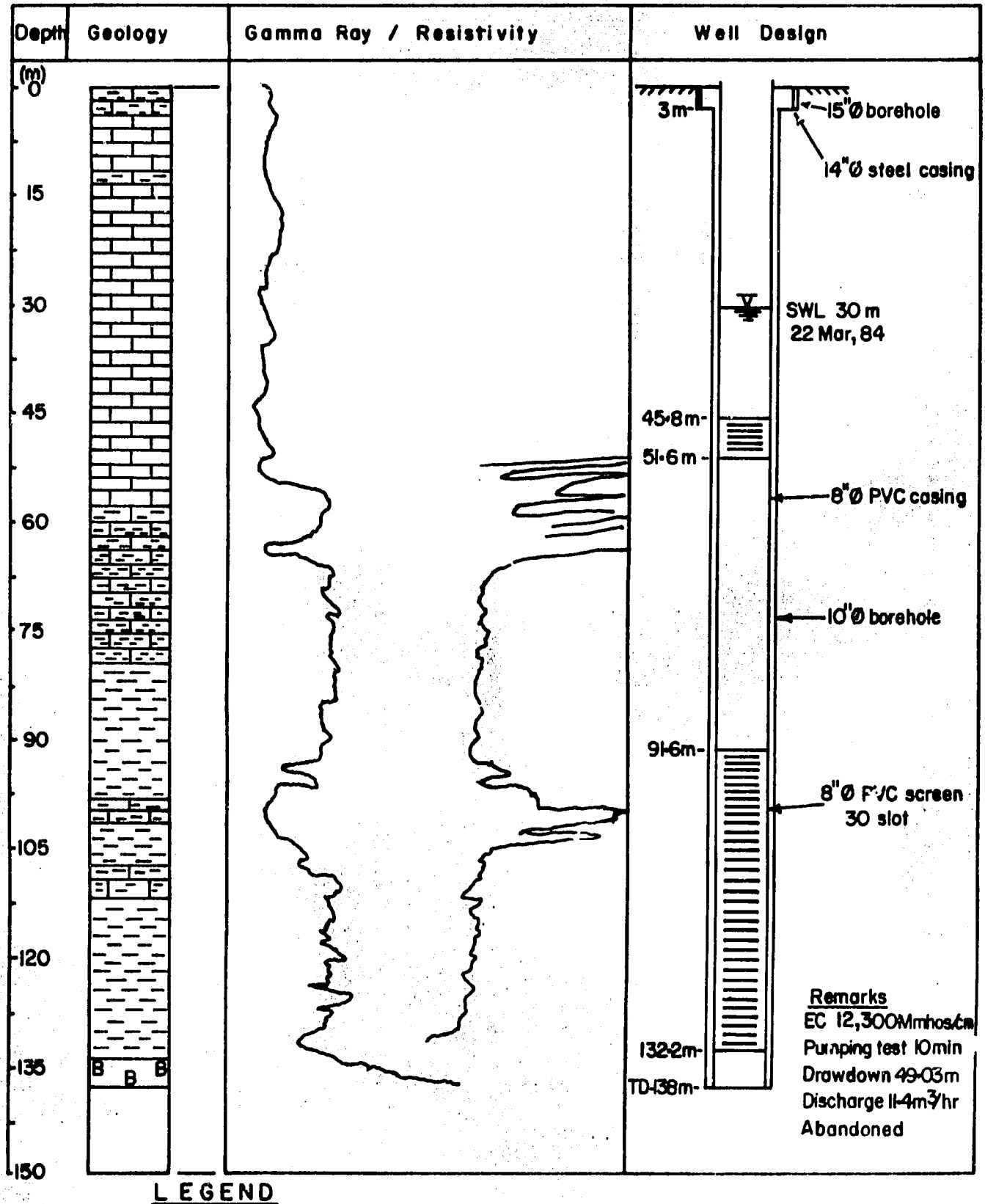
Clayey Sand | Sandstone | Karst Limestone | Basement

Water Development Agency

CGDP - 104

Well Nº 59

Location Showka



LEGEND

Clay or Shale | Sand | Limestone | Marl

Clayey Sand | Sandstone | Karst Limestone | Basement

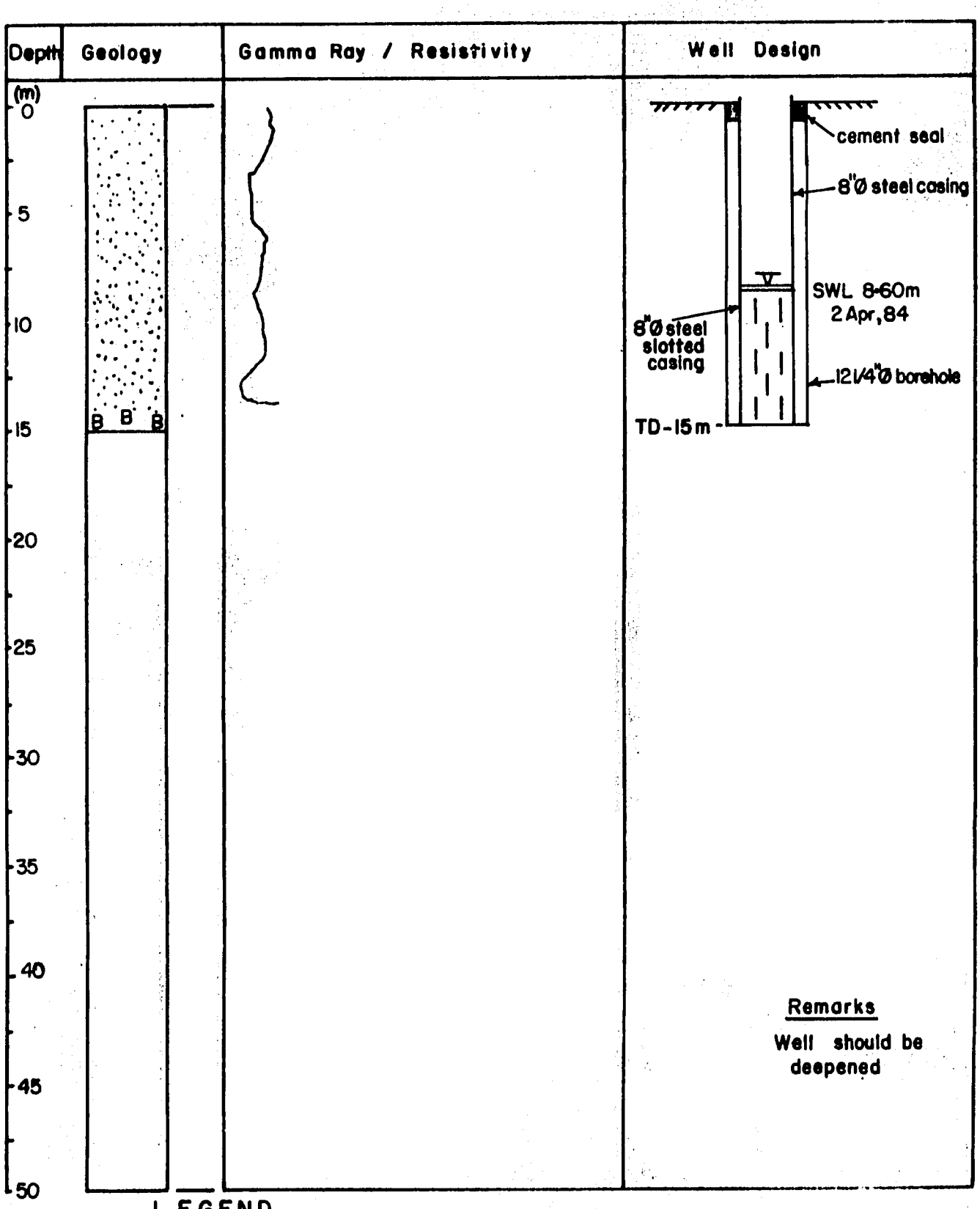
45

Water Development Agency

CGDP - 104

Well Nº 60

Location Kannanax

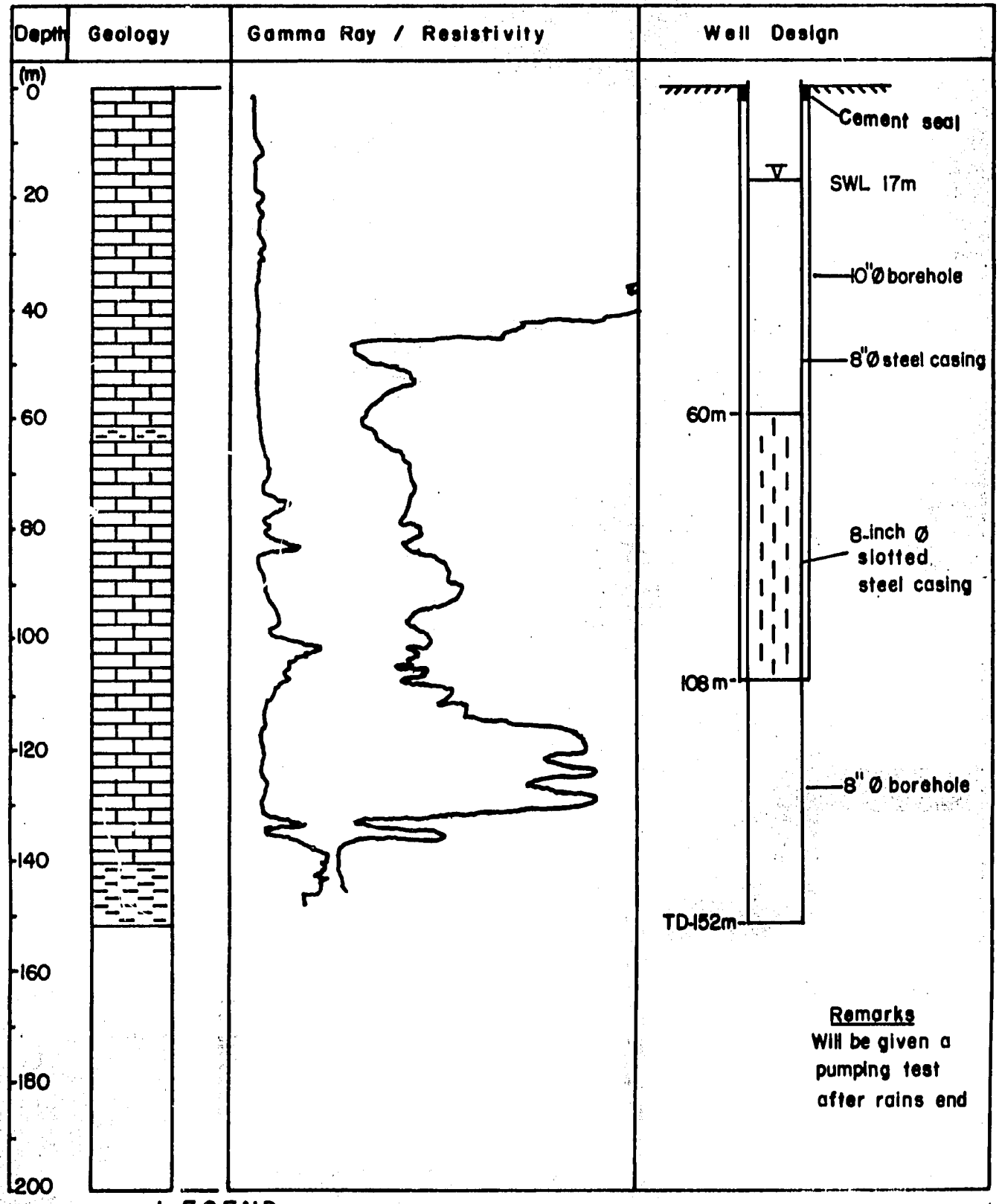


Water Development Agency

CGDP - 104

Well Nº 61

Location Hubay



LEGEND

Clay or Shale | Sand | Limestone | Marl

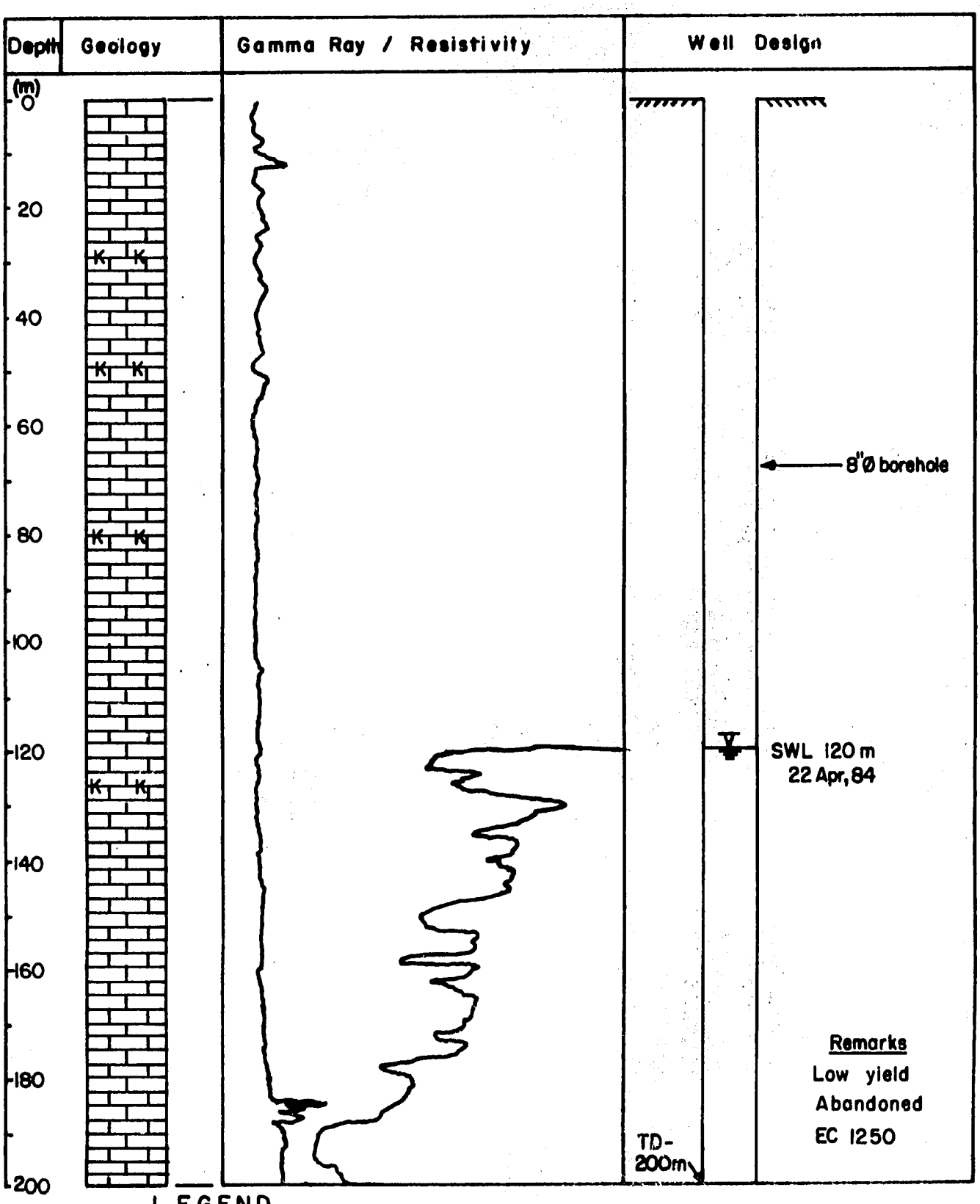
Clayey Sand | Sandstone | Karst Limestone | Basement

Water Development Agency

CGDP - 104

Well Nº 62

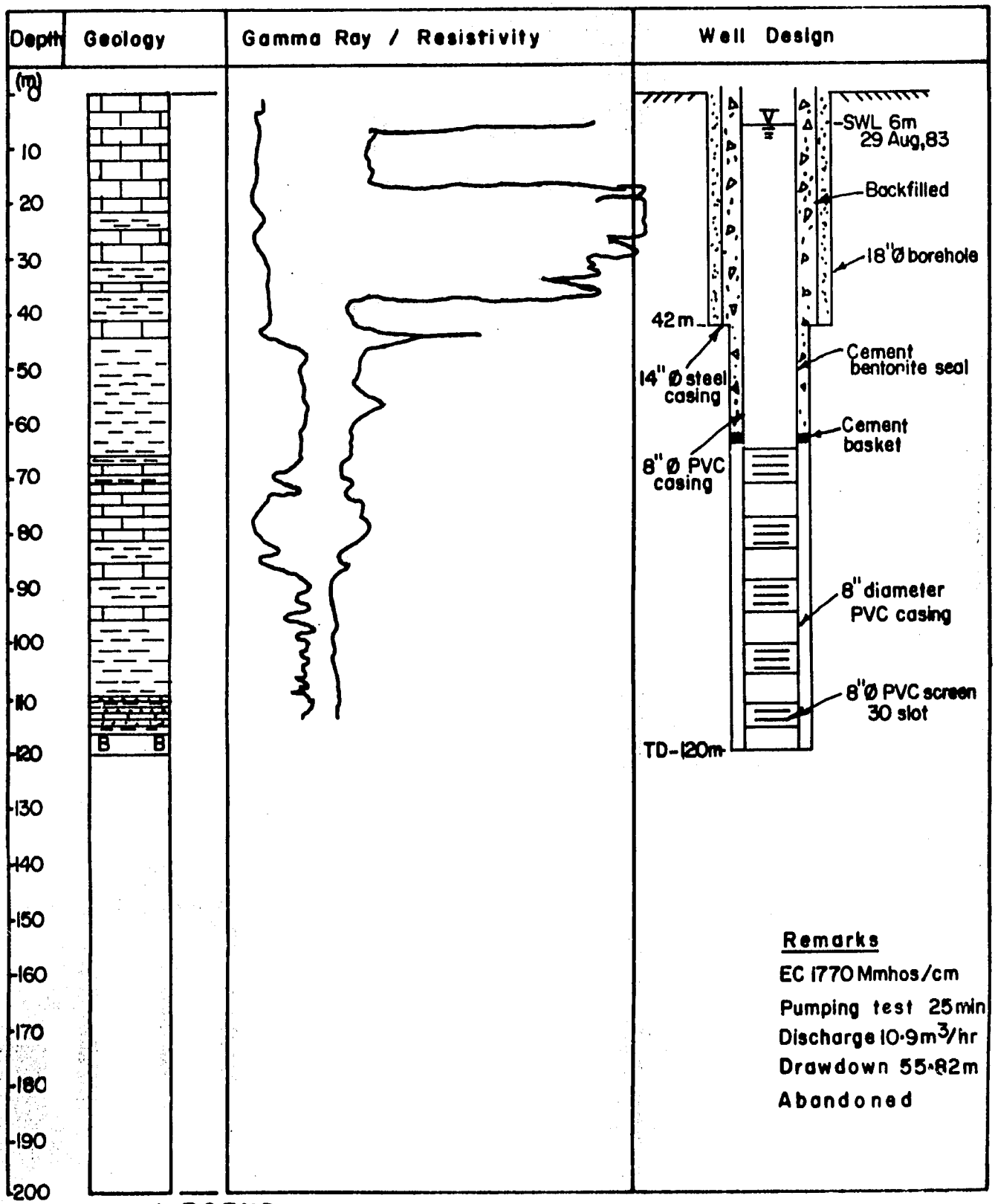
Location War Asha



48

Water Development Agency **Well Nº 45**

CGDP - 104 **Location USAID Compound Baidoa III**



LEGEND

Clay or Shale | Sand | Limestone | Marl

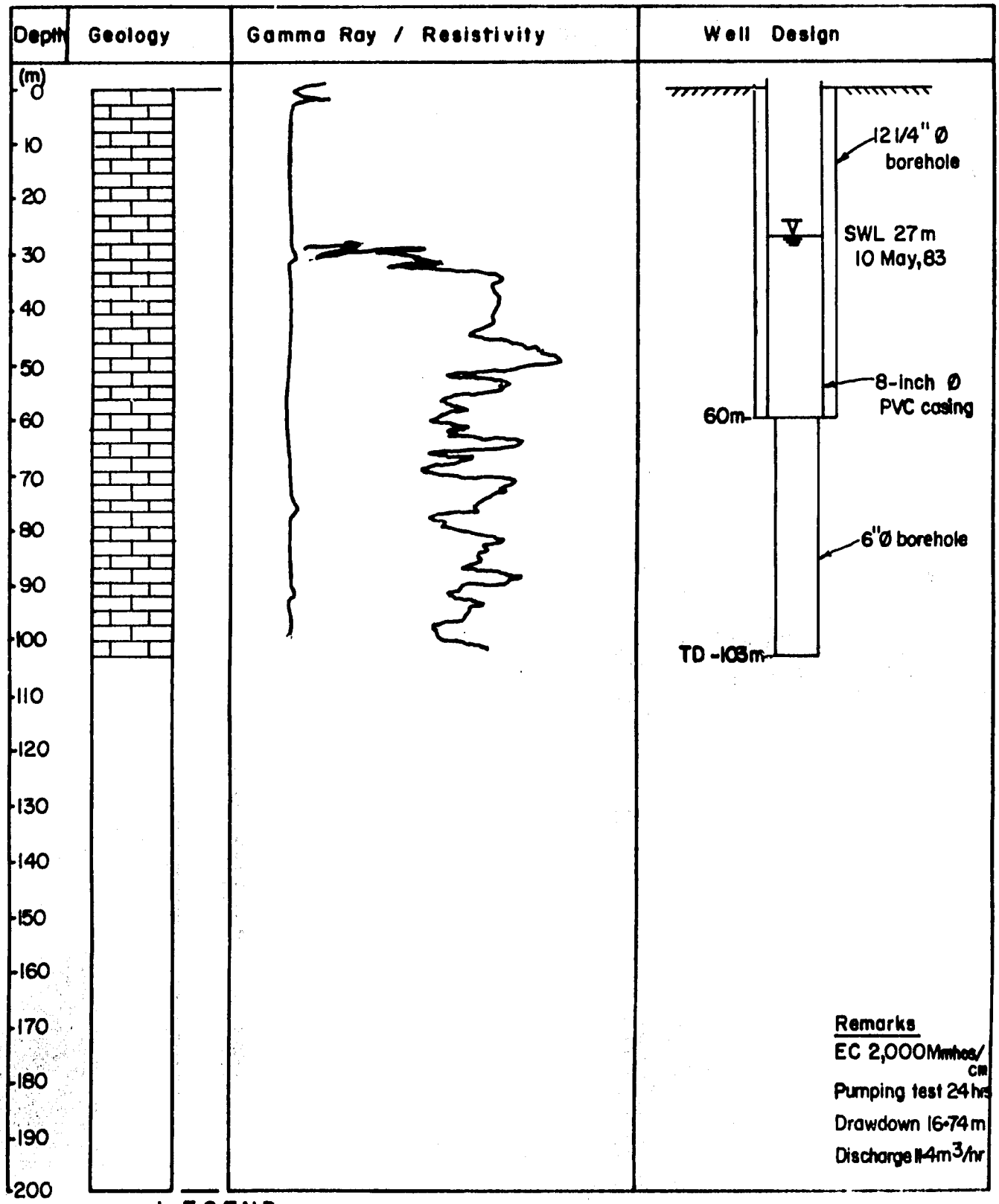
Clayey Sand | Sandstone | Karst Limestone | Basement

Water Development Agency

CGDP - 104

Well Nº 46

Location Qansax Dheere Road Well



LEGEND

Clay or Shale | Sand | Limestone | Marl

Clayey Sand | Sandstone | Karst Limestone | Basement

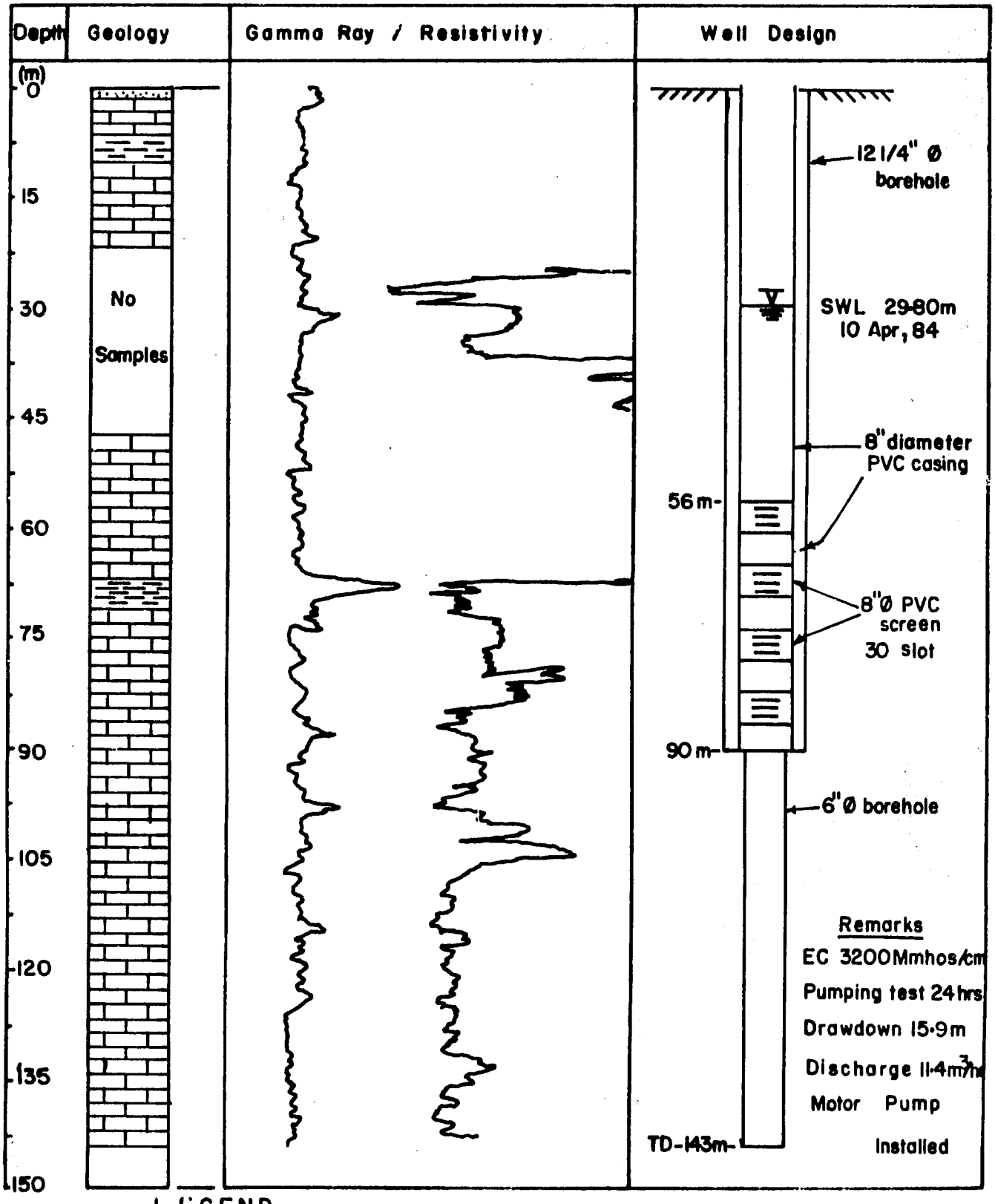
50

Water Development Agency

CGDP - 104

Well Nº 47

Location Awshini



LEGEND

Clay or Shale | Sand | Limestone | Marl

Clayey Sand | Sandstone | Karst Limestone | Basement

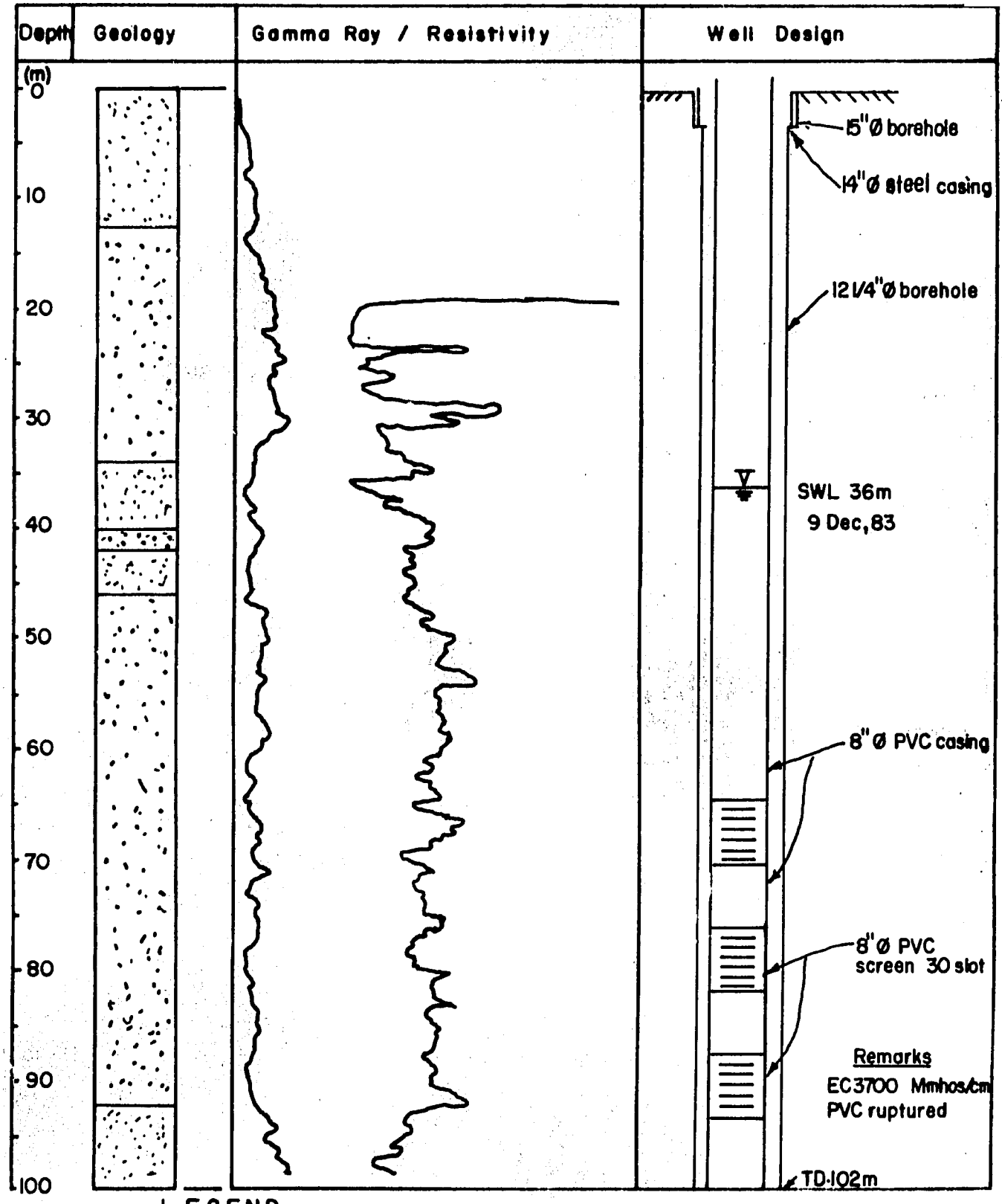
51

Water Development Agency

CGDP - 104

Well Nº 48

Location More Ari



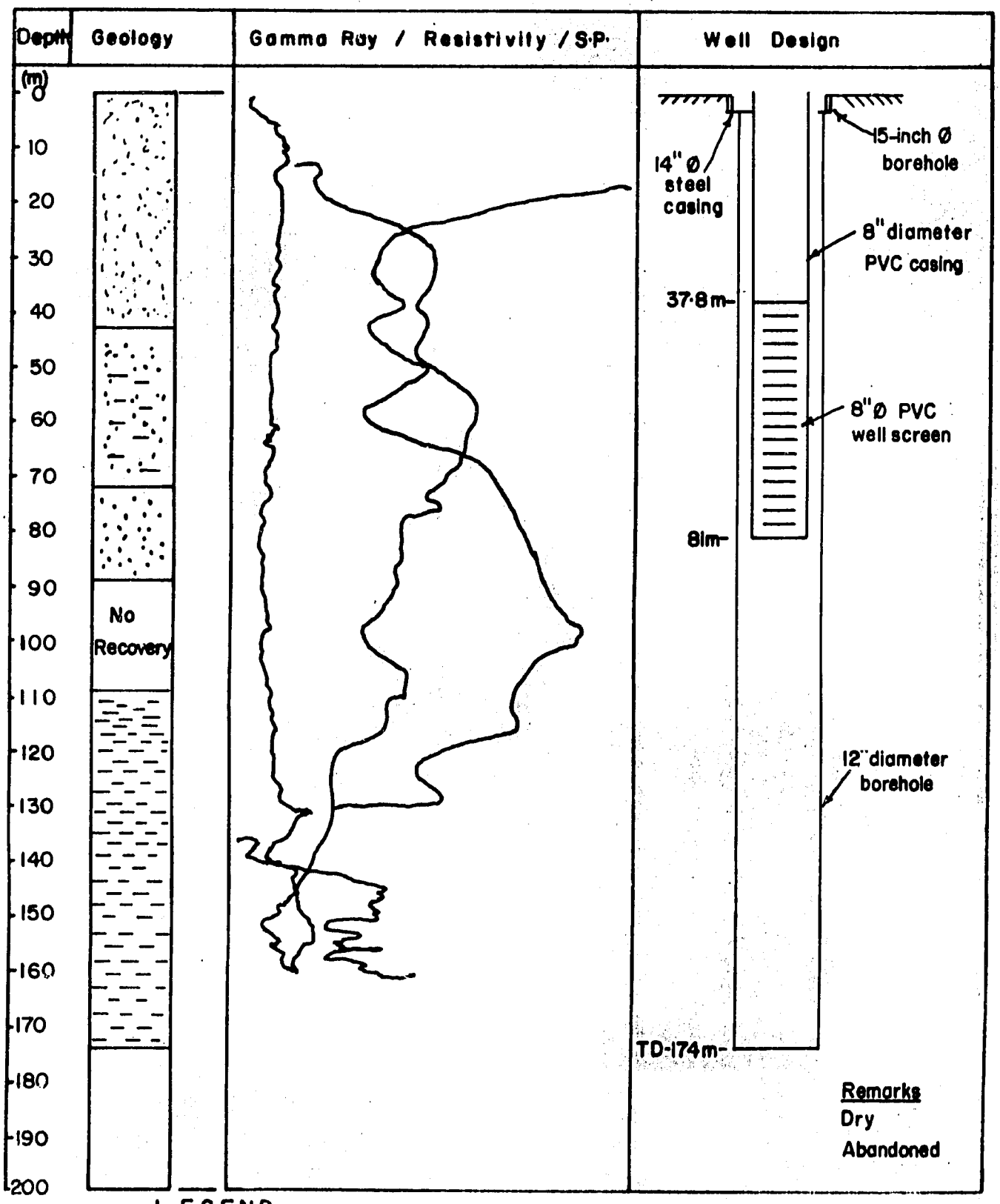
59

Water Development Agency

CGDP - 104

Well Nº 44

Location Afar Irdood



LEGEND

Clay or Shale | Sand | Limestone | Marl

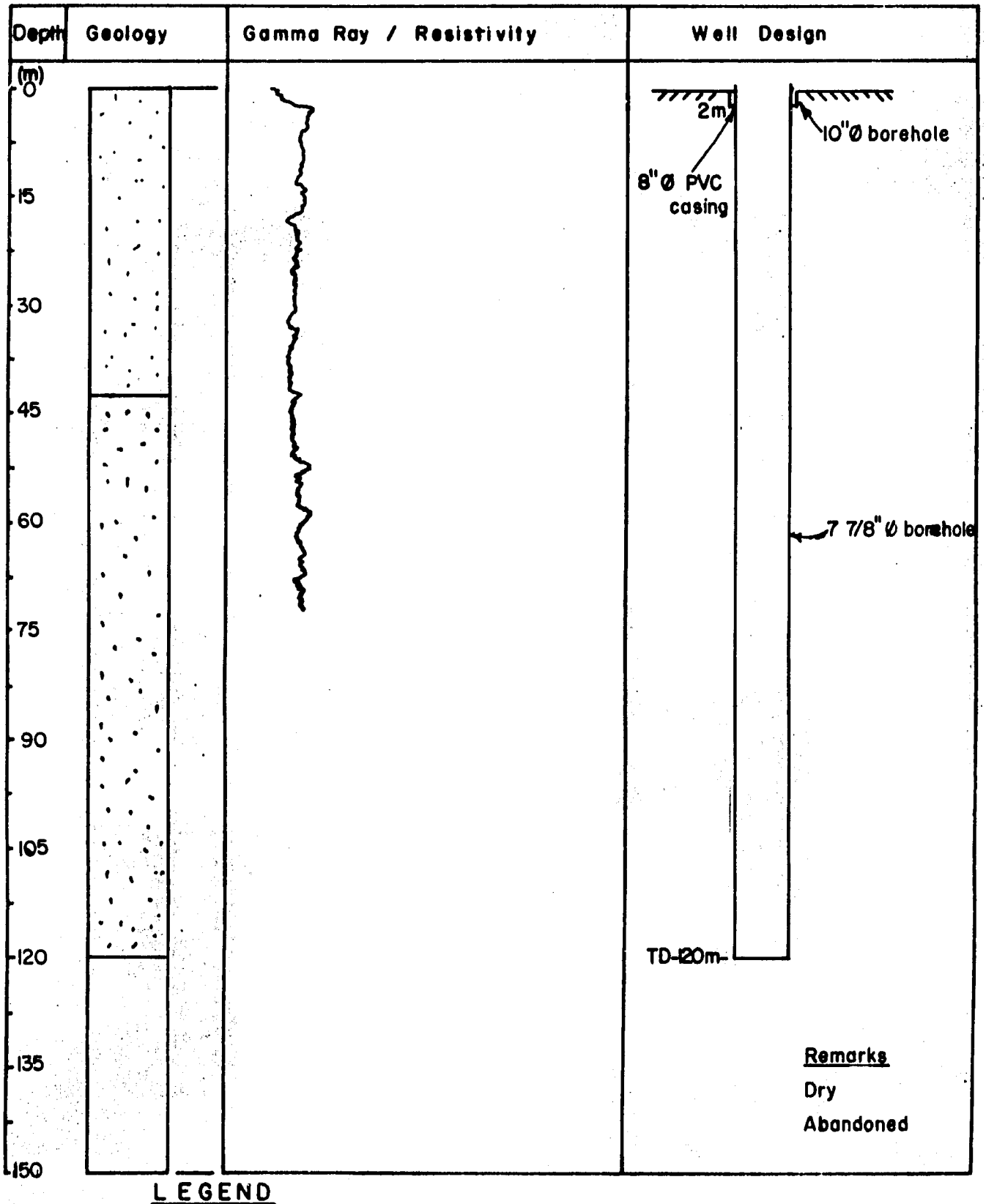
Clayey Sand | Sandstone | Karst Limestone | Basement

Water Development Agency

CGDP - 104

Well Nº 43

Location Aborey I



LEGEND

Clay or Shale | Sand | Limestone | Marl

Clayey Sand | Sandstone | Karst Limestone | Basement

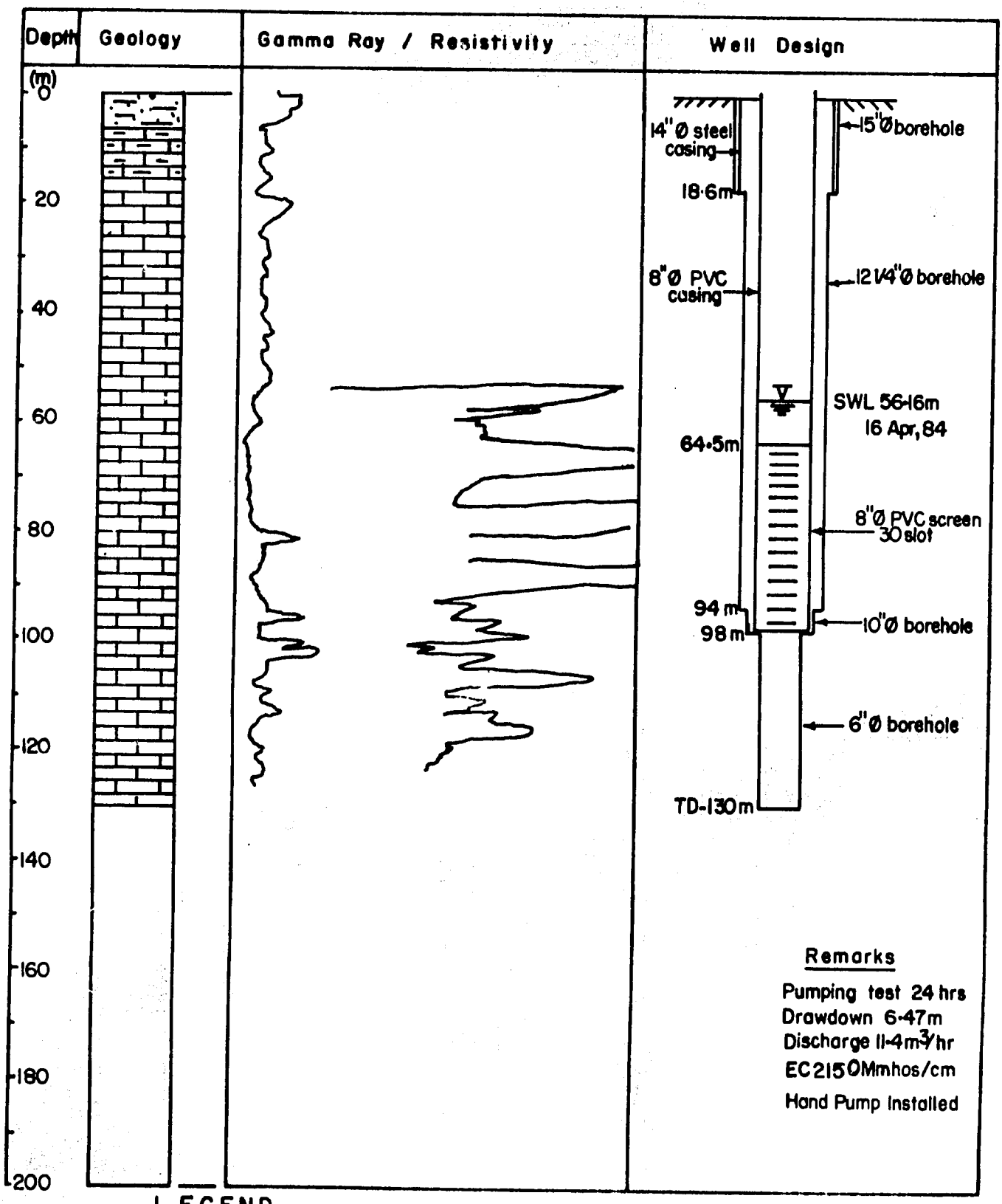
54

Water Development Agency

CGDP - 104

Well Nº 42

Location Buulo Fuur II



LEGEND

Clay or Shale | Sand | Limestone | Marl

Clayey Sand | Sandstone | Karst Limestone | Basement

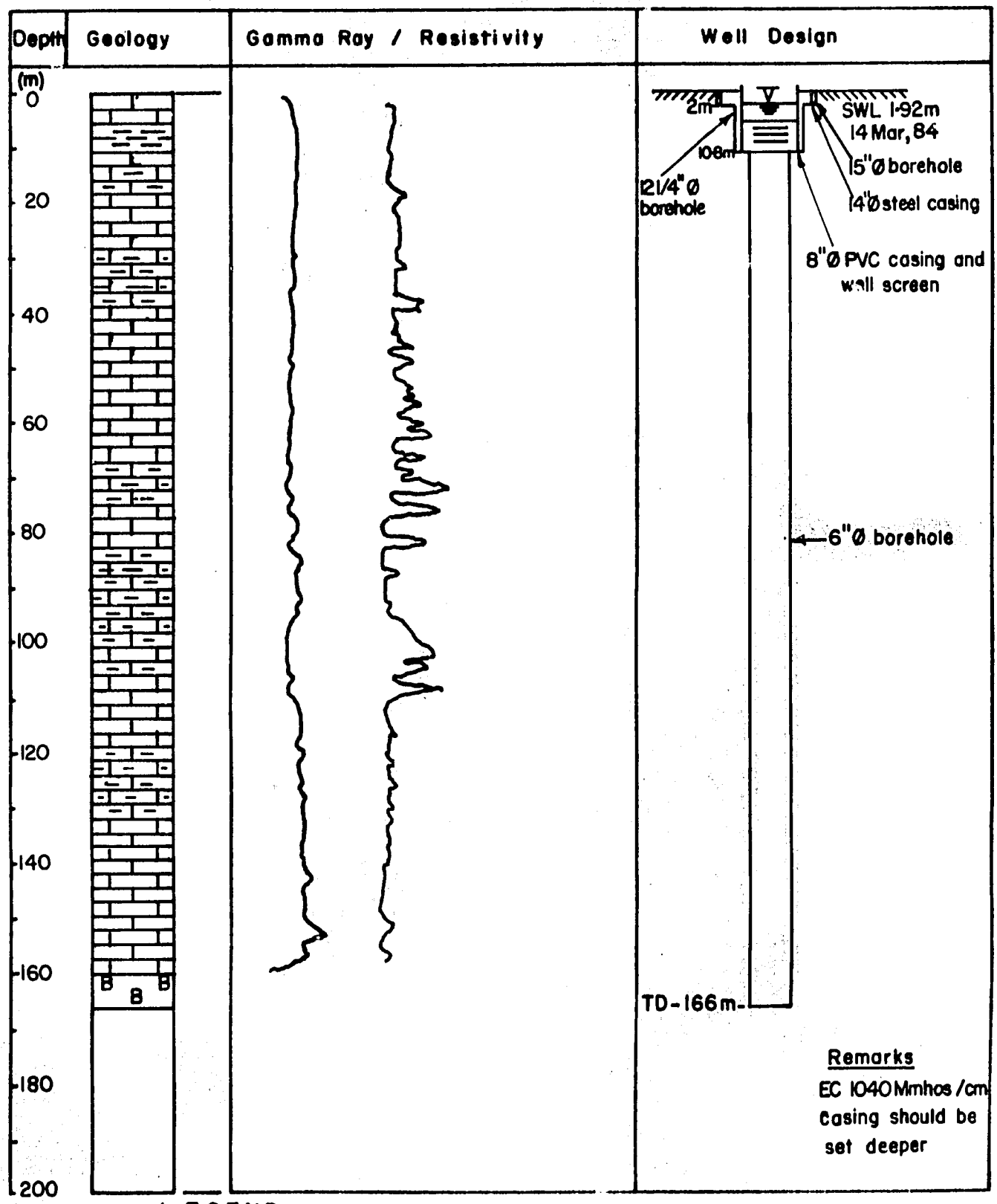
55

Water Development Agency

CGDP - 104

Well Nº 41

Location Dolondole

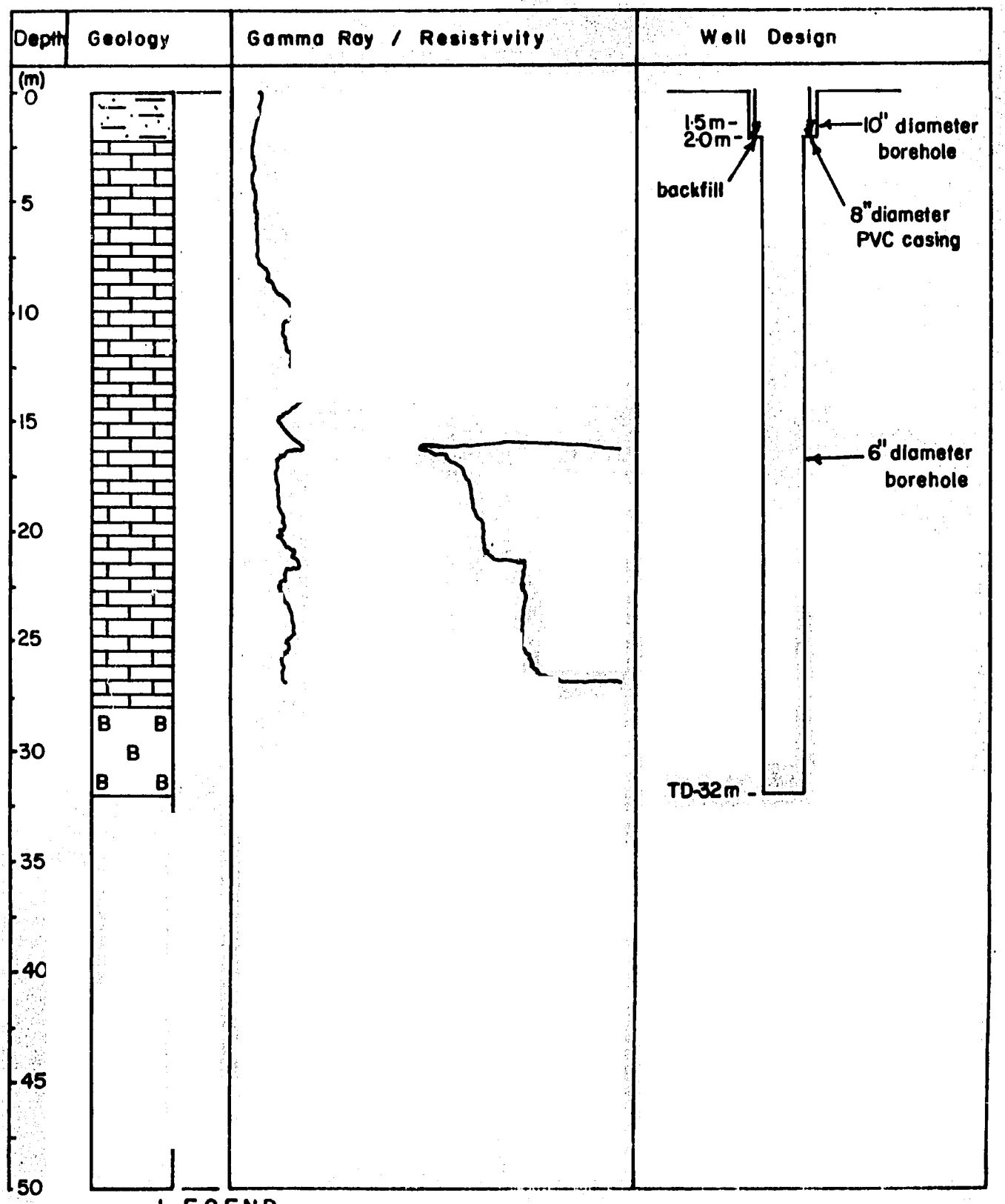


Water Development Agency

CGDP - 104

Well Nº 40

Location Limestone Depression "A"



LEGEND

Clay or Shale | Sand | Limestone | Marl

Clayey Sand | Sandstone | Karst Limestone | Basement

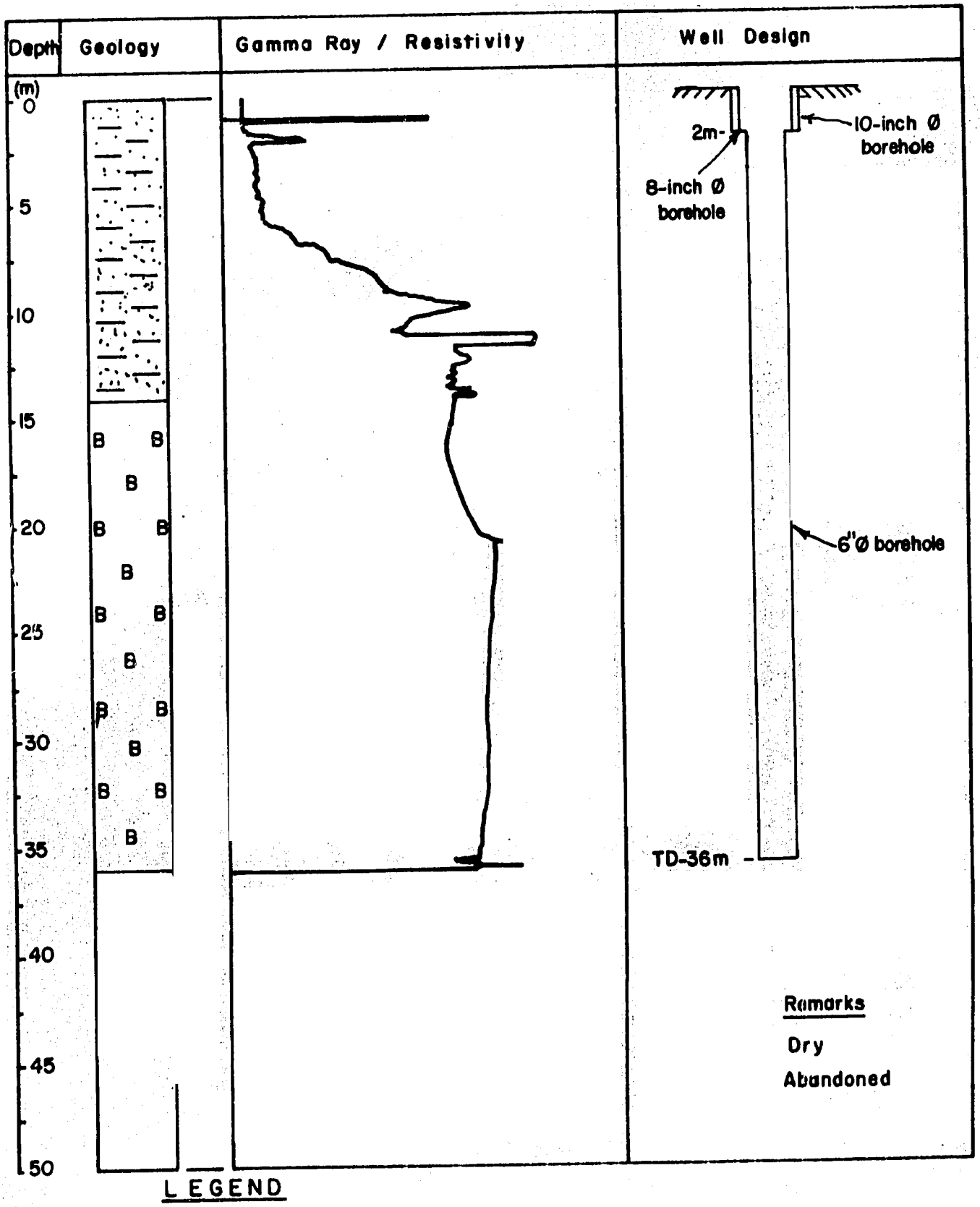
51

Water Development Agency

CGDP - 104

Well Nº 38

Location Bur Heibo VI



LEGEND

Clay or Shale | Sand | Limestone | Marl

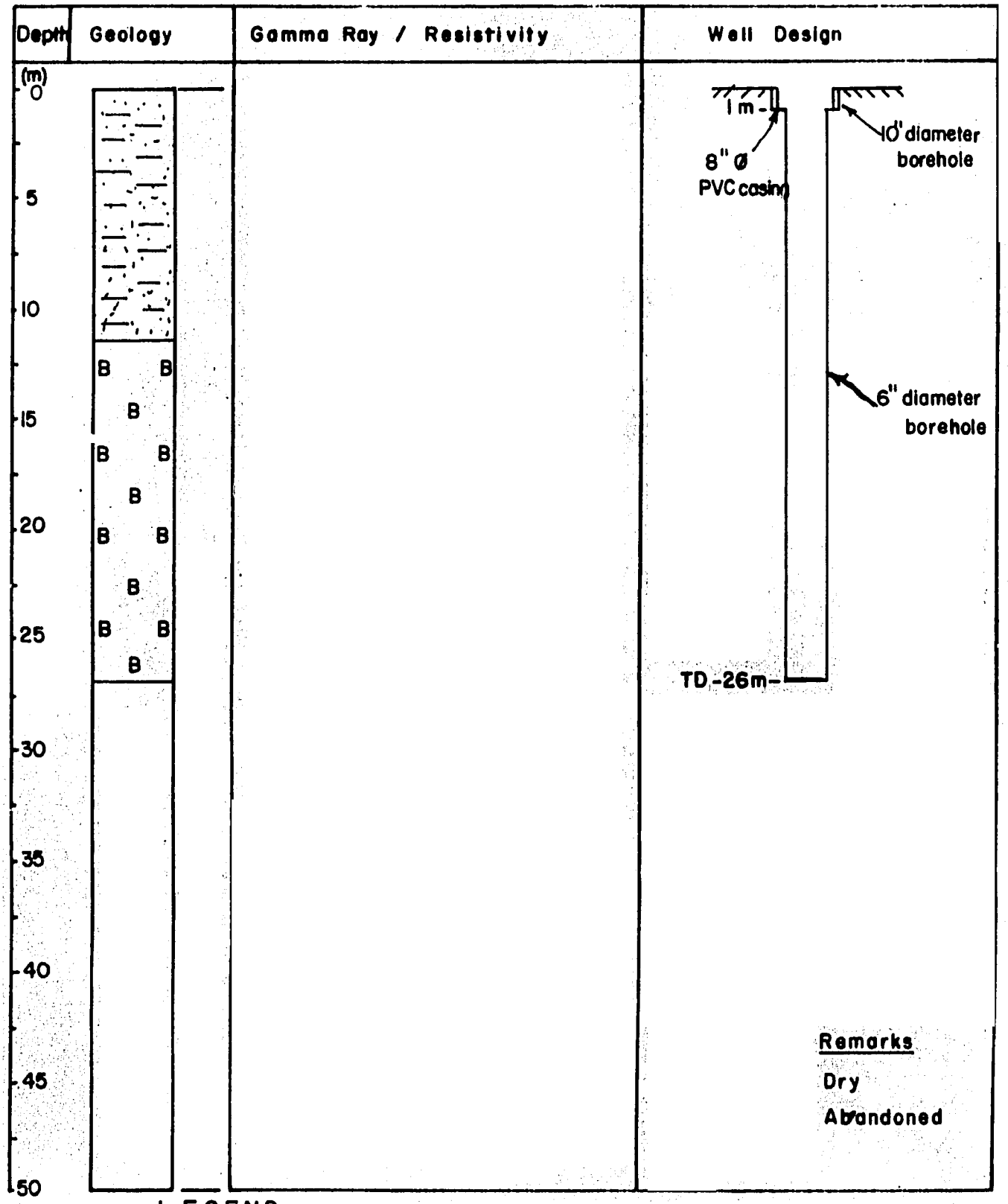
Clayey Sand | Sandstone | Karst Limestone | Basement

Water Development Agency

CGDP - 104

Well Nº 37

Location Bur Heibo V



LEGEND

Clay or Shale | Sand | Limestone | Marl

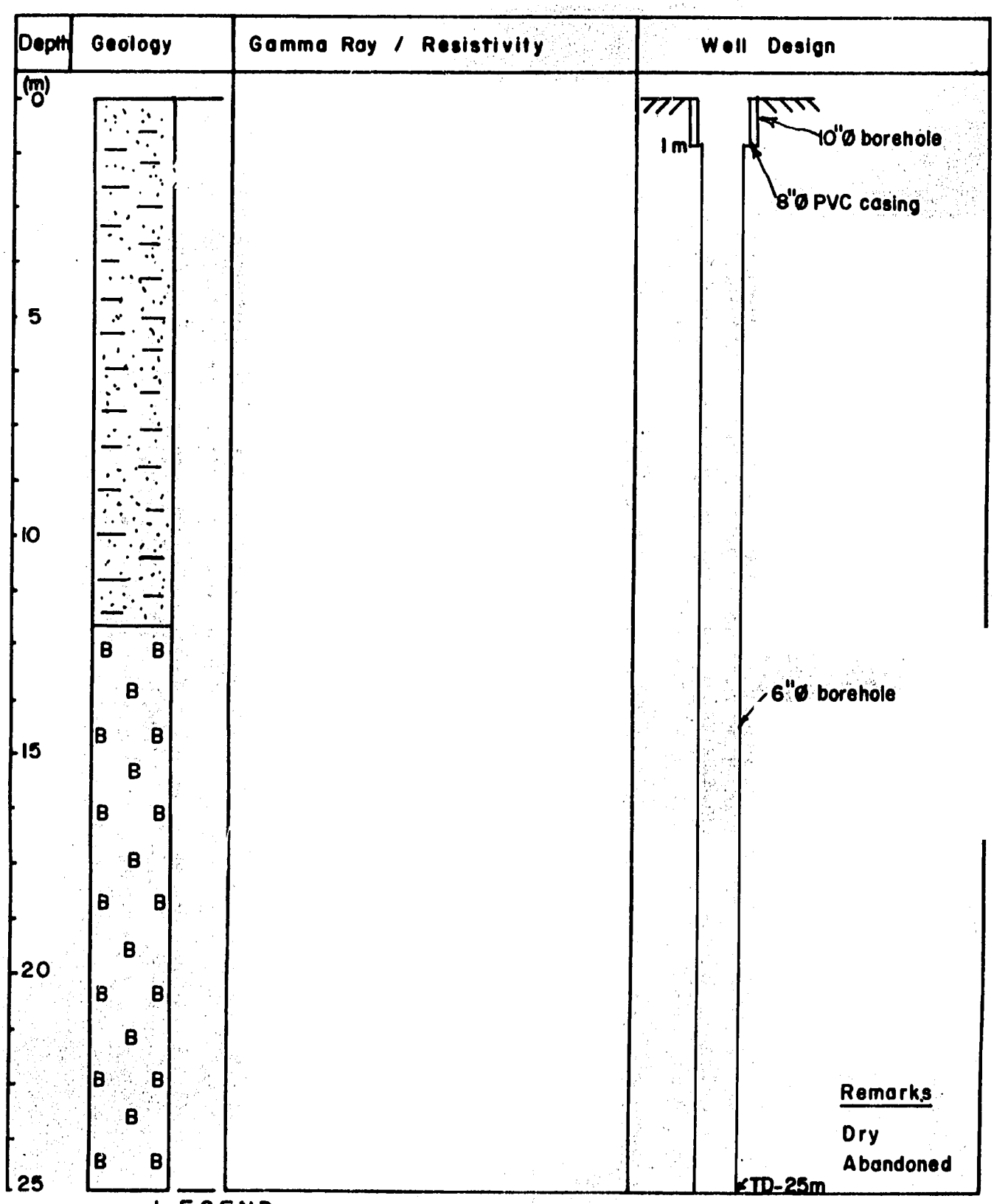
Clayey Sand | Sandstone | Karst Limestone | Basement

Water Development Agency

CGDP - 104

Well Nº 36

Location Bur Heibo IV



LEGEND

Clay or Shale | Sand | Limestone | Marl

Clayey Sand | Sandstone | Karst Limestone | Basement

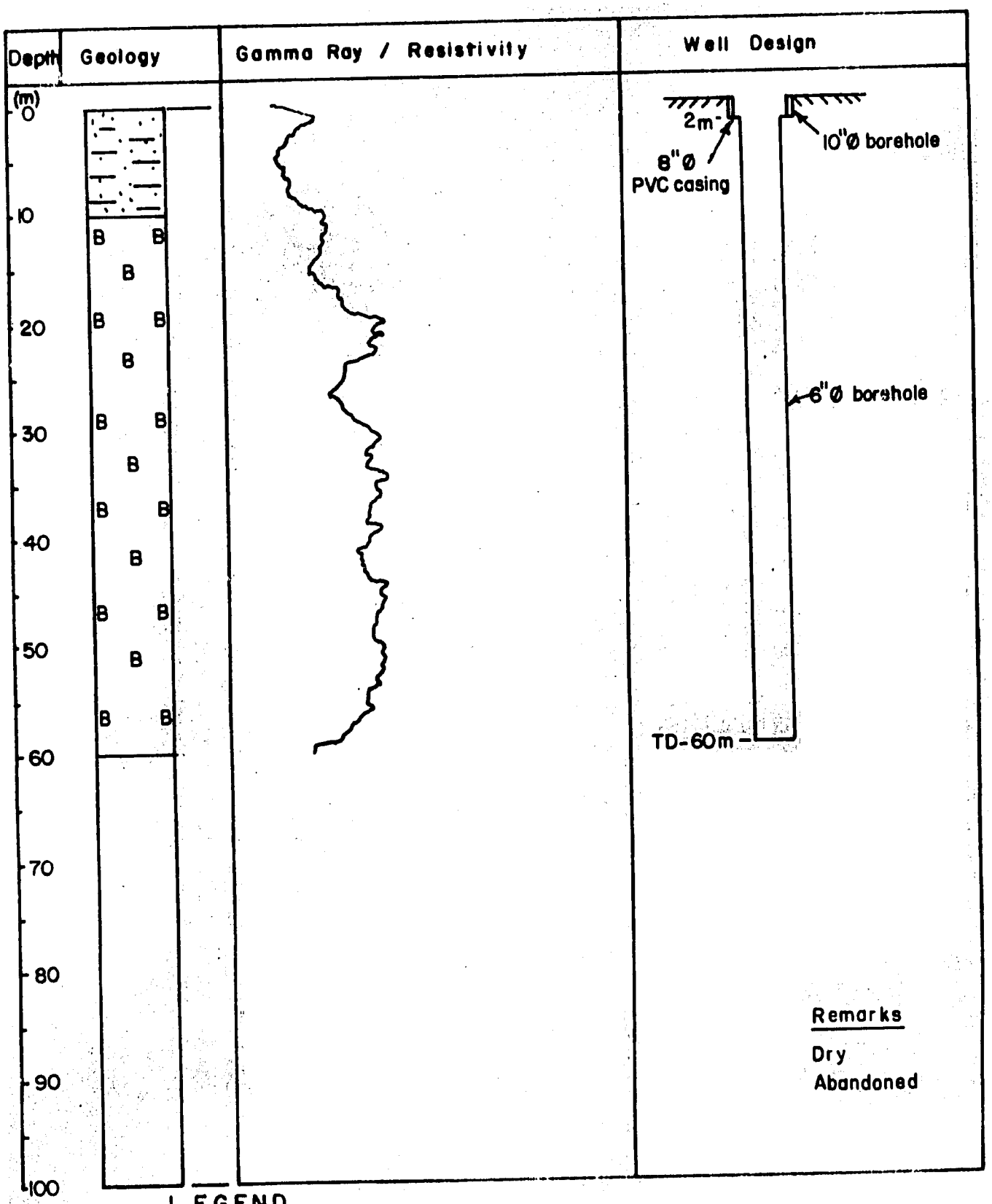
60

Water Development Agency

CCDP - 104

Well Nº 35

Location Bur Heibo III



LEGEND

Clay or Shale

Sand

Limestone

Marl

Clayey Sand

Sandstone

Karst Limestone

Basement

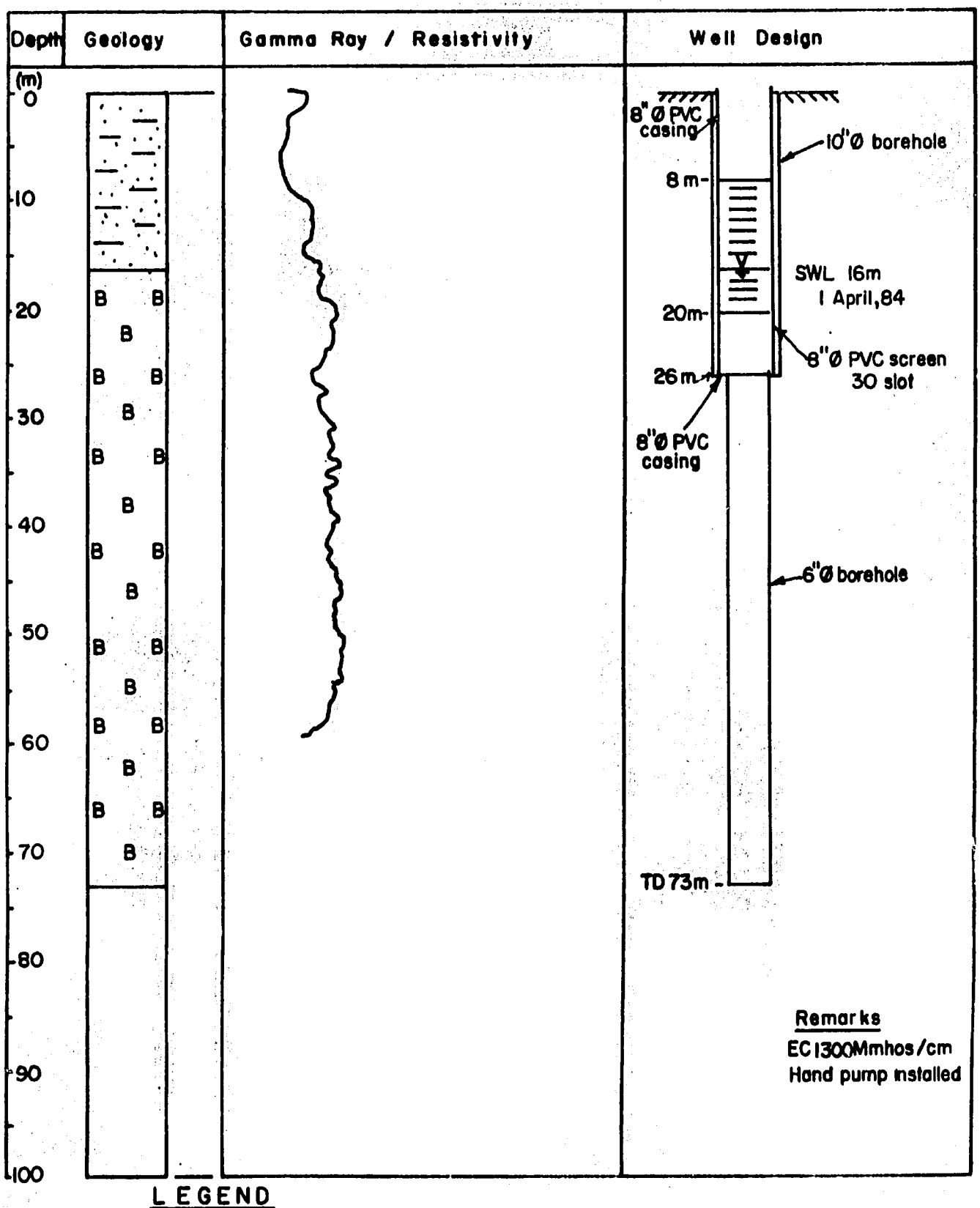
101

Water Development Agency

CGDP - 104

Well Nº 34

Location Bur Heibo II



LEGEND

Clay or Shale | Sand | Limestone | Marl

Clayey Sand | Sandstone | Karst Limestone | Basement

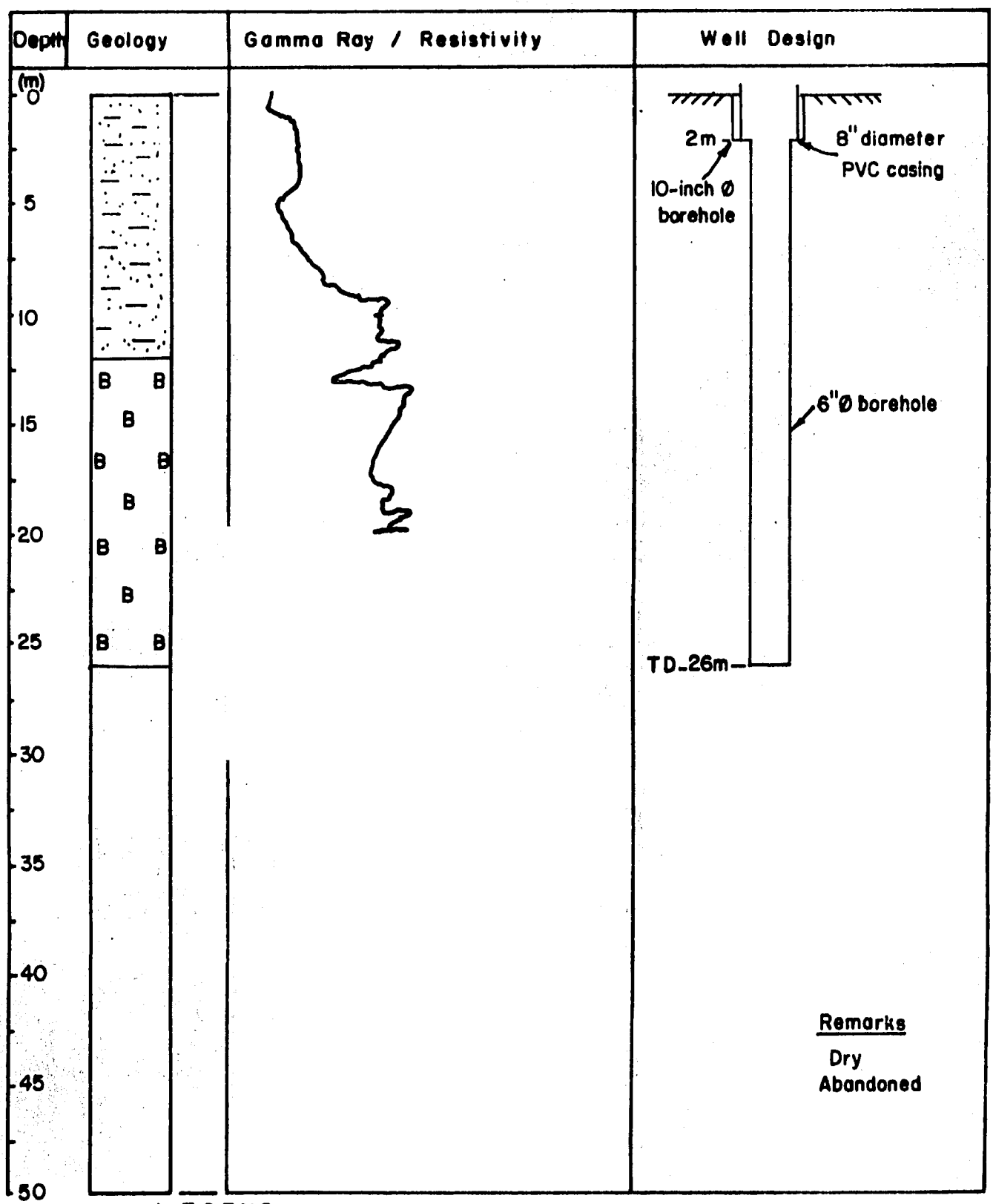
102

Water Development Agency

CGDP - 104

Well Nº 33

Location Bur Heibo I



LEGEND

Clay or Shale | Sand | Limestone | Marl

Clayey Sand | Sandstone | Karst Limestone | Basement

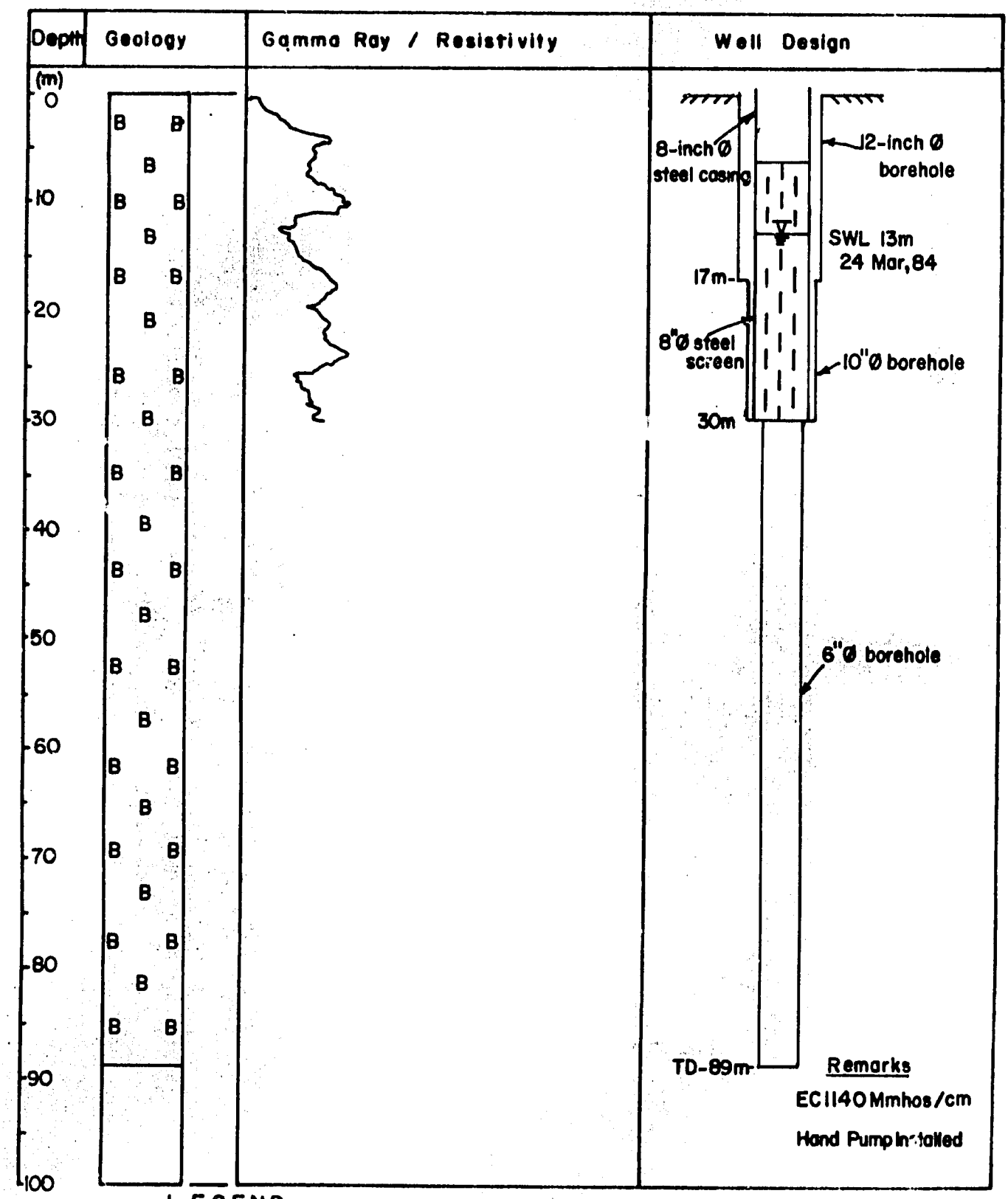
12

Water Development Agency

CGDP - 104

Well Nº 32

Location Bur Akaba V WDA yard



LEGEND

Clay or Shale | Sand | Limestone | Marl

Clayey Sand | Sandstone | Karst Limestone | Basement

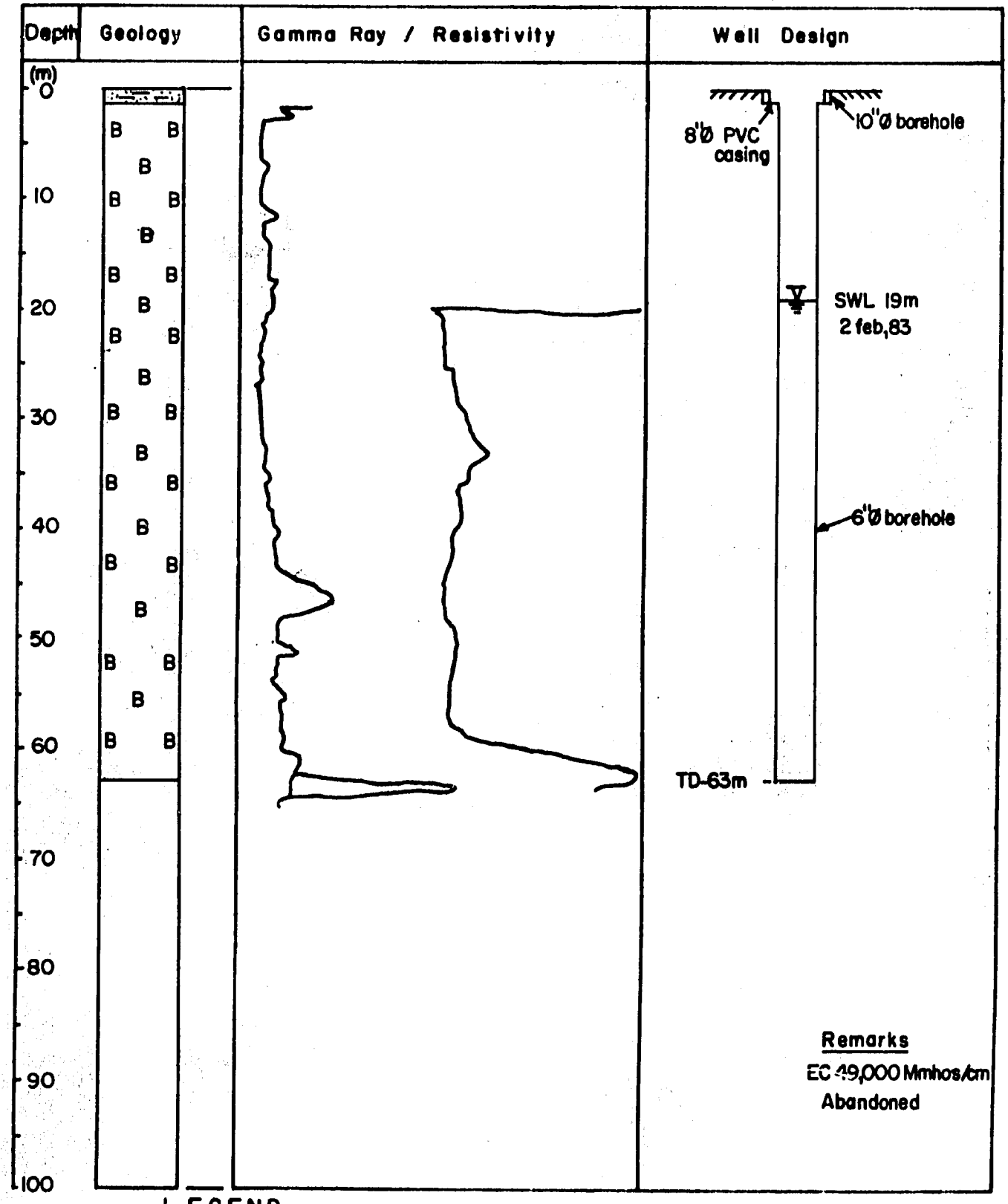
64

Water Development Agency

CGDP - 104

Well Nº 31

Location Bur Akaba IV



LEGEND

Clay or Shale | Sand | Limestone | Marl

Clayey Sand | Sandstone | Karst Limestone | Basement

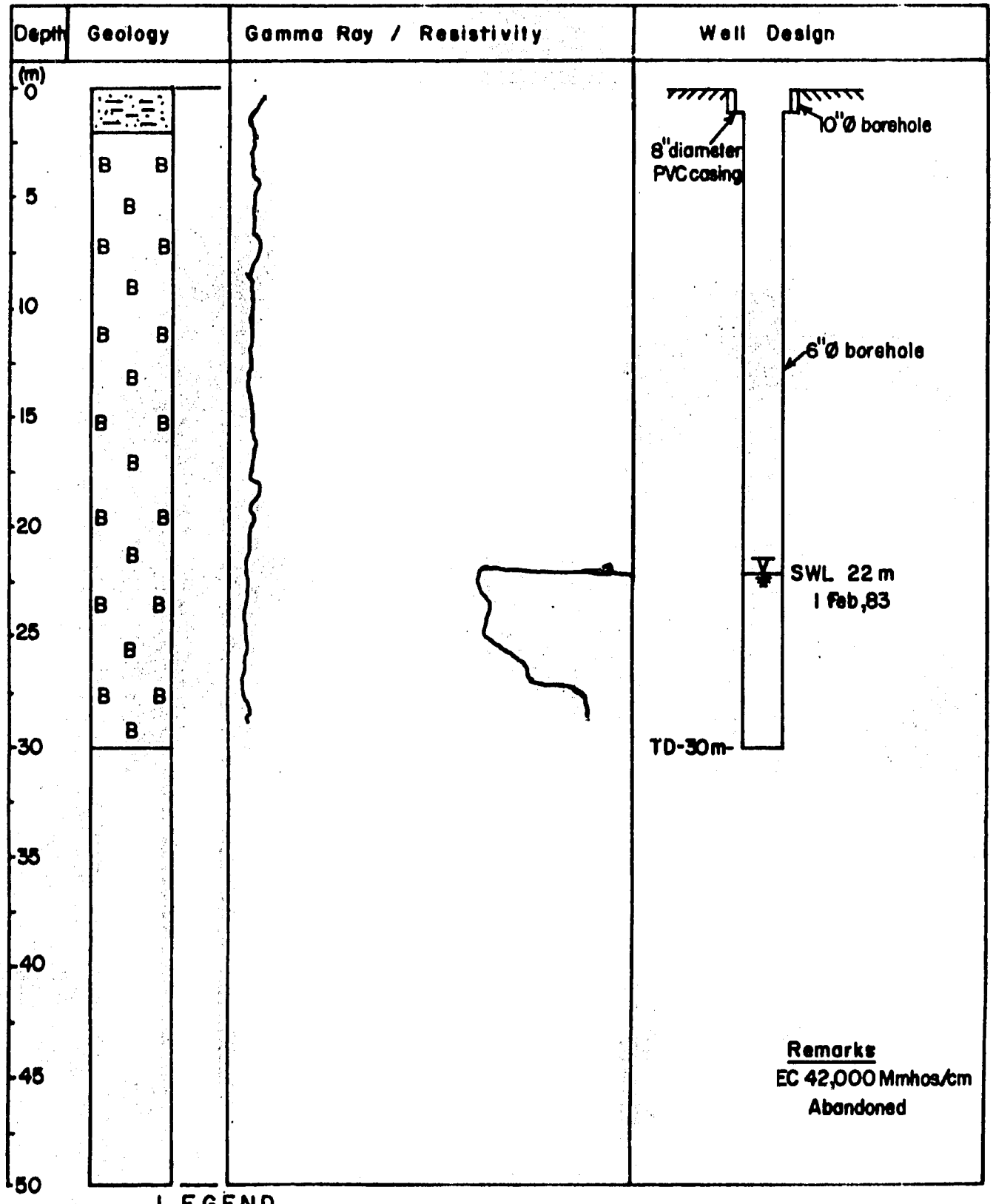
65

Water Development Agency

CGDP - 104

Well Nº 30

Location Bur Akaba II



LEGEND

Clay or Shale | Sand | Limestone | Marl

Clayey Sand | Sandstone | Karst Limestone | Basement

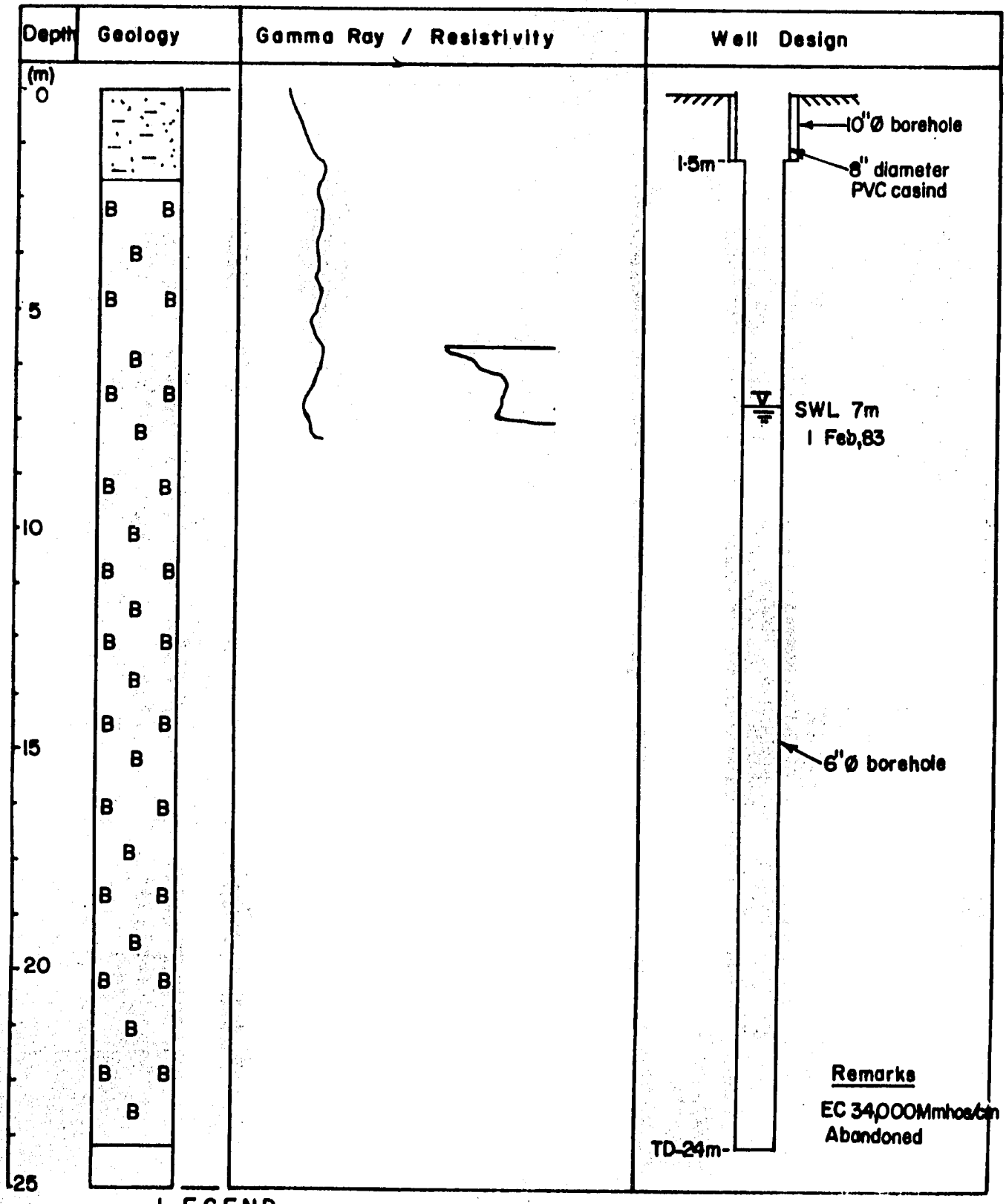
16

Water Development Agency

CGDP - 104

Well Nº 29

Location Bur Akaba II WDA yard



LEGEND

Clay or Shale | Sand | Limestone | Marl

Clayey Sand | Sandstone | Karst Limestone | Basement

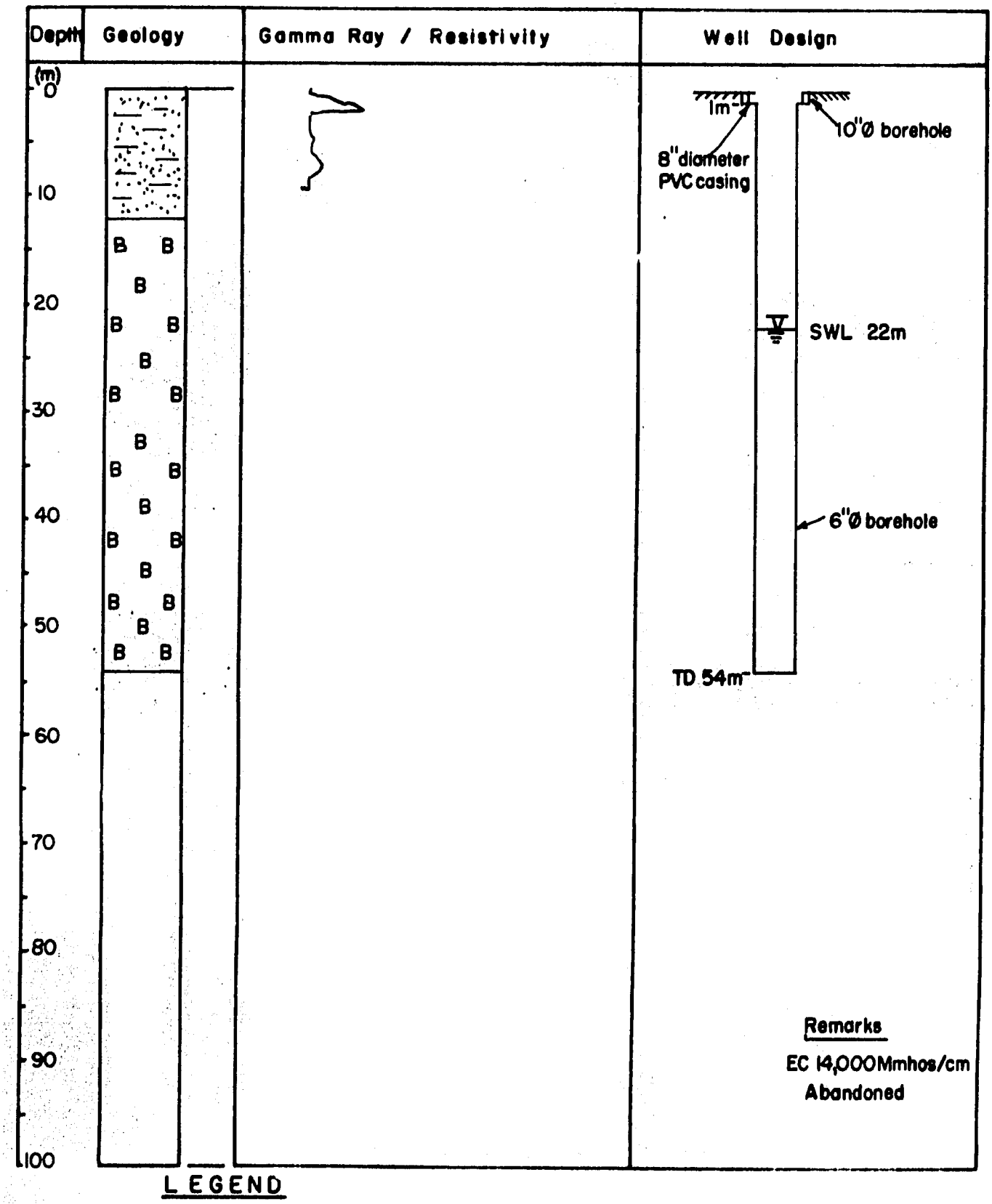
67

Water Development Agency

CGDP - 104

Well Nº 28

Location Bur Akaba I



LEGEND

Clay or Shale | Sand | Limestone | Marl

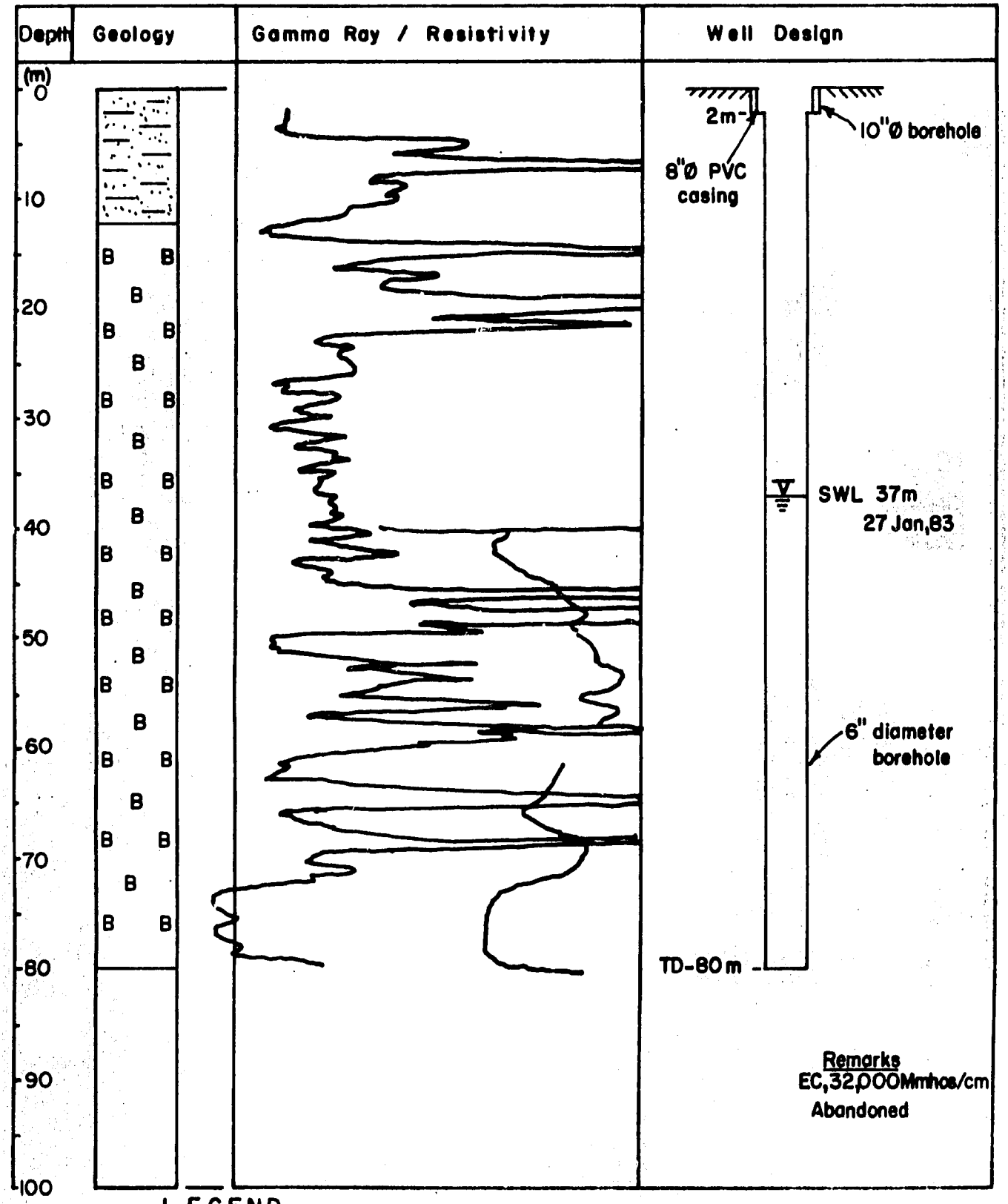
Clayey Sand | Sandstone | Karst Limestone | Basement

Water Development Agency

CGDP - 104

Well Nº 27

Location Shidaalow II



LEGEND

Clay or Shale | Sand | Limestone | Marl

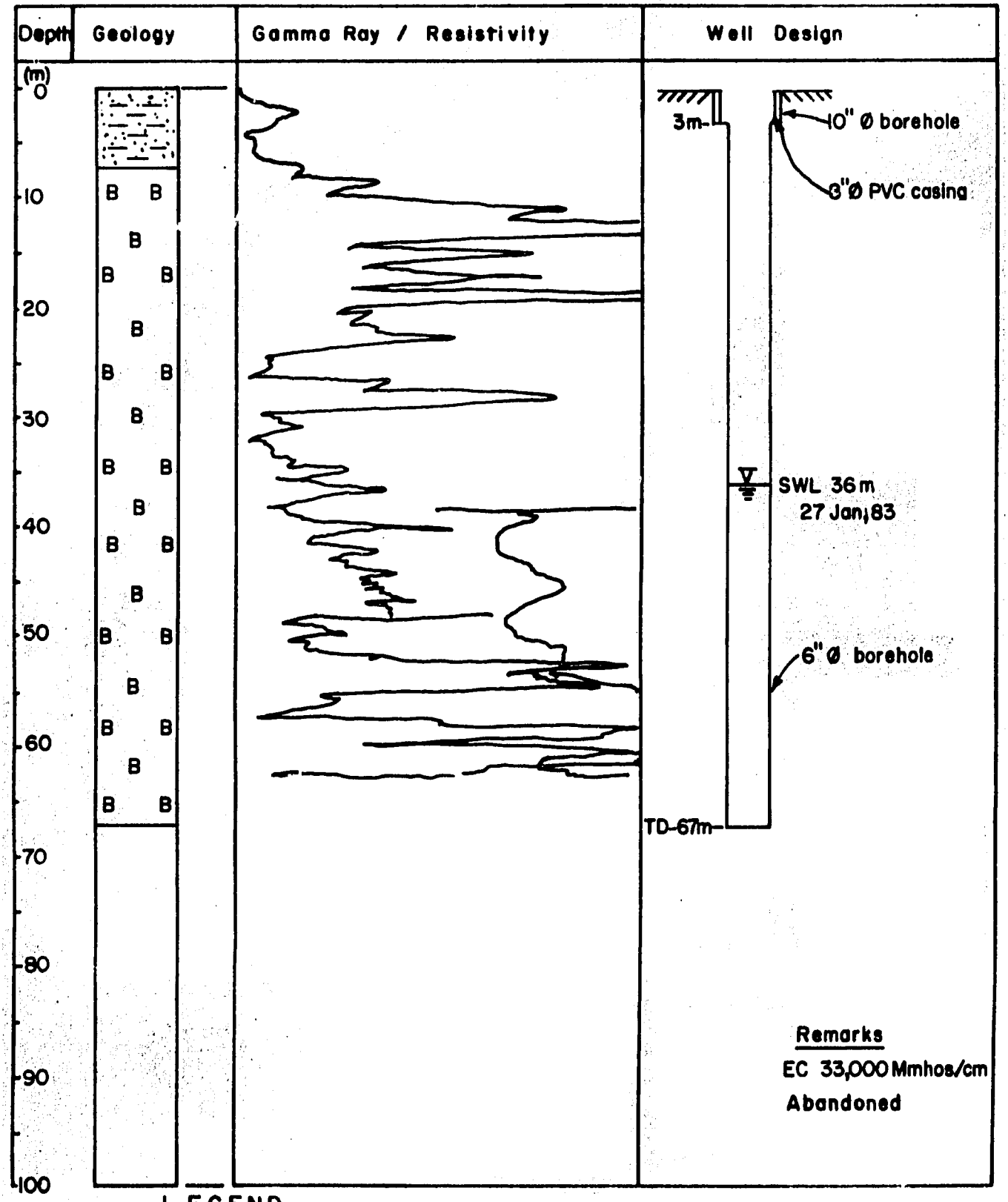
Clayey Sand | Sandstone | Karst Limestone | Basement

Water Development Agency

CGDP - 104

Well Nº 26

Location Shidaalow I



LEGEND

Clay or Shale | Sand | Limestone | Marl

Clayey Sand | Sandstone | Karst Limestone | Basement

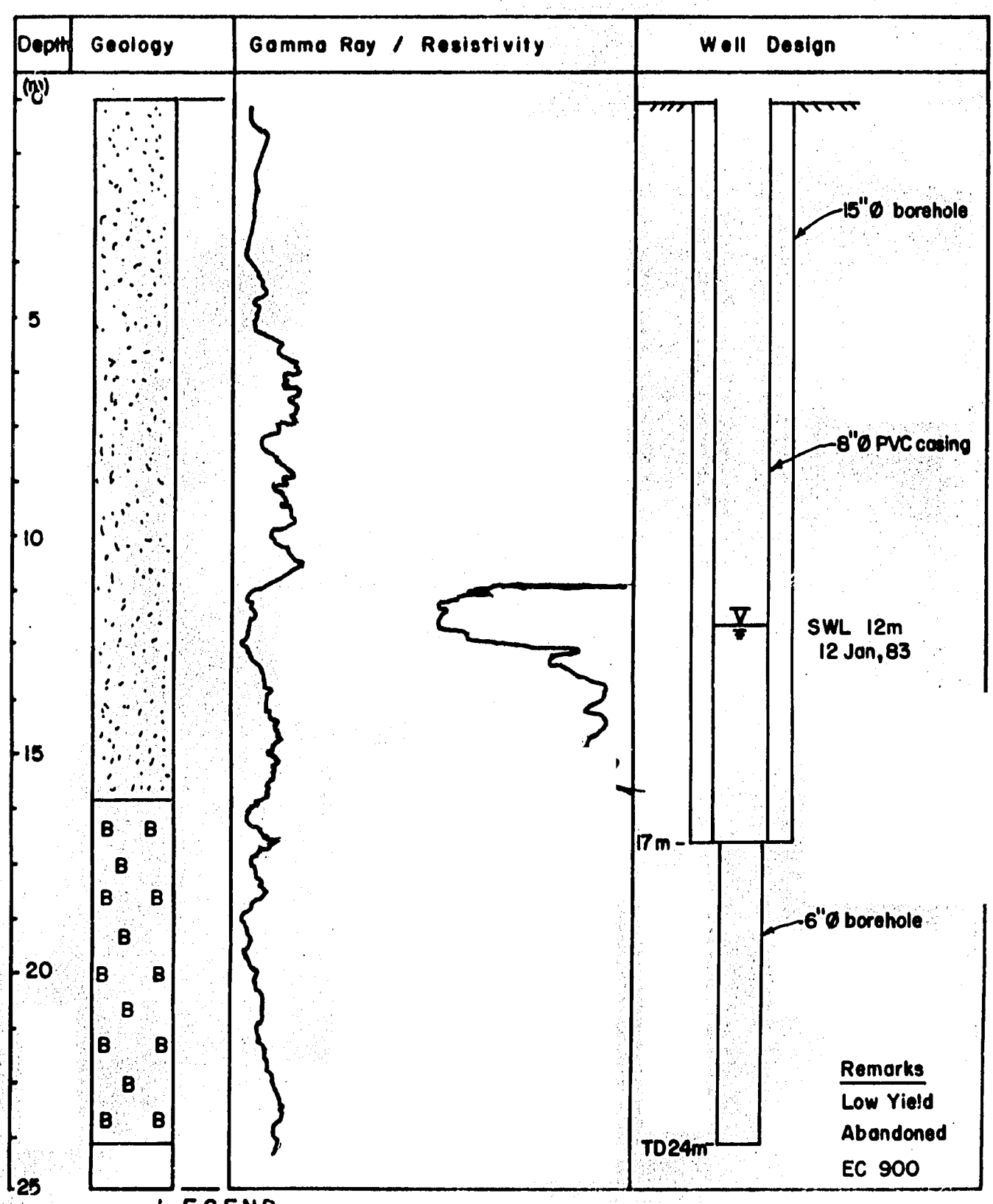
70

Water Development Agency

CGDP - 104

Well Nº 25

Location Dodole



LEGEND

Clay or Shale | Sand | Limestone | Marl

Clayey Sand | Sandstone | Karst Limestone | Basement

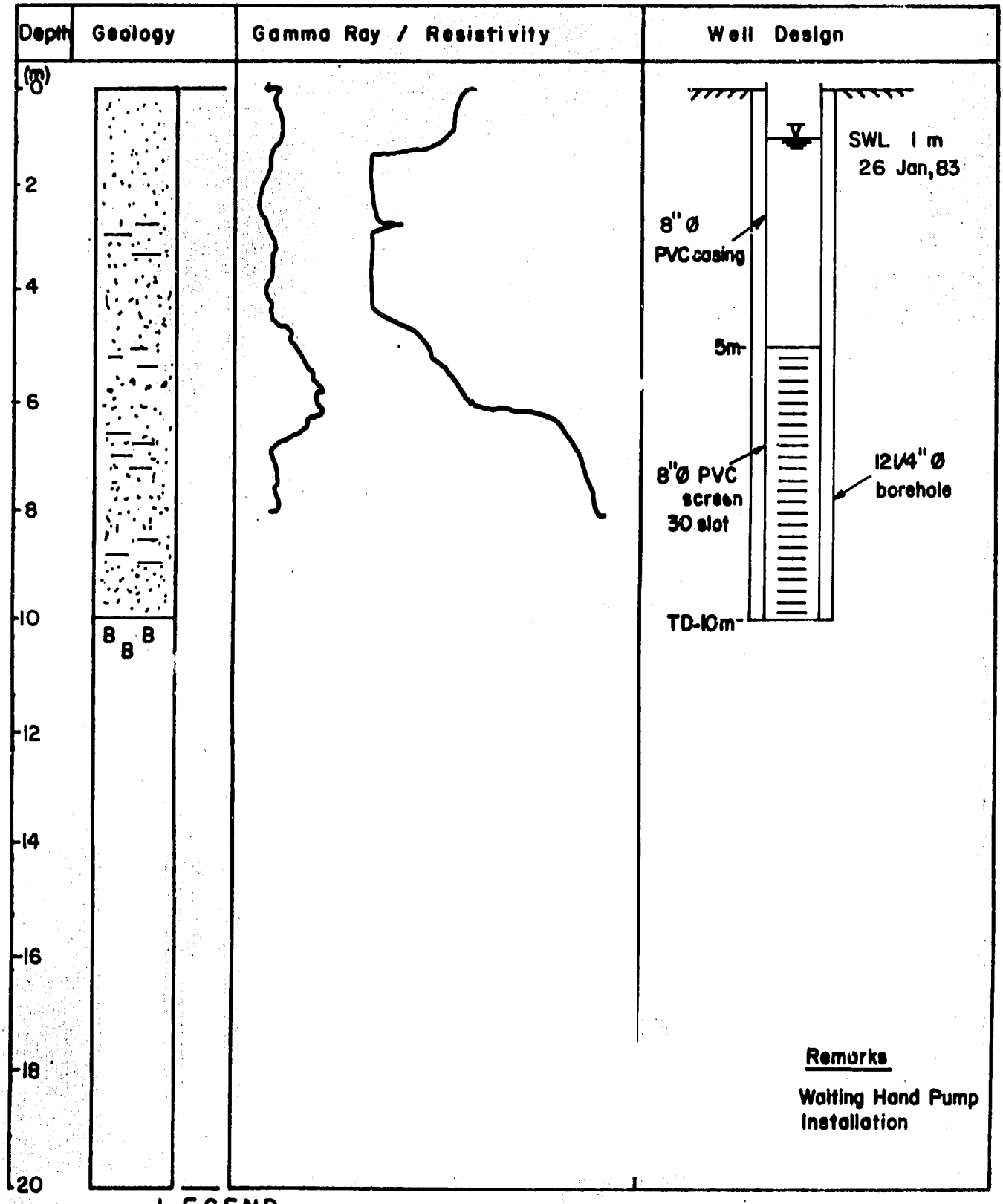
71

Water Development Agency

CGDP - 104

Well Nº 24

Location Yaaq Braawe



LEGEND

Clay or Shale | Sand | Limestone | Marl

Clayey Sand | Sandstone | Karst Limestone | Basement

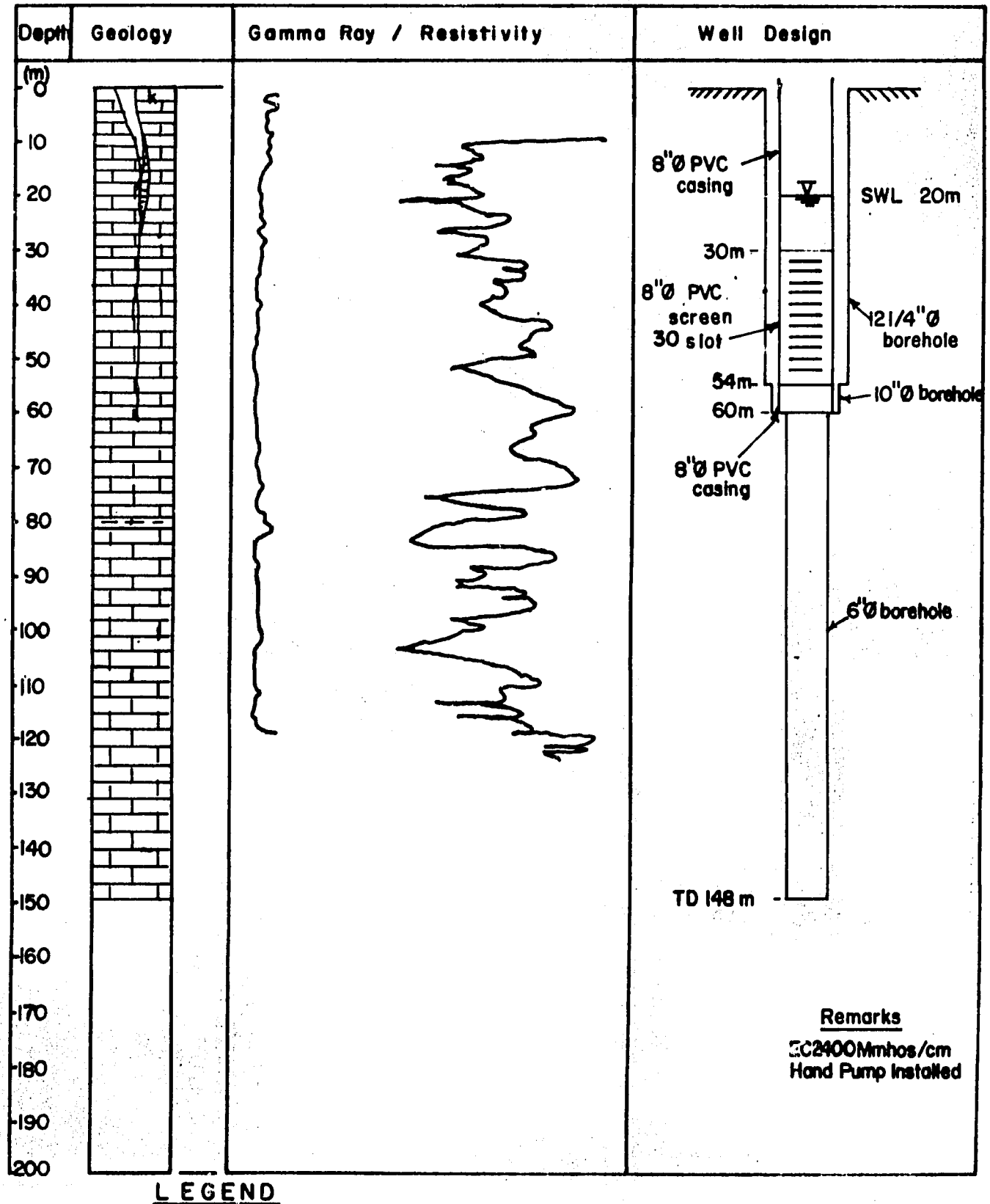
78

Water Development Agency

CGDP - 104

Well Nº 23

Location Kurman



LEGEND

Clay or Shale | Sand | Limestone | Marl

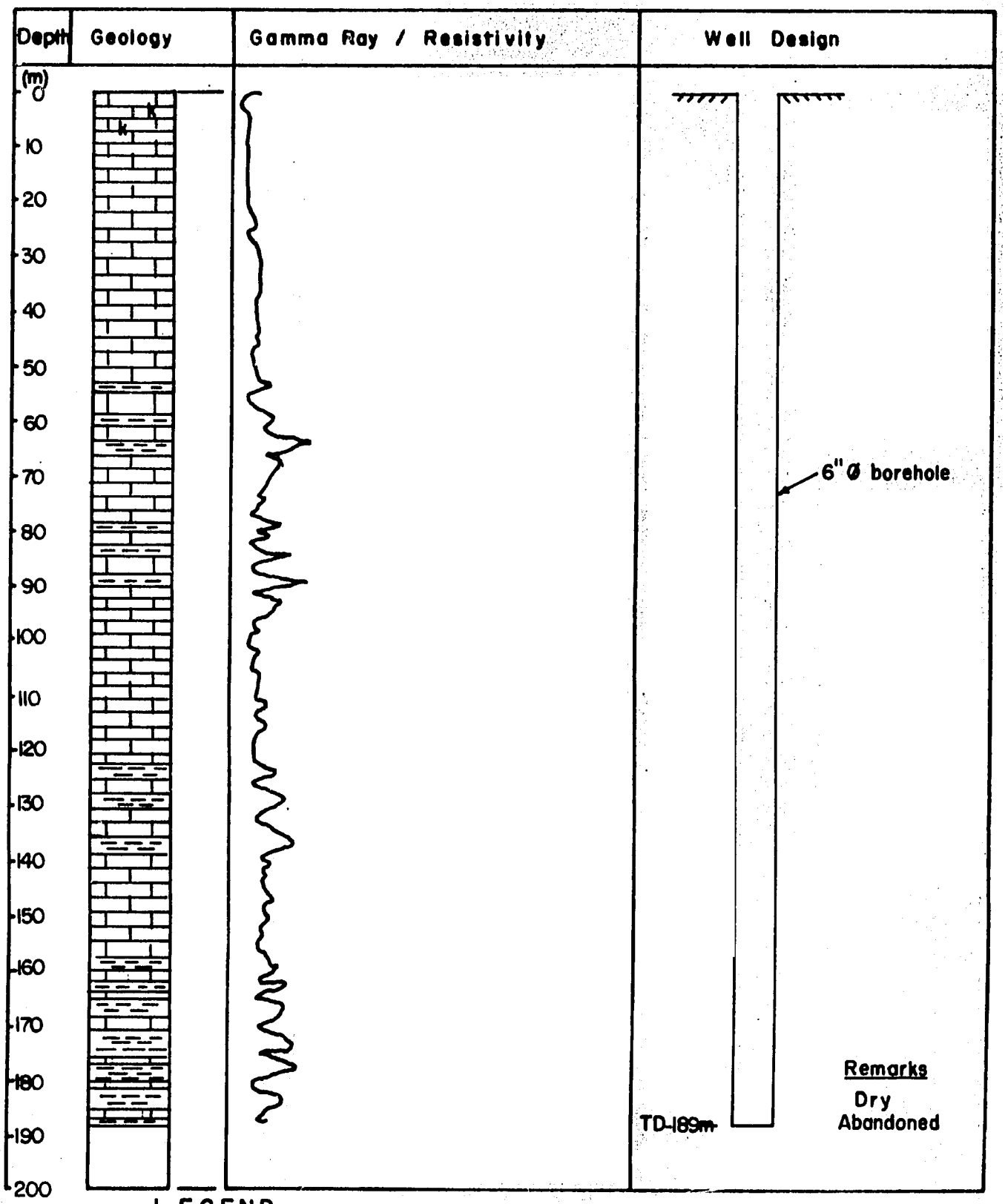
Clayey Sand | Sandstone | Karst Limestone | Basement

Water Development Agency

CGDP - 104

Well Nº 22

Location Buulo Gaduud

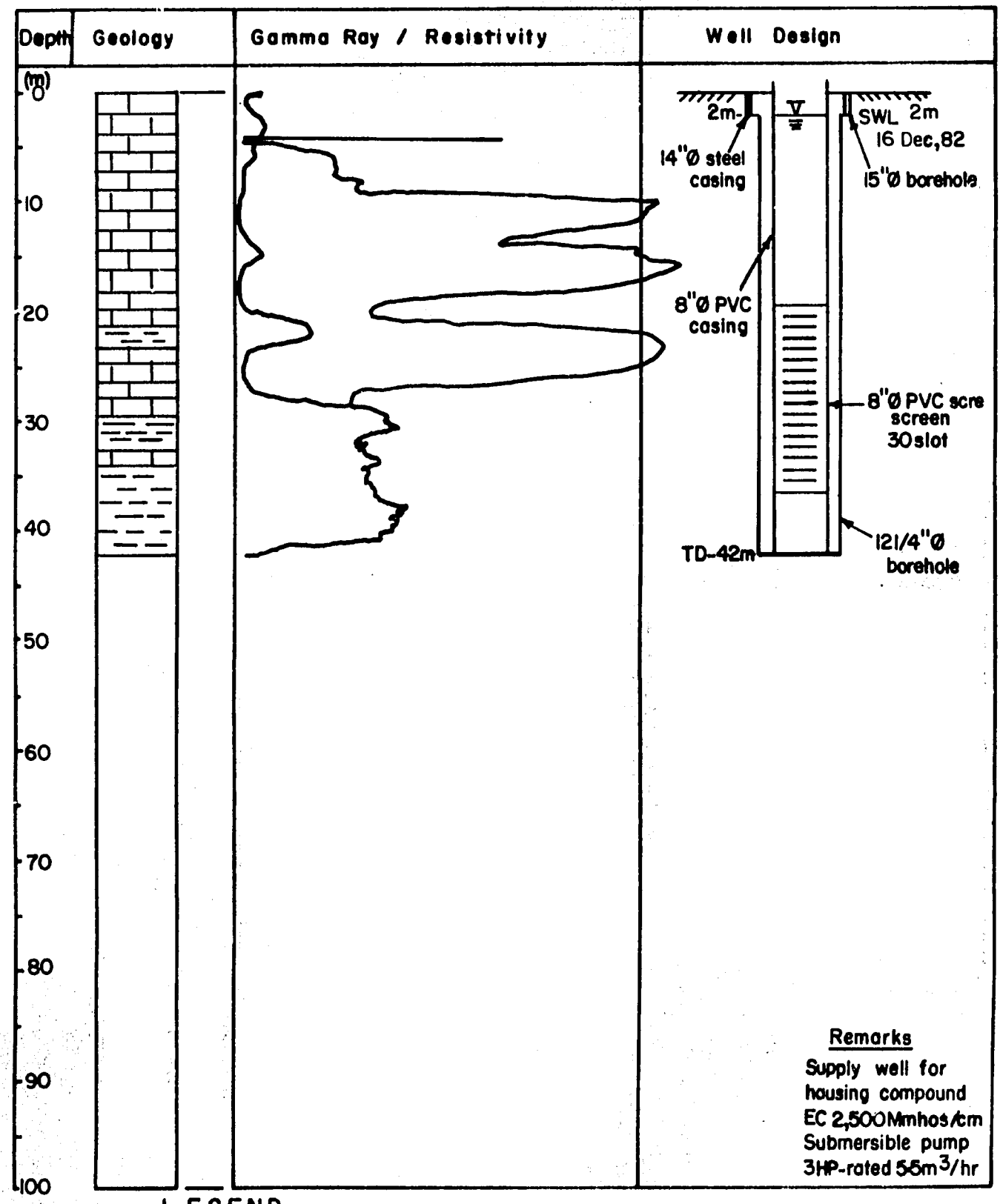


Water Development Agency

CGDP - 104

Well Nº 21

Location USAID-Compound Baidoa II



LEGEND

Clay or Shale | Sand | Limestone | Marl

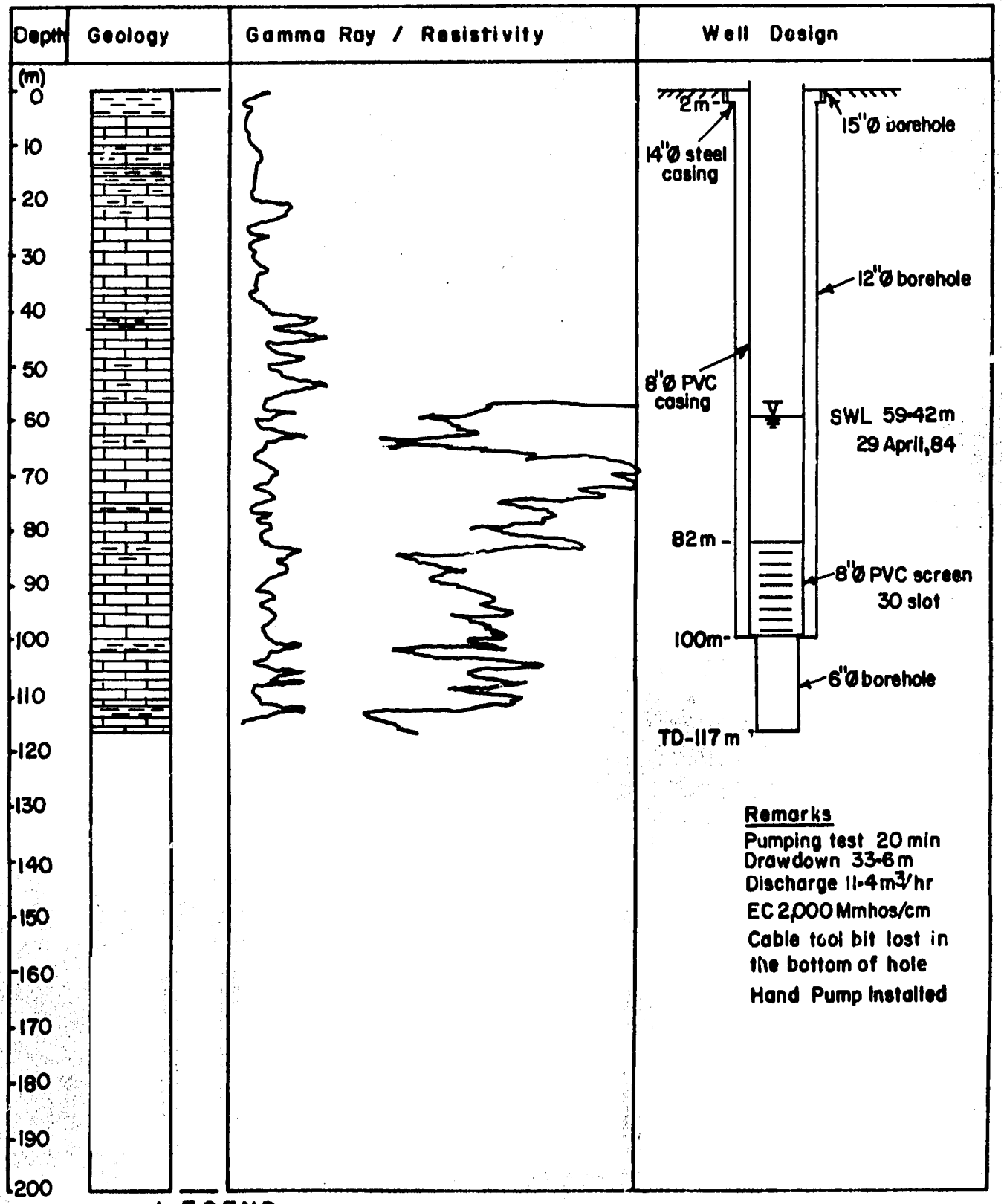
Clayey Sand | Sandstone | Karst Limestone | Basement

Water Development Agency

CGDP - 104

Well Nº 20

Location Durei Ali Galle



LEGEND

Clay or Shale | Sand | Limestone | Marl

Clayey Sand | Sandstone | Karst Limestone | Basement

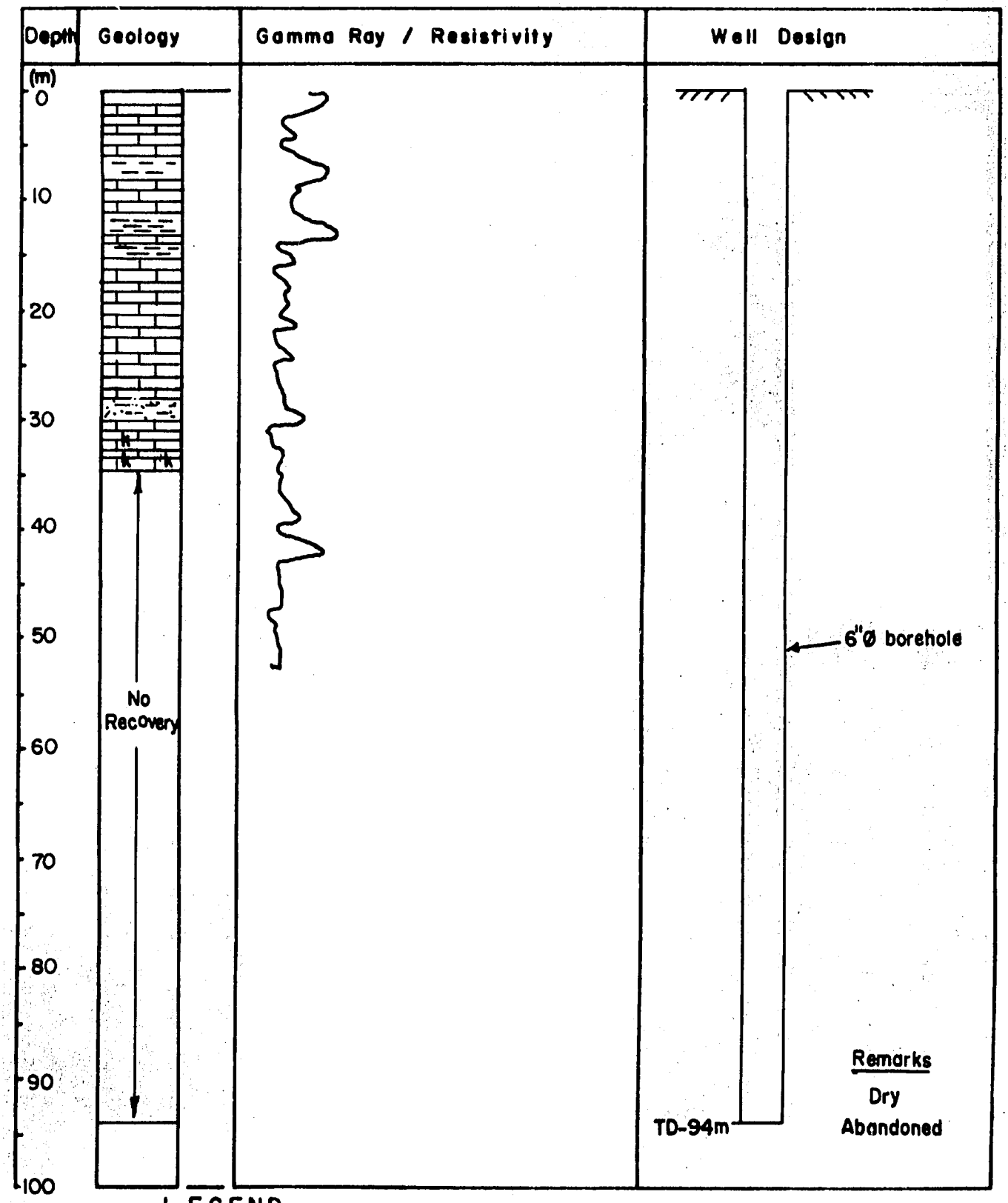
76

Water Development Agency

CGDP - 104

Well Nº 19

Location Buulo Fuur I



LEGEND

Clay or Shale | Sand | Limestone | Marl

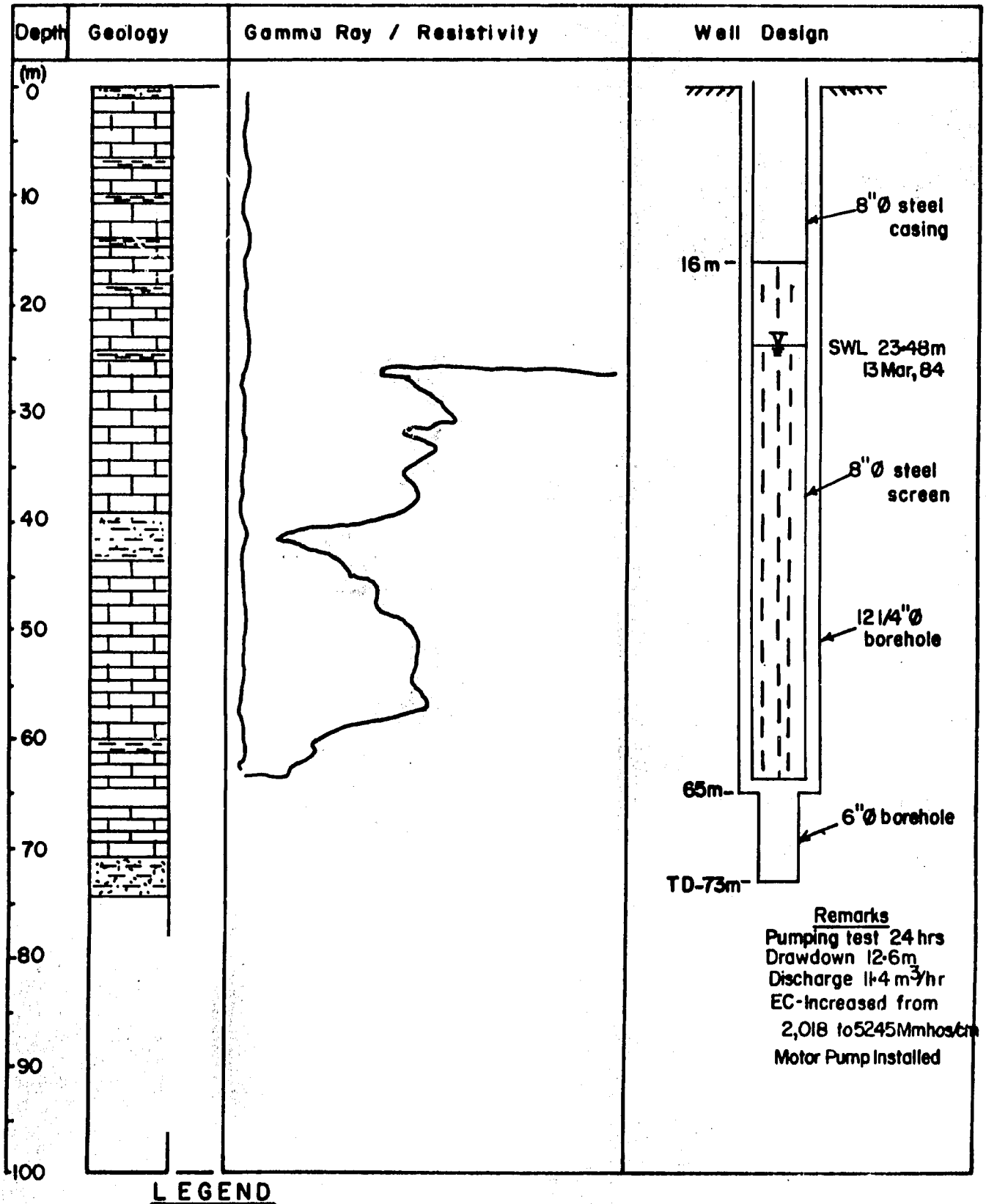
Clayey Sand | Sandstone | Karst Limestone | Basement

Water Development Agency

CGDP - 104

Well Nº 18

Location Gaduudo Dhunte



LEGEND

Clay or Shale | Sand | Limestone | Marl

Clayey Sand | Sandstone | Karst Limestone | Basement

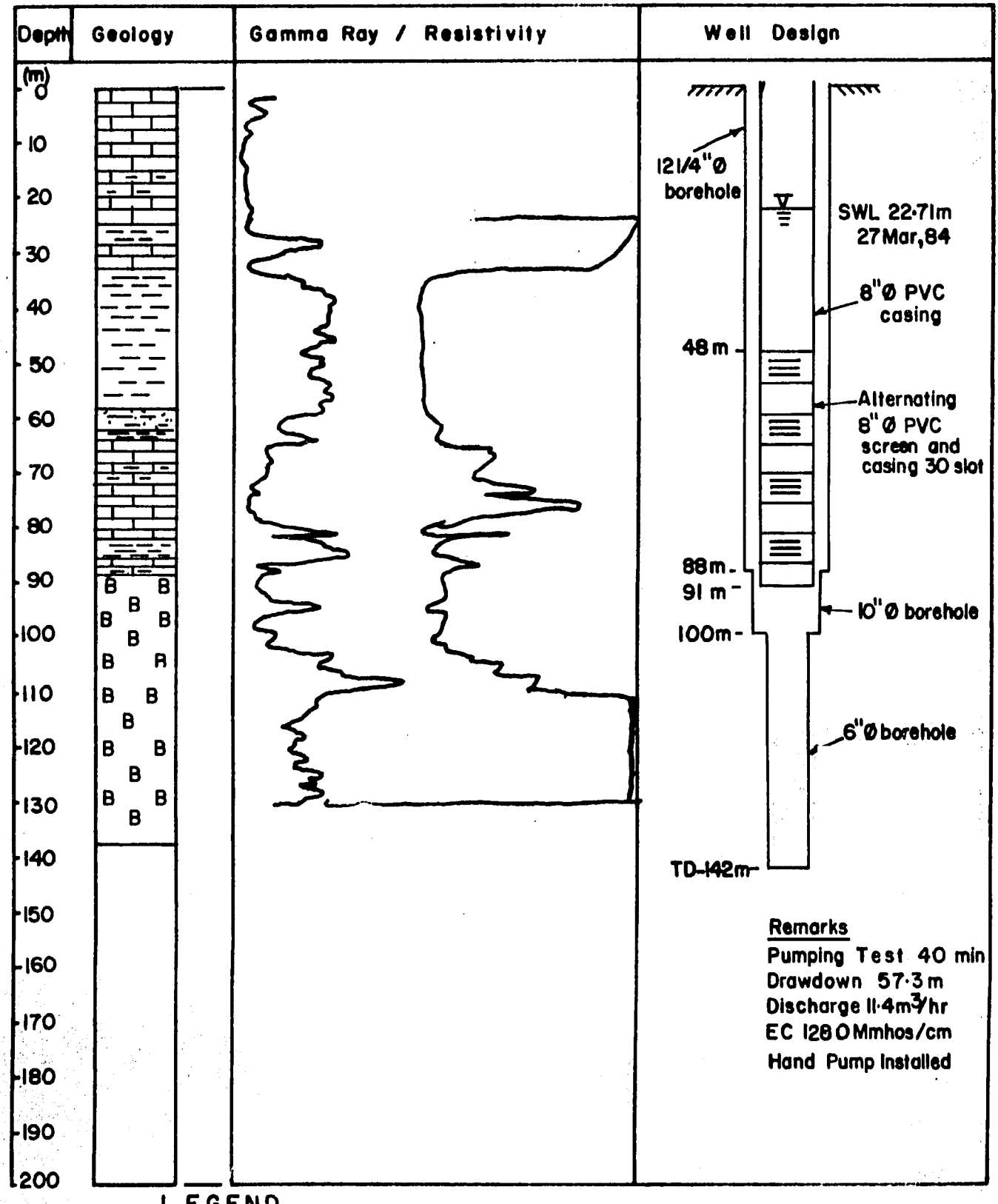
78

Water Development Agency

CGDP - 104

Well Nº 17

Location Roobey Gaduud



LEGEND

Clay or Shale | Sand | Limestone | Marl

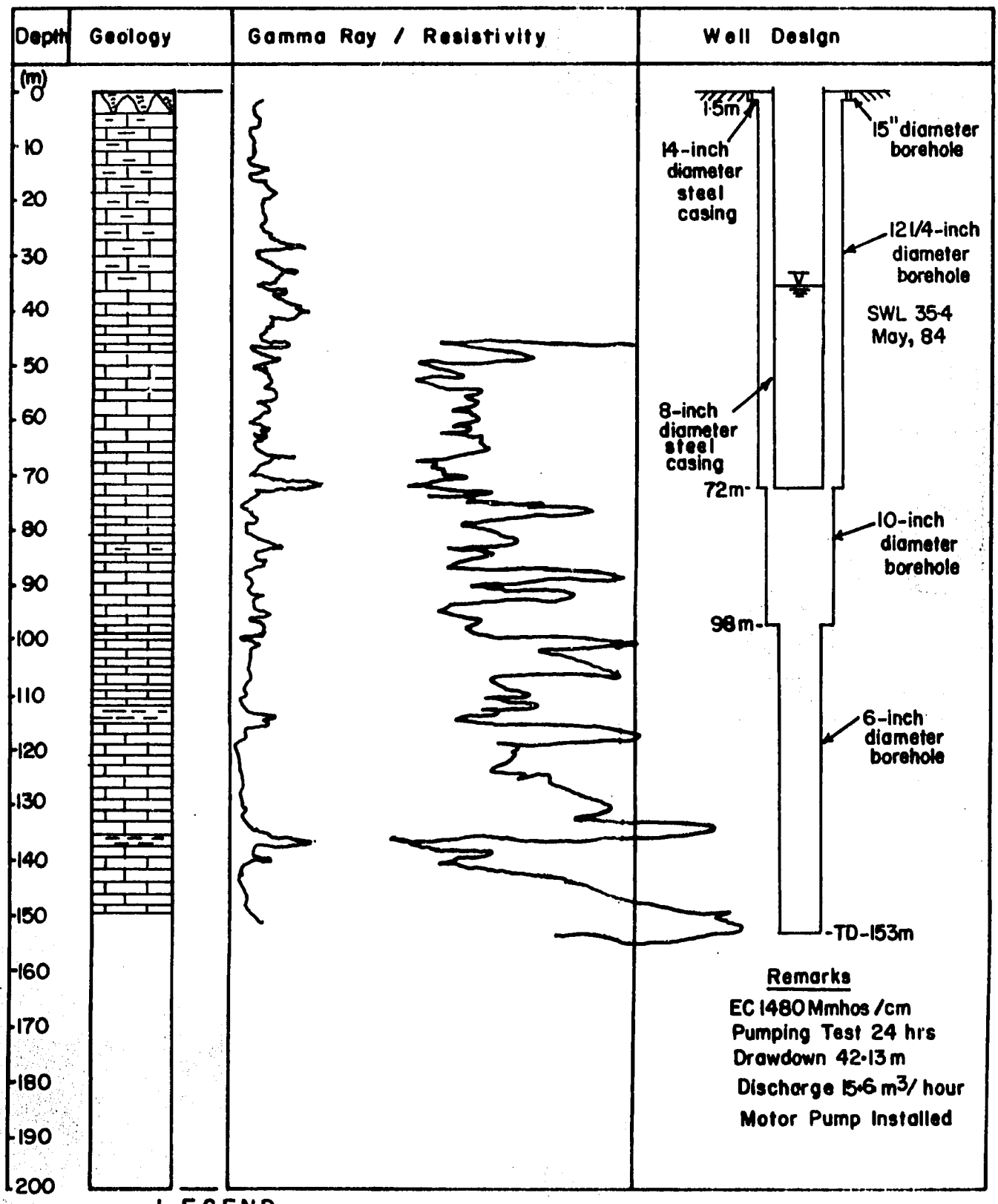
Clayey Sand | Sandstone | Karst Limestone | Basement

Water Development Agency

CGDP - 104

Well Nº 16

Location Taflow



LEGEND

Clay or Shale | Sand | Limestone | Marl

Clayey Sand | Sandstone | Karst Limestone | Basement

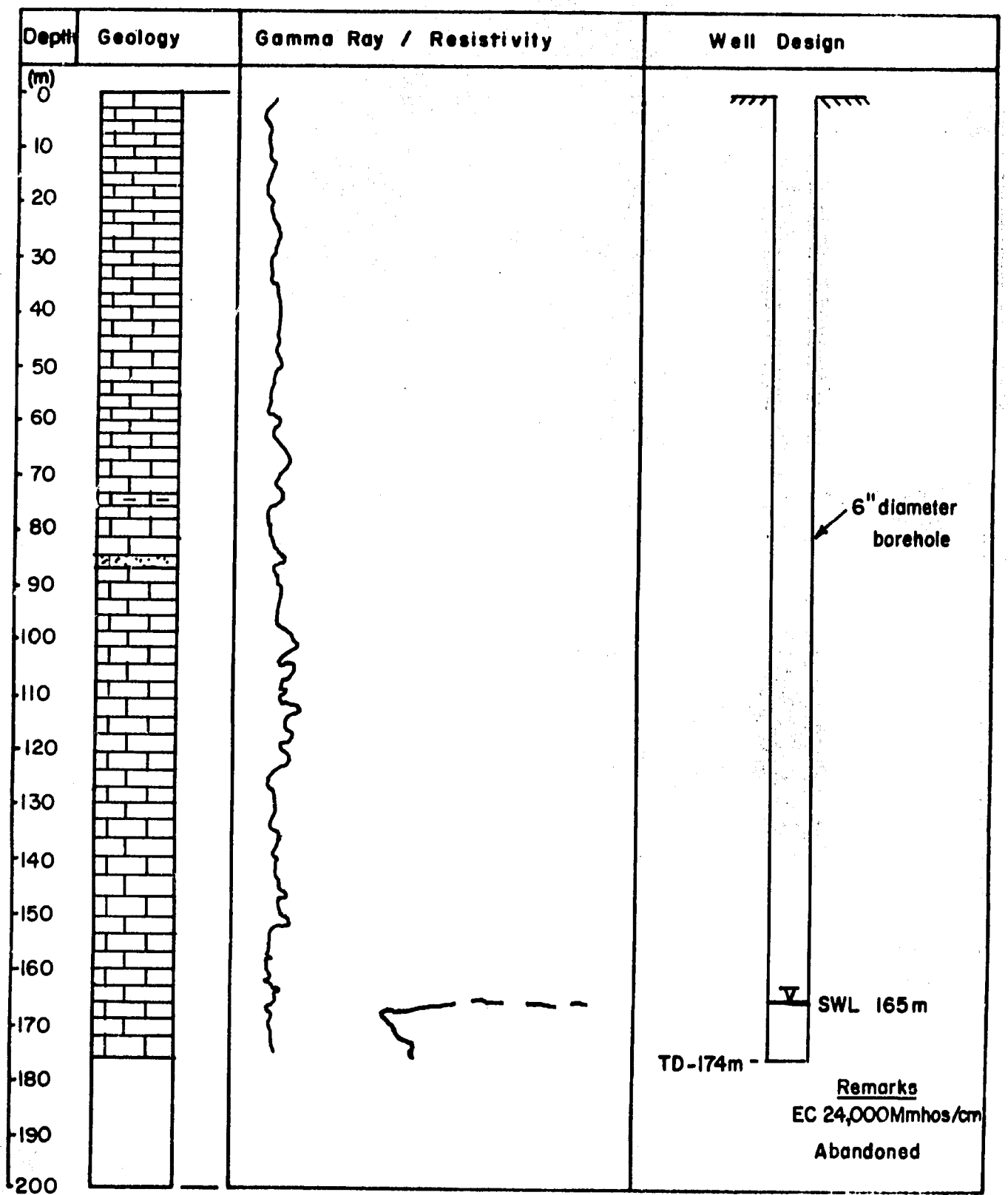
80

Water Development Agency

CGDP - 104

Well Nº 15

Location Qansax Omane



LEGEND

Clay or Shale

Sand

Limestone

Marl

Clayey Sand

Sandstone

Karst Limestone

Basement

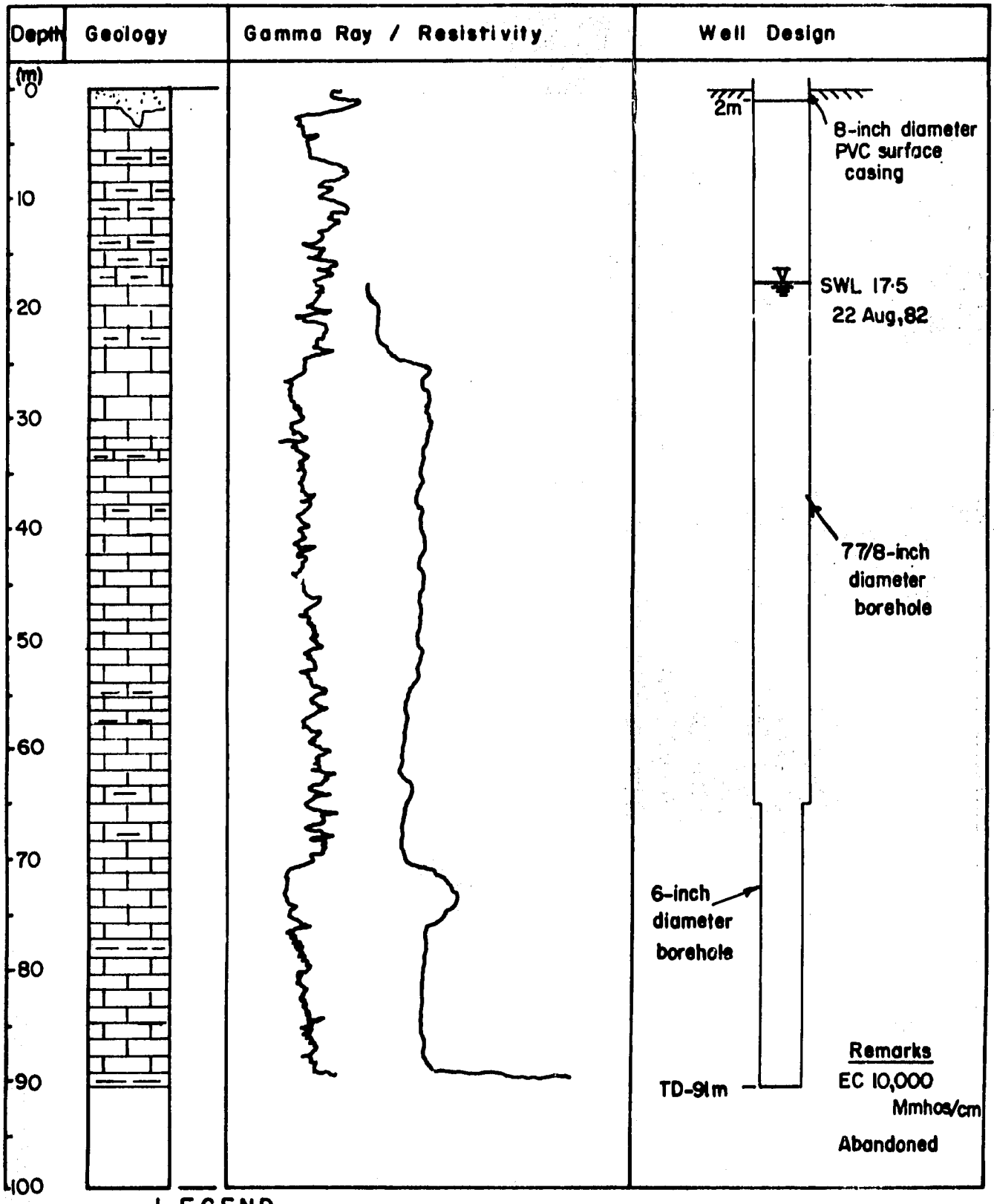
81

Water Development Agency

CGDP - 104

Well Nº 14

Location Warta Jaffay



LEGEND

Clay or Shale | Sand | Limestone | Marl

Clayey Sand | Sandstone | Karst Limestone | Basement

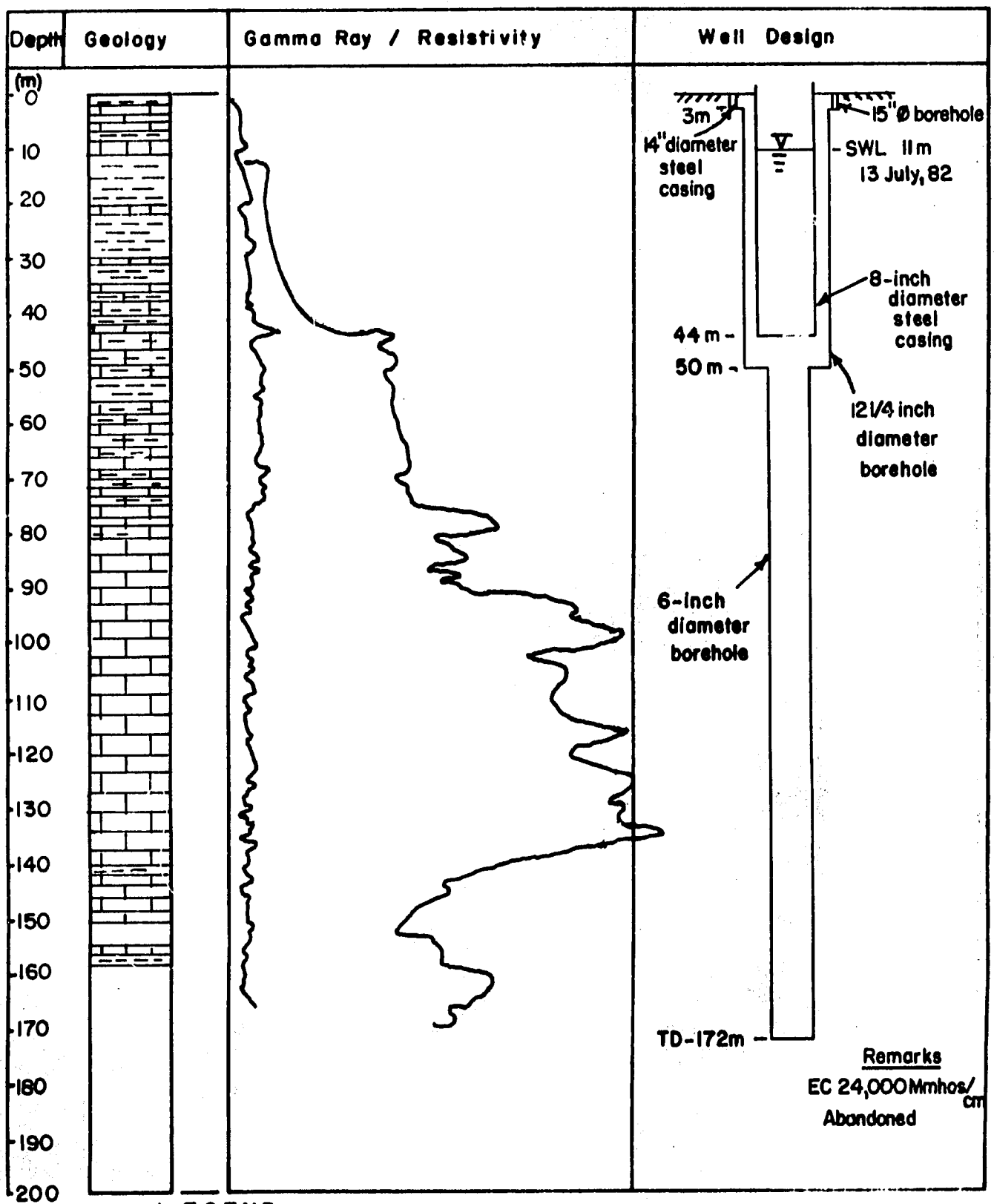
88

Water Development Agency

CGDP - 104

Well Nº 13

Location Shabelle Dugsilow



LEGEND

Clay or Shale | Sand | Limestone | Marl

Clayey Sand | Sandstone | Karst Limestone | Basement

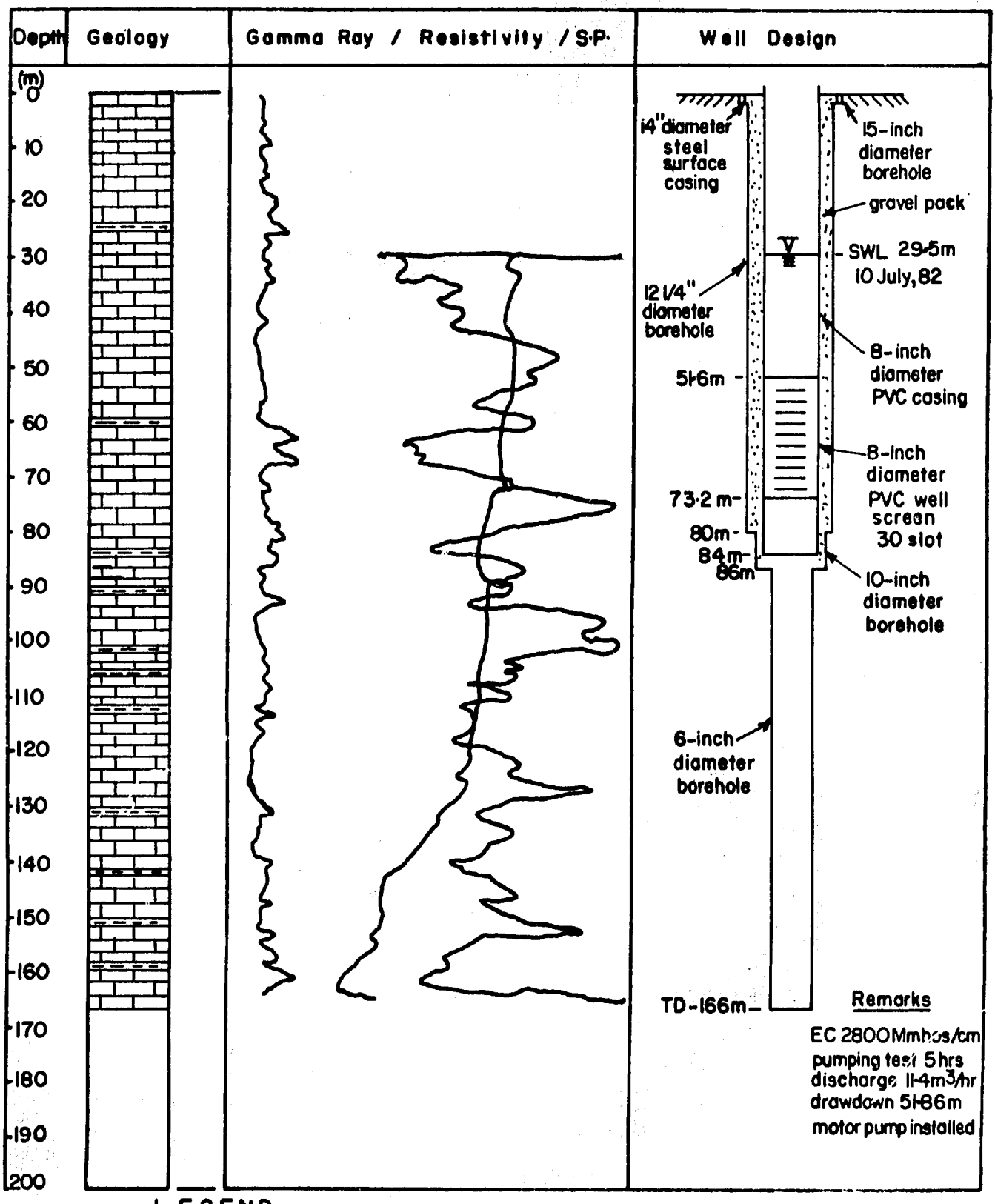
8

Water Development Agency

CGDP - 104

Well Nº 12

Location Hareero Jilfo



LEGEND

Clay or Shale | Sand | Limestone | Marl

Clayey Sand | Sandstone | Karst Limestone | Basement

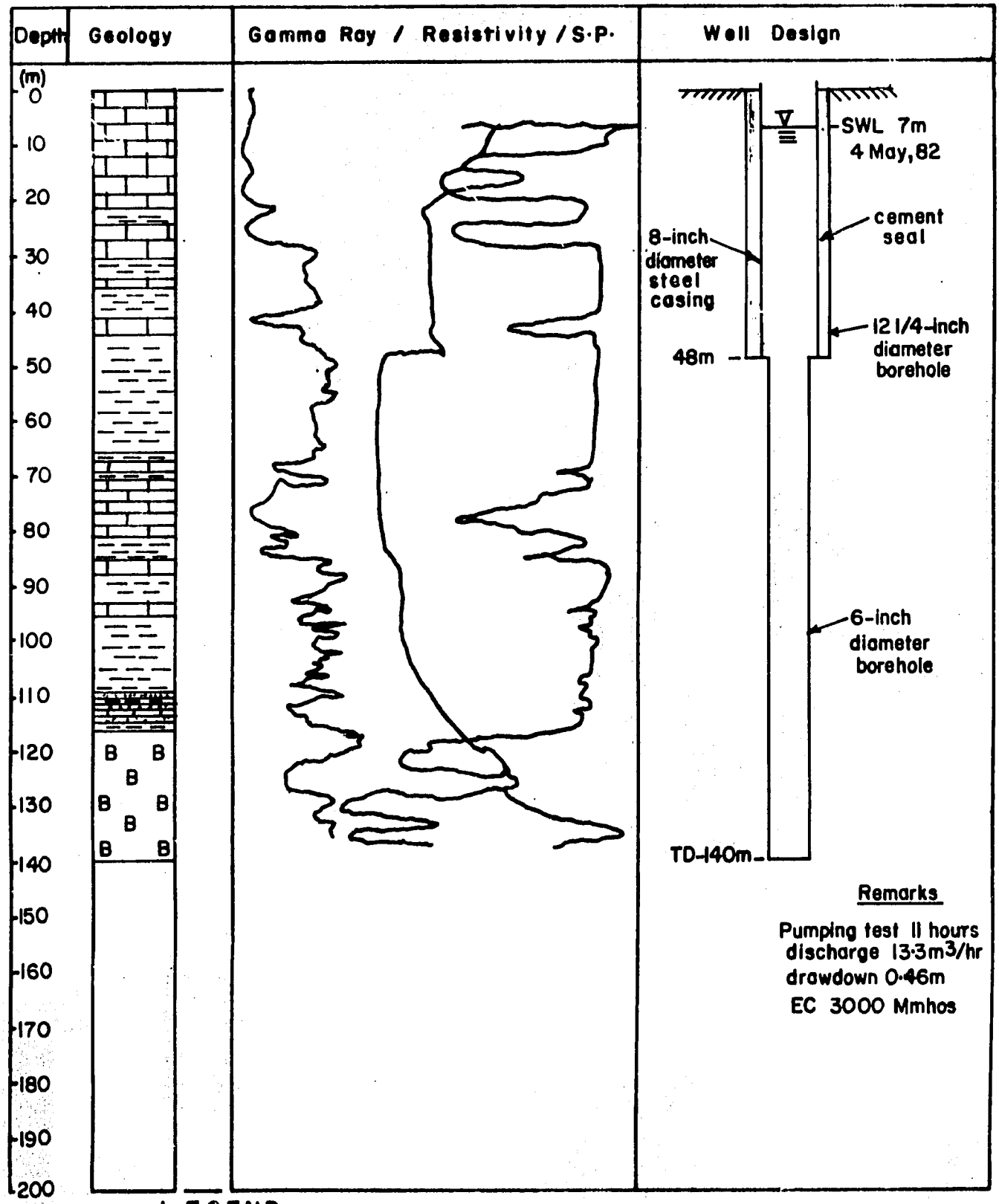
84

Water Development Agency

CGDP - 104

Well Nº 11

Location Baidoa Compound I



LEGEND

Clay or Shale | Sand | Limestone | Marl

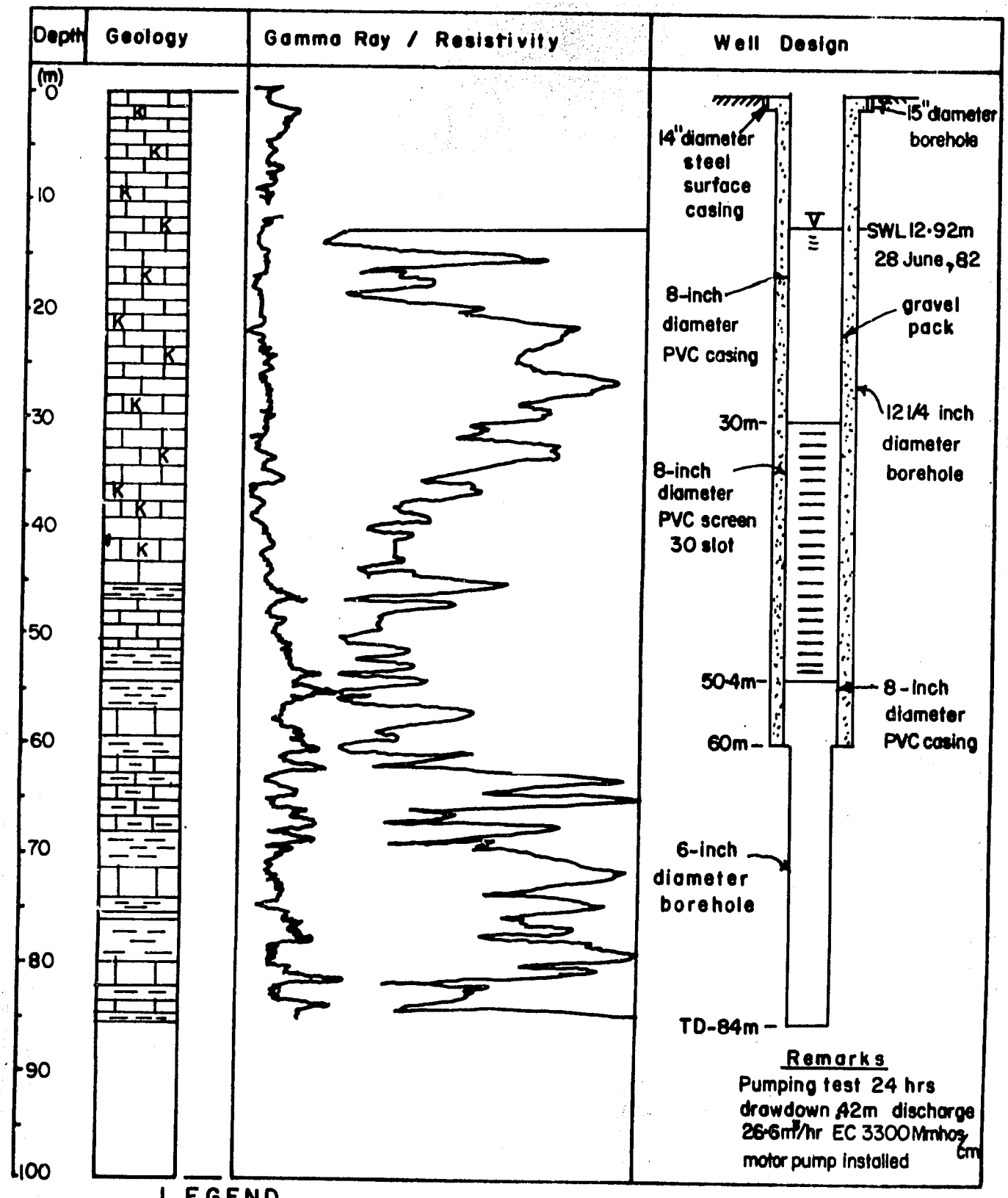
Clayey Sand | Sandstone | Karst Limestone | Basement

Water Development Agency

CGDP - 104

Well Nº 10

Location Sarmaan Dheere



LEGEND

Clay or Shale | Sand | Limestone | Marl

Clayey Sand | Sandstone | Karst Limestone | Basement

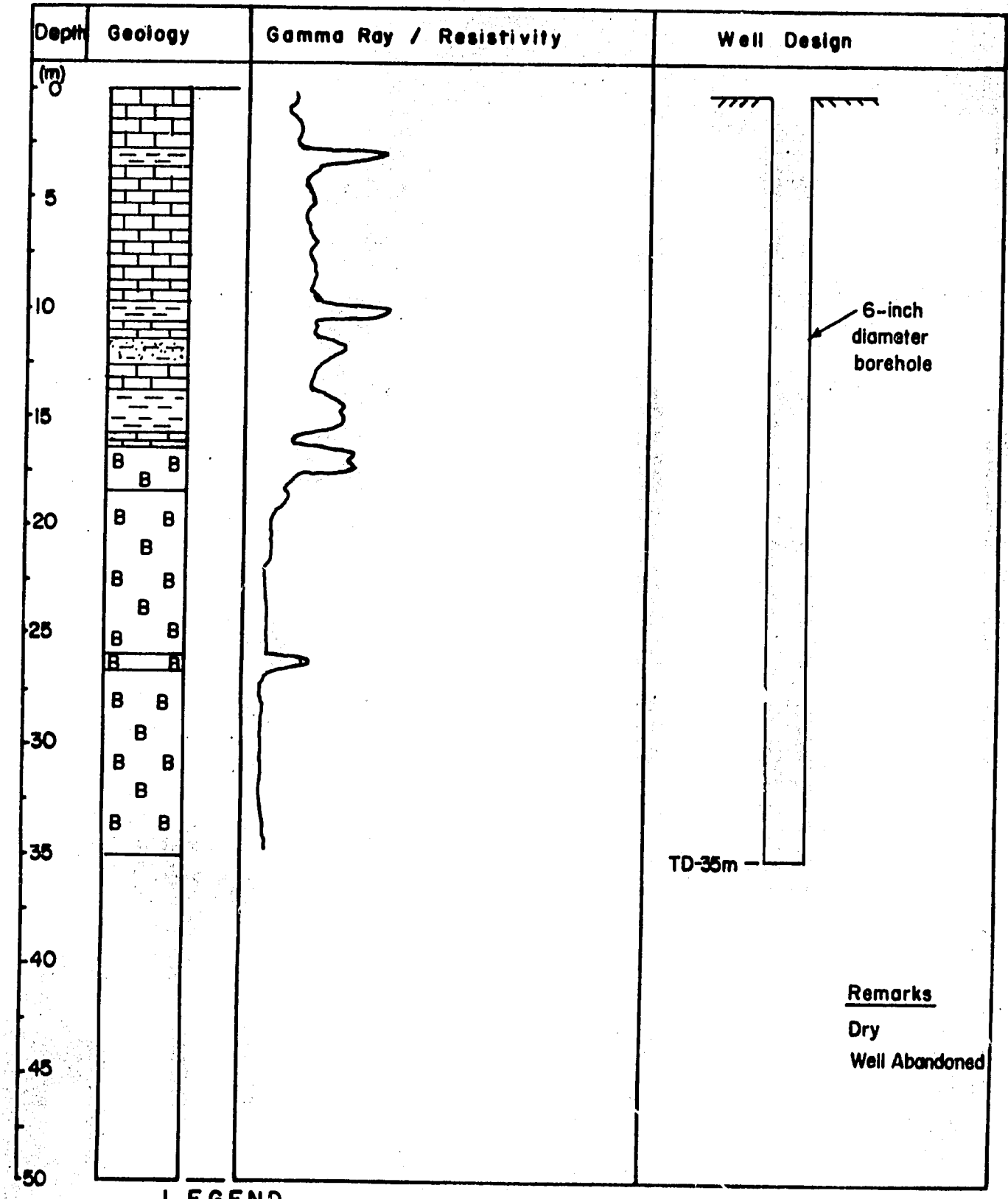
86

Water Development Agency

CGDP - 104

Well Nº 9

Location Bur Halab



LEGEND

Clay or Shale | Sand | Limestone | Marl

Clayey Sand | Sandstone | Karst Limestone | Basement

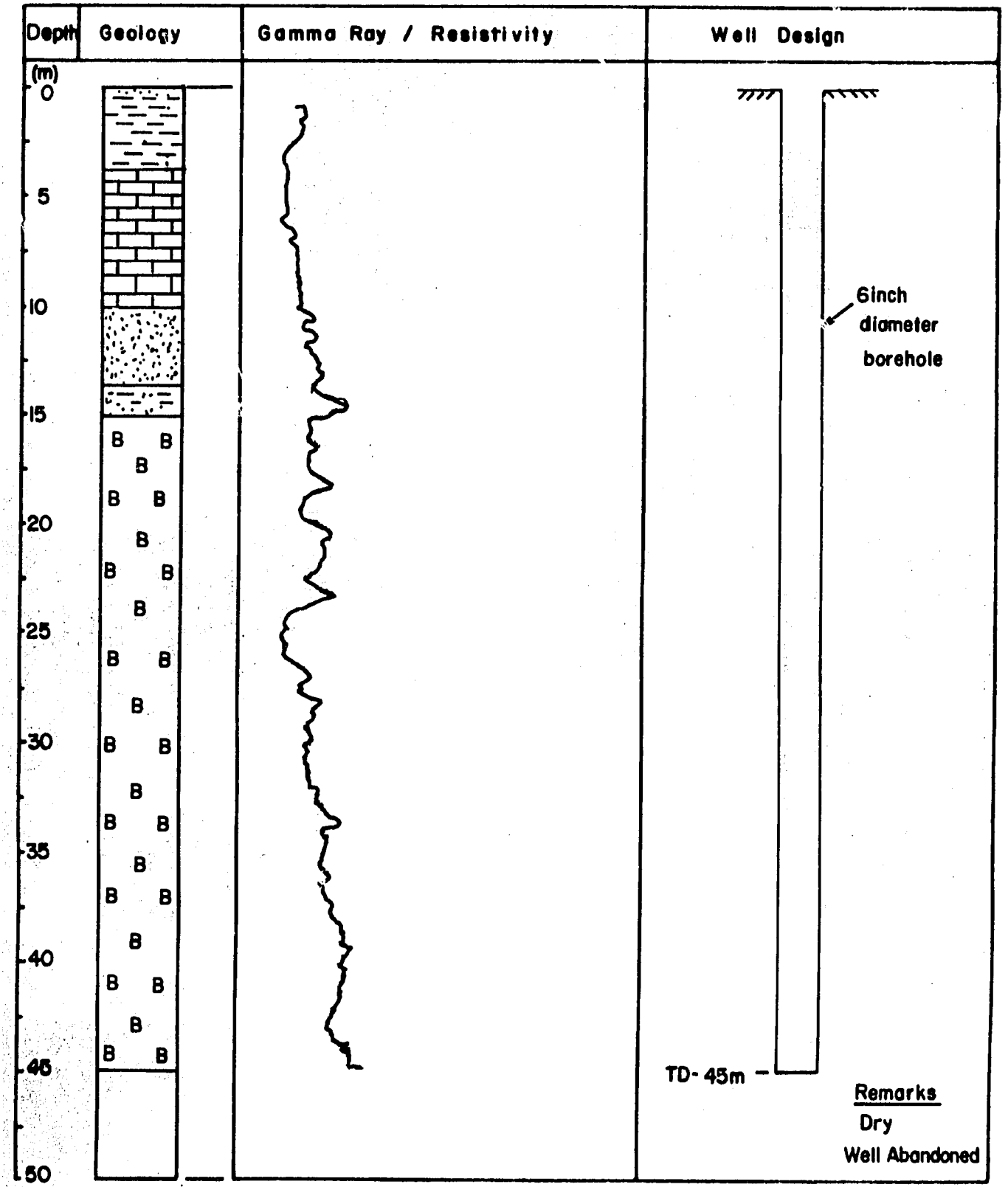
(2)

Water Development Agency

CGDP - 104

Well Nº 8

Location Tugerew II



LEGEND

Clay or Shale | Sand | Limestone | Marl

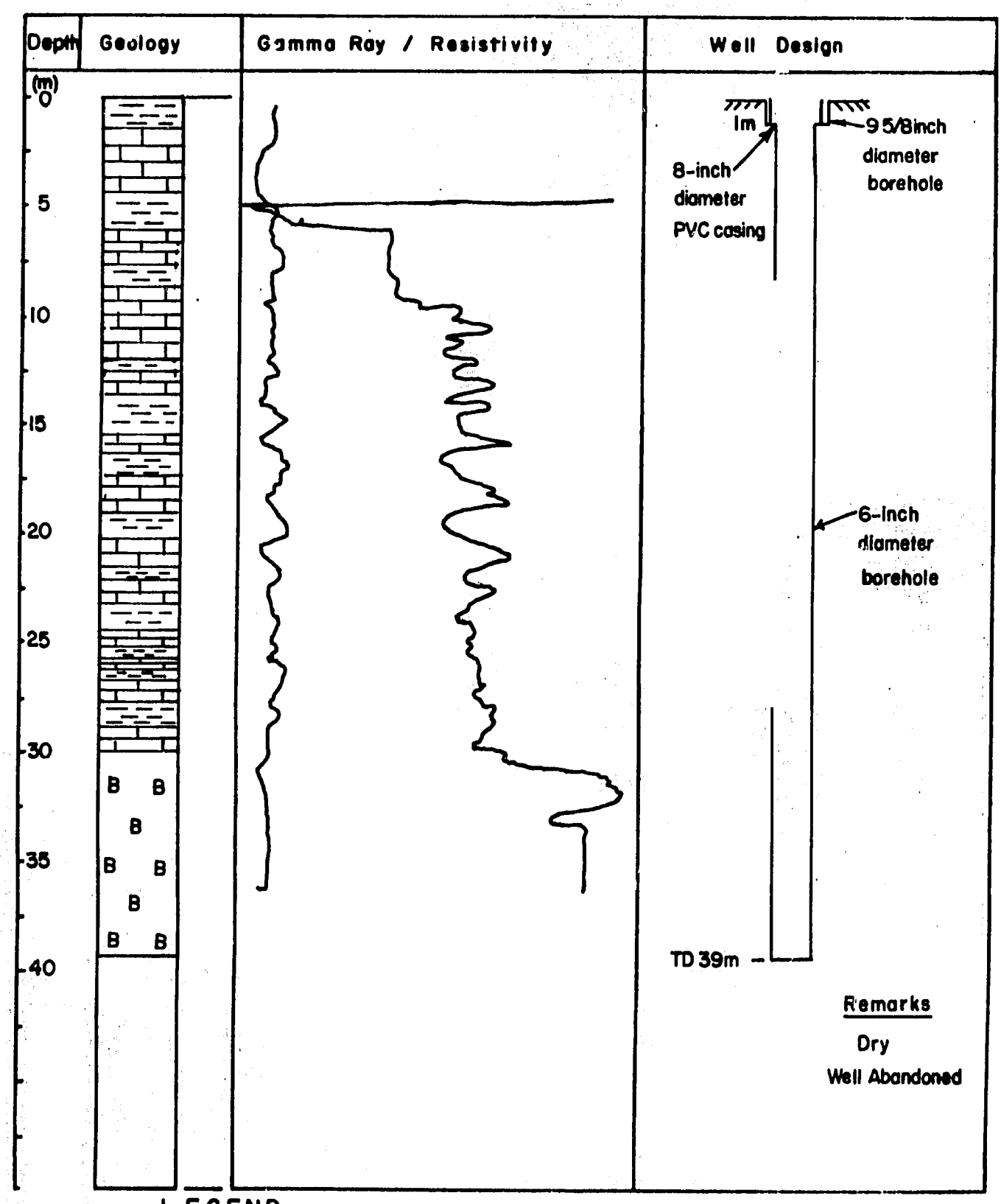
Clayey Sand | Sandstone | Karst Limestone | Basement

Water Development Agency

CGDP - 104

Well Nº 7

Location Waraji II



LEGEND

Clay or Shale | Sand | Limestone | Marl

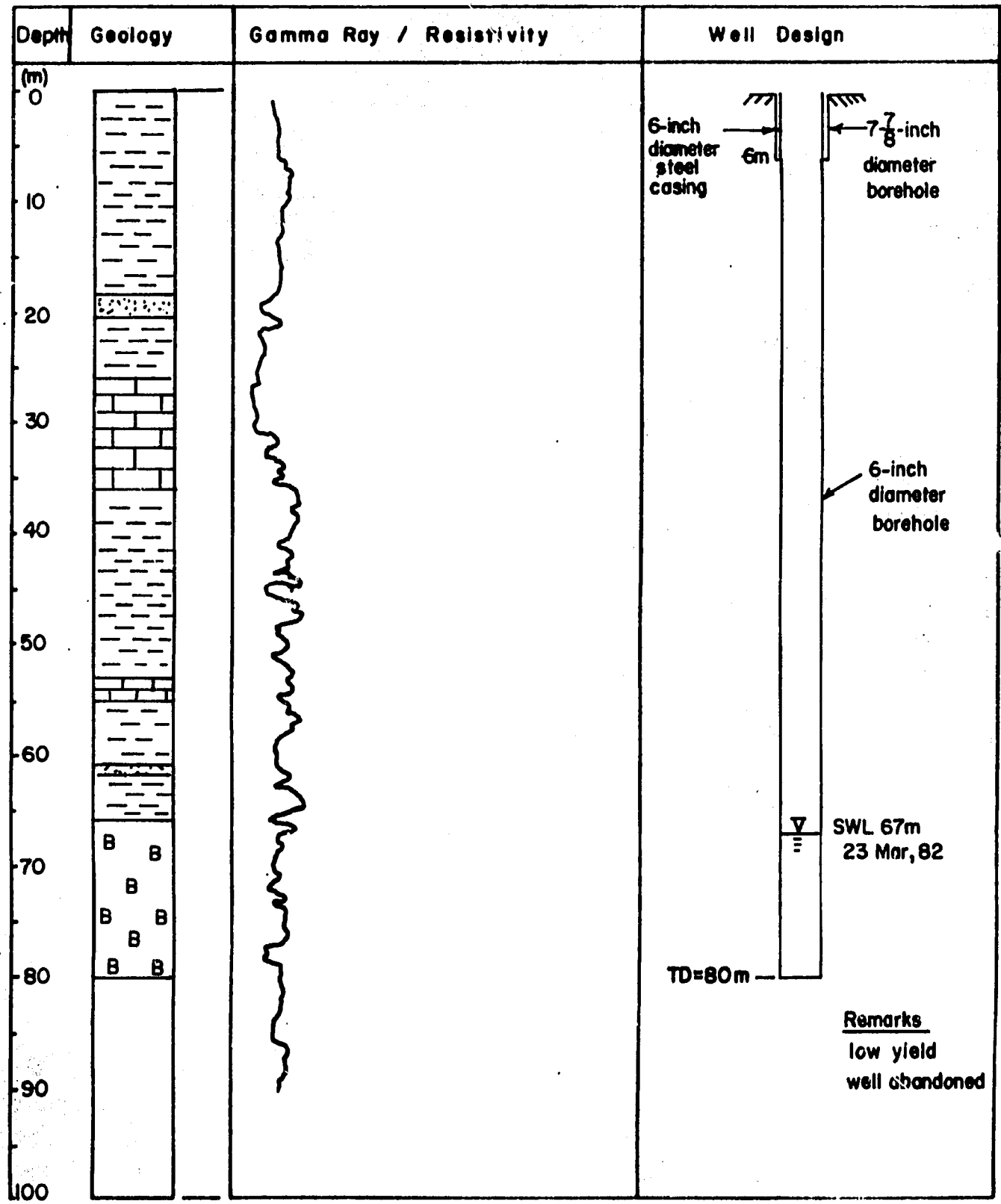
Clayey Sand | Sandstone | Karst Limestone | Basement

Water Development Agency

CGDP - 104

Well Nº 6

Location Waraji I

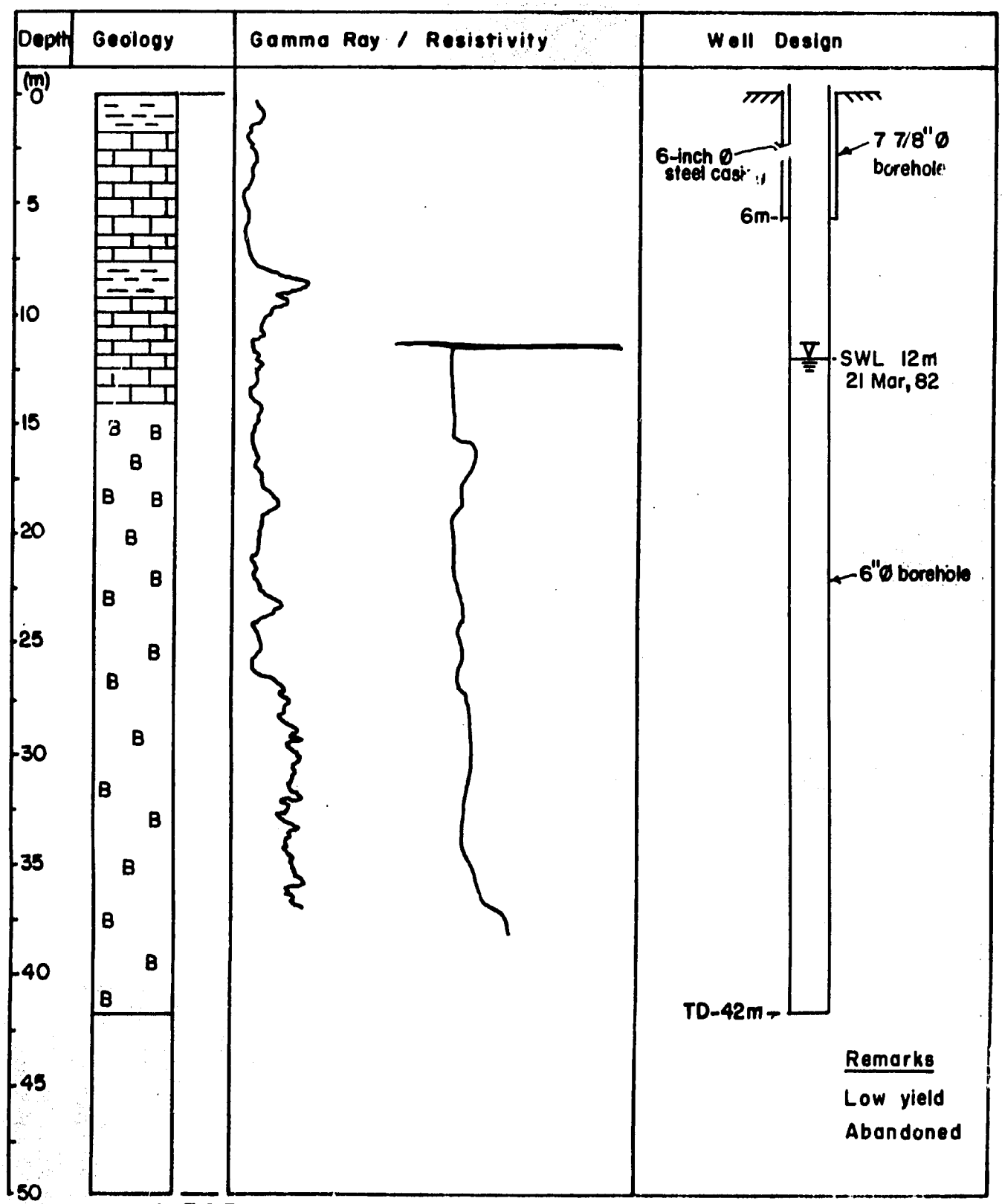


Water Development Agency

CGDP - 104

Well Nº 5

Location Gasarta



LEGEND

Clay or Shale | Sand | Limestone | Marl

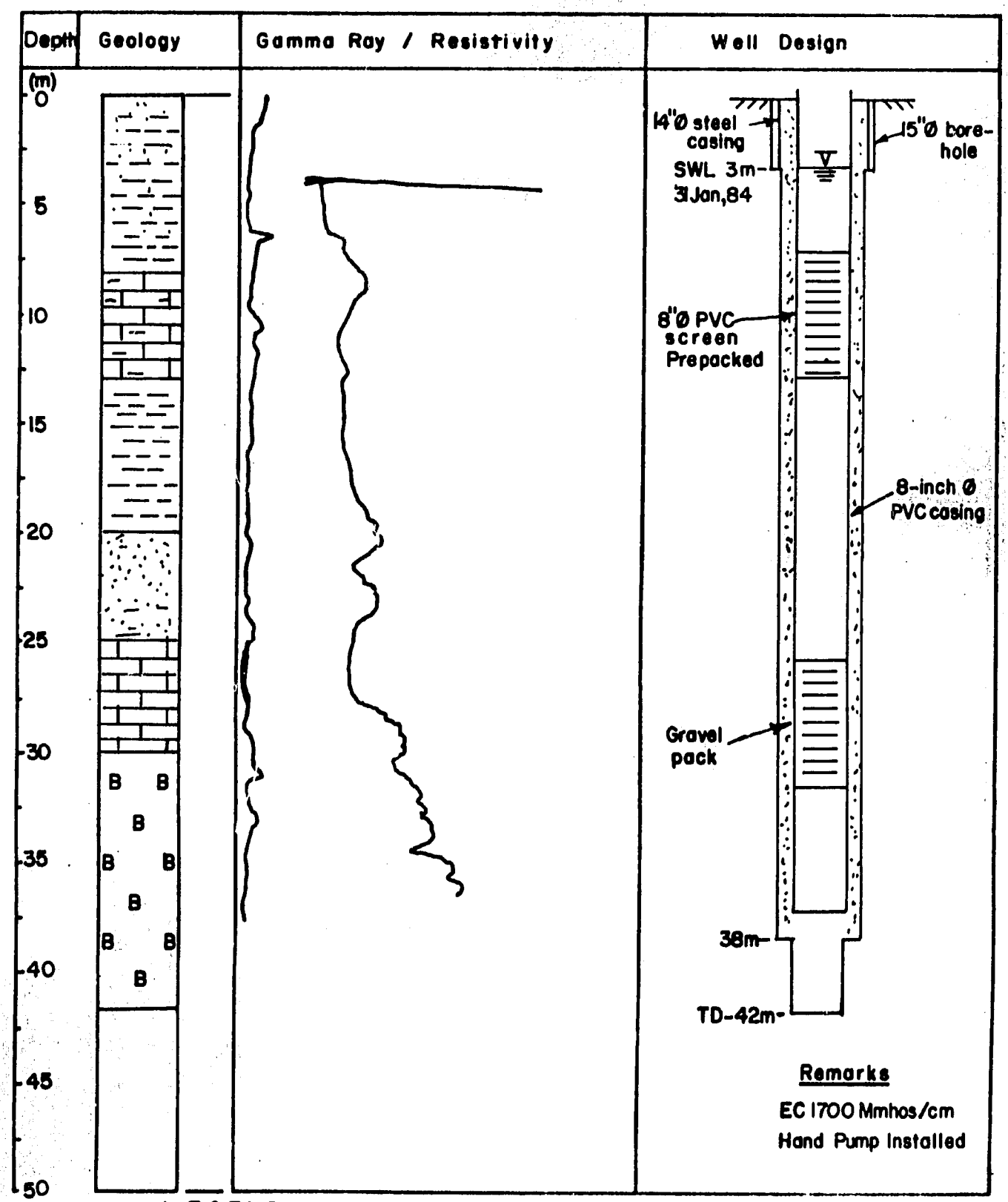
Clayey Sand | Sandstone | Karst Limestone | Basement

Water Development Agency

CGDP - 104

Well Nº 4

Location Tugerew I



LEGEND

Clay or Shale | Sand | Limestone | Marl

Clayey Sand | Sandstone | Karst Limestone | Basement

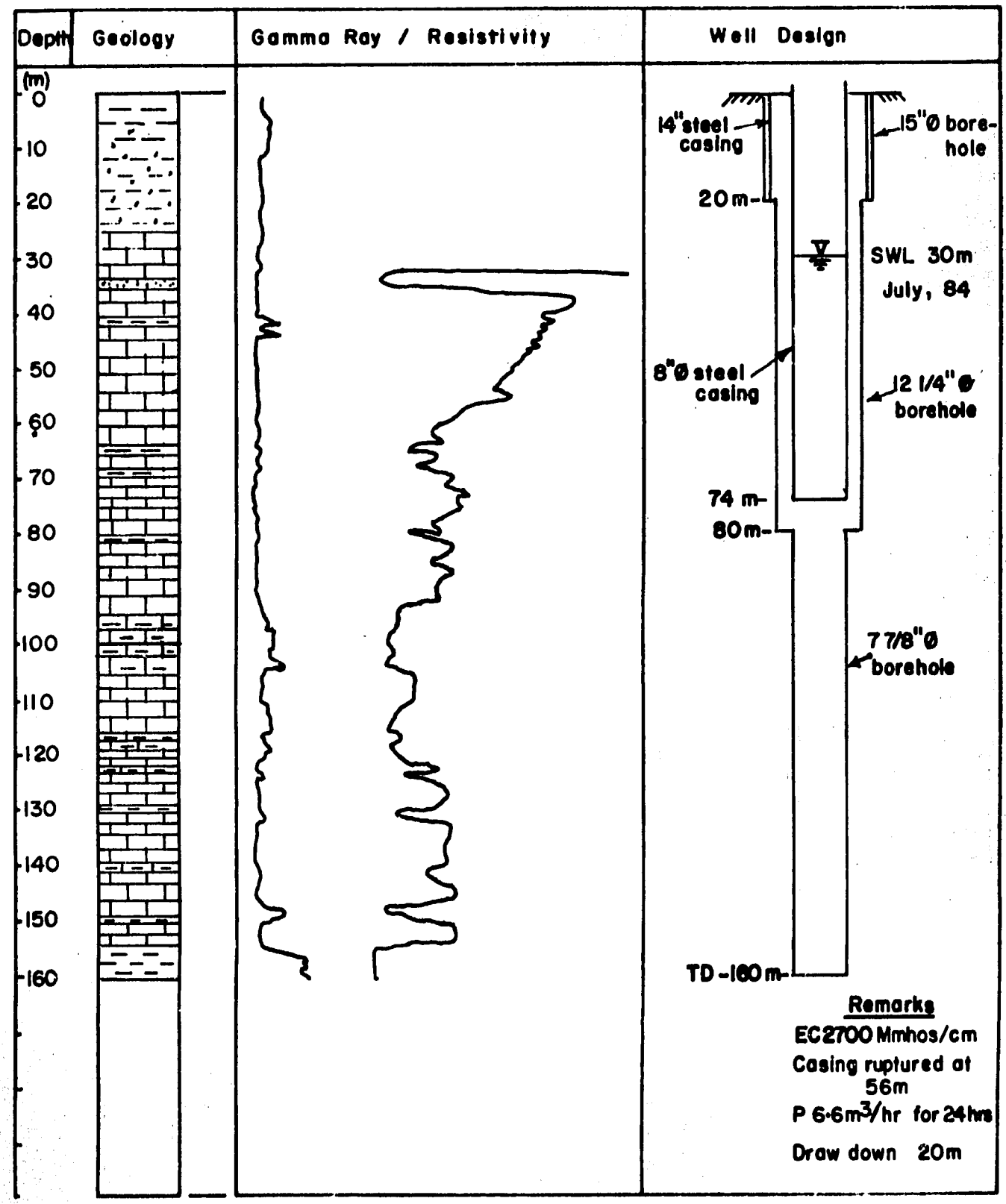
92

Water Development Agency

CGDP - 104

Well Nº 3

Location Bonkay III



LEGEND

Clay or Shale | Sand | Limestone | Marl

Clayey Sand | Sandstone | Karst Limestone | Basement

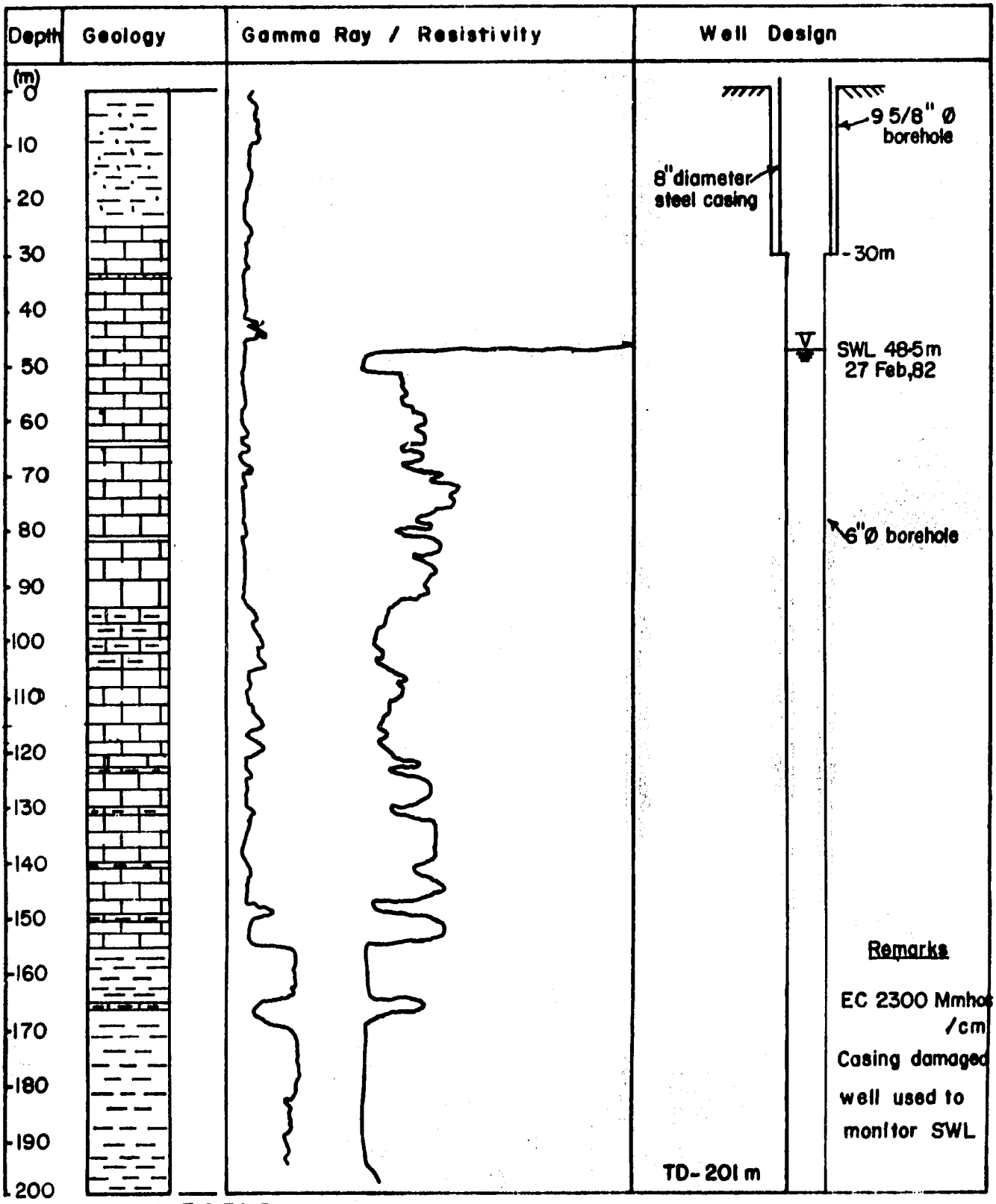
93

Water Development Agency

CGDP - 104

Well Nº 2

Location Bonkay II

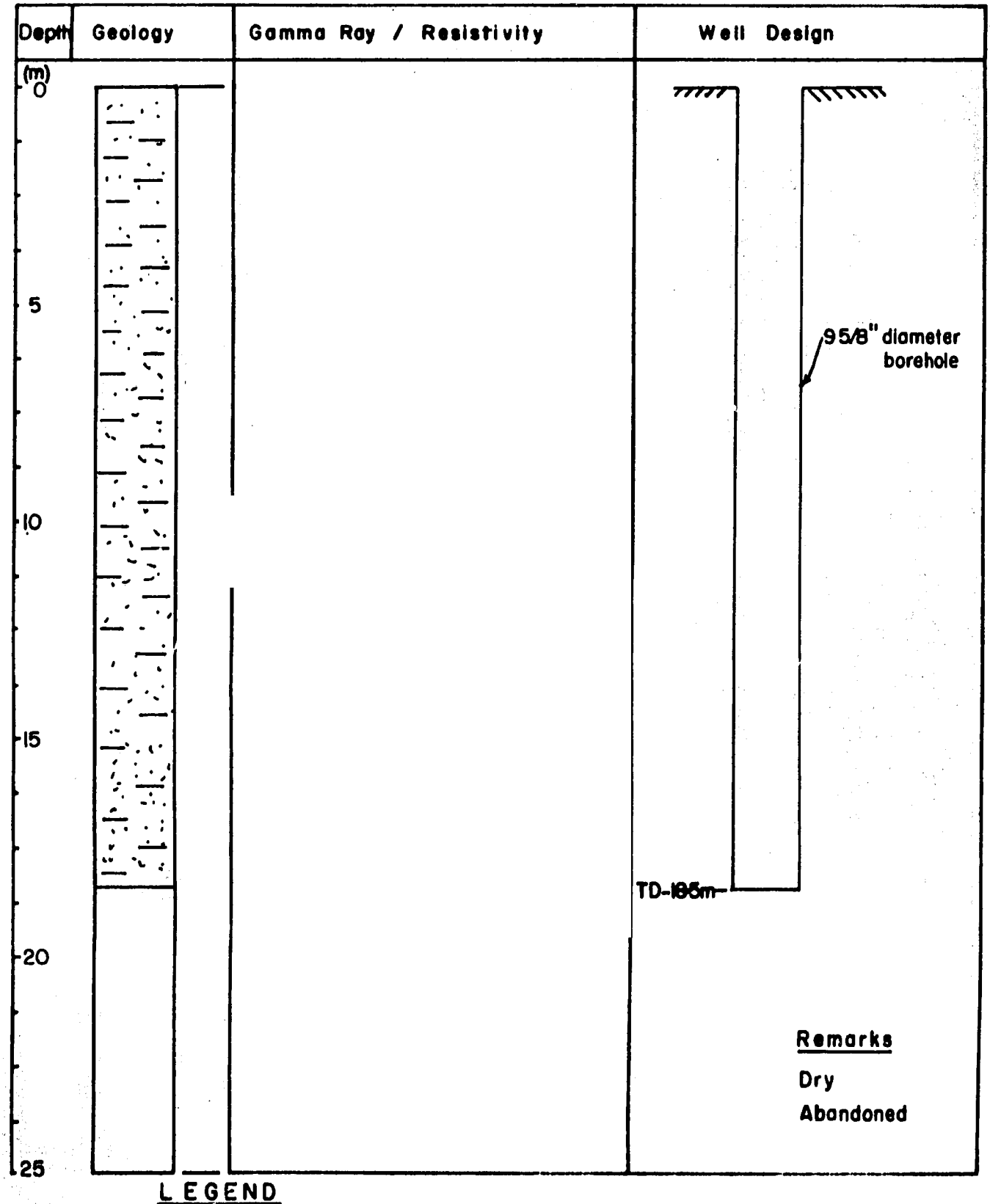


Water Development Agency

CGDP - 104

Well Nº 1

Location Bonkay I

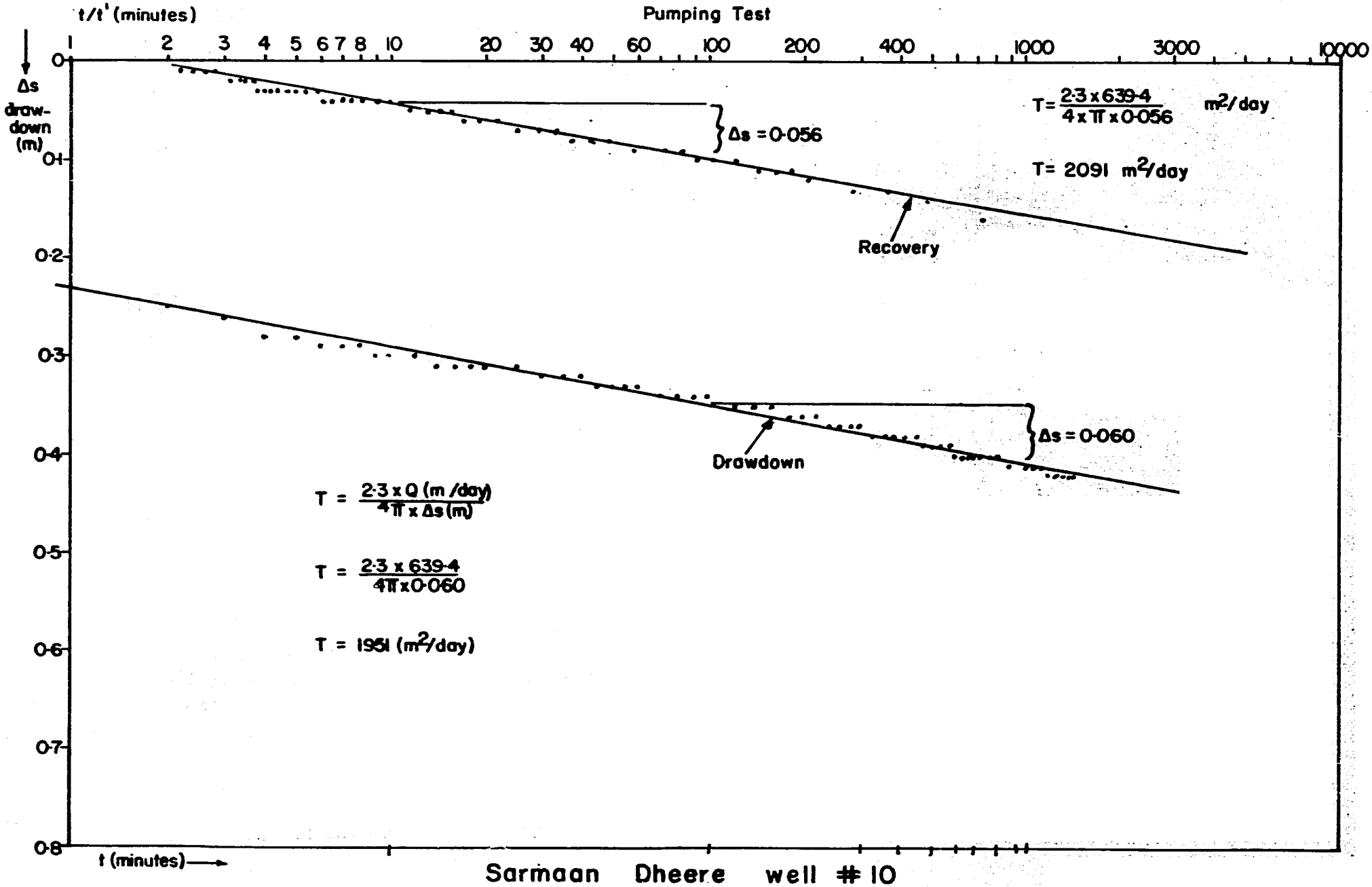


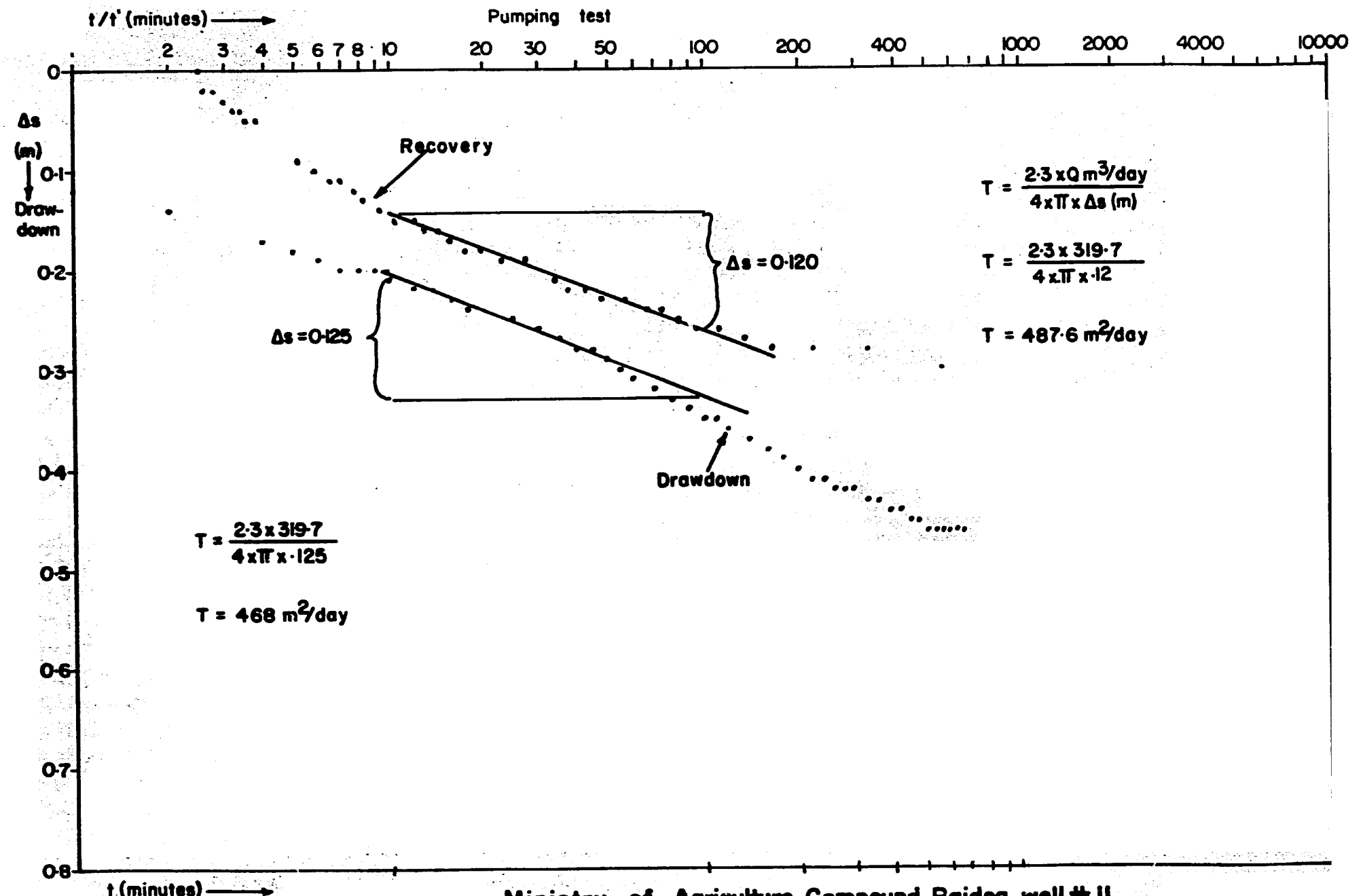
LEGEND

Clay or Shale | Sand | Limestone | Marl

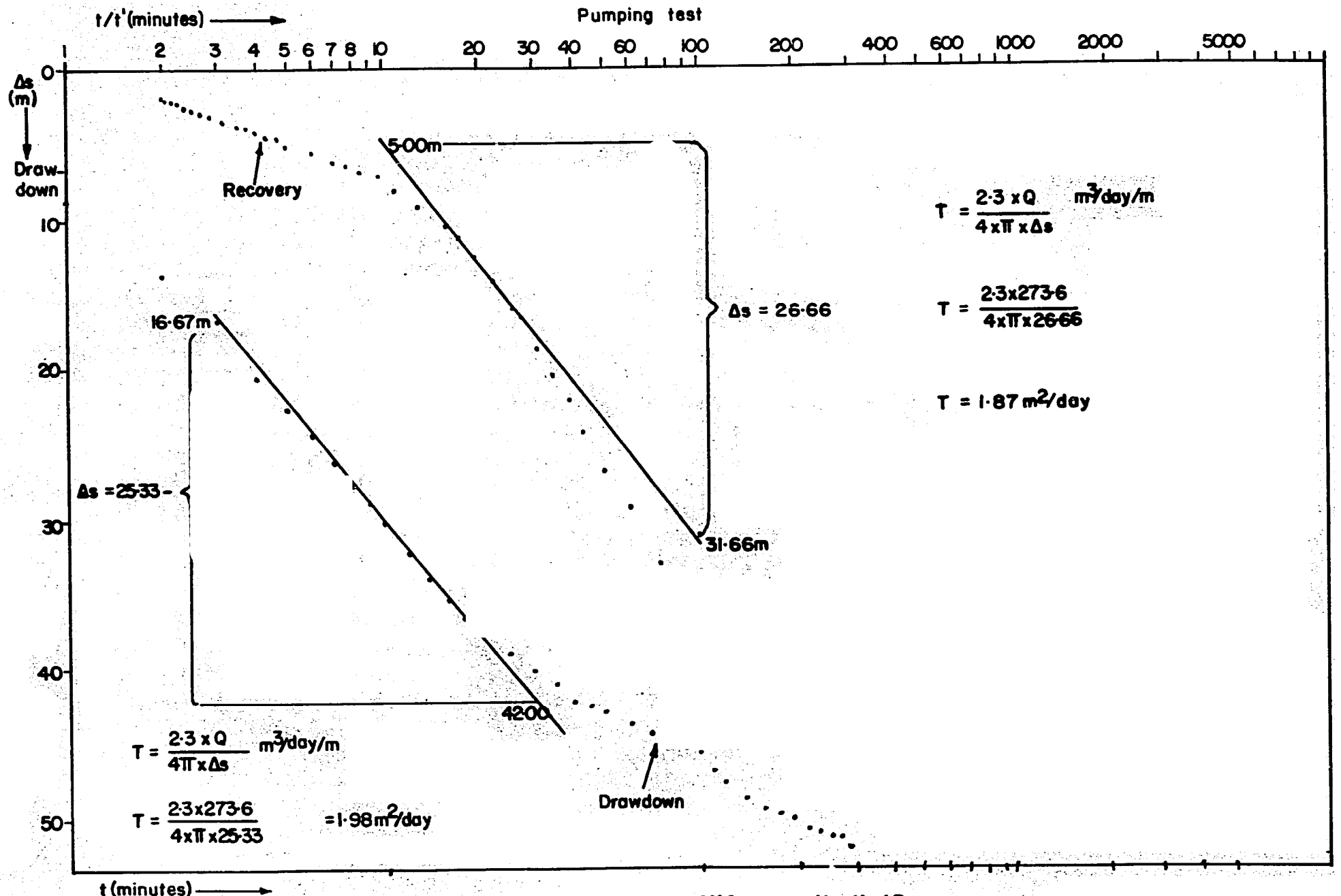
Clayey Sand | Sandstone | Karst Limestone | Basement

A4 PUMPING TESTS for SELECTED BOREHOLES

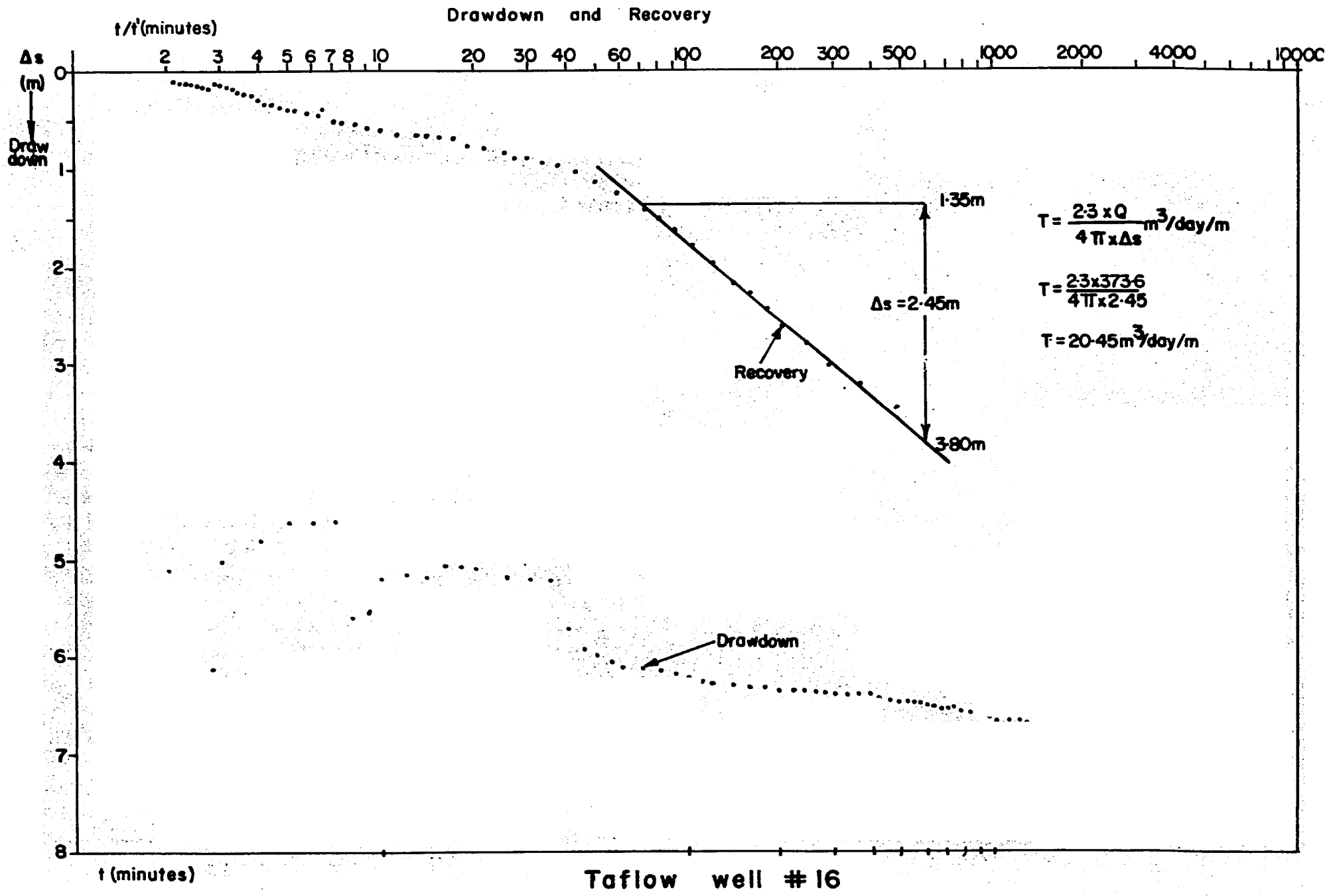

t/t' (minutes)
Pumping Test
1 2 3 4 5 6 7 8 10 20 30 40 60 100 200 400 1000 3000 10000
Δs drawdown (m)
0 0·1 0·2 0·3 0·4 0·5 0·6 0·7 0·8
Δs = 0·056
T = 2·3 x 639·4 / 4 x π x 0·056 m²/day
T = 2091 m²/day
Recovery
Drawdown
Δs = 0·060
T = 2·3 x Q (m/day) / 4π x Δs (m)
T = 2·3 x 639·4 / 4π x 0·060
T = 1951 (m²/day)
t (minutes)
Sarmaan Dheere well # 10



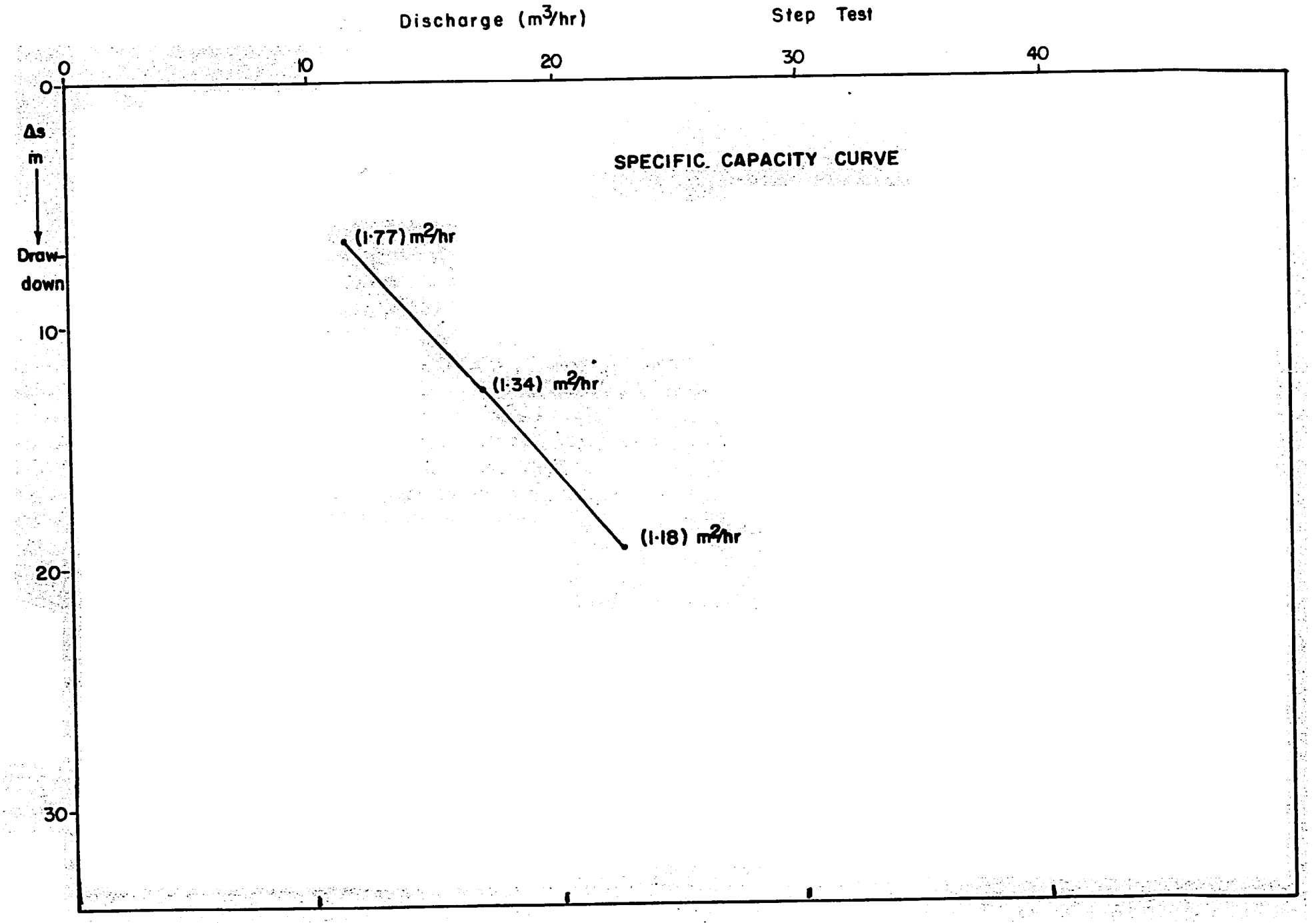
Ministry of Agriculture Compound-Baidoa well # II



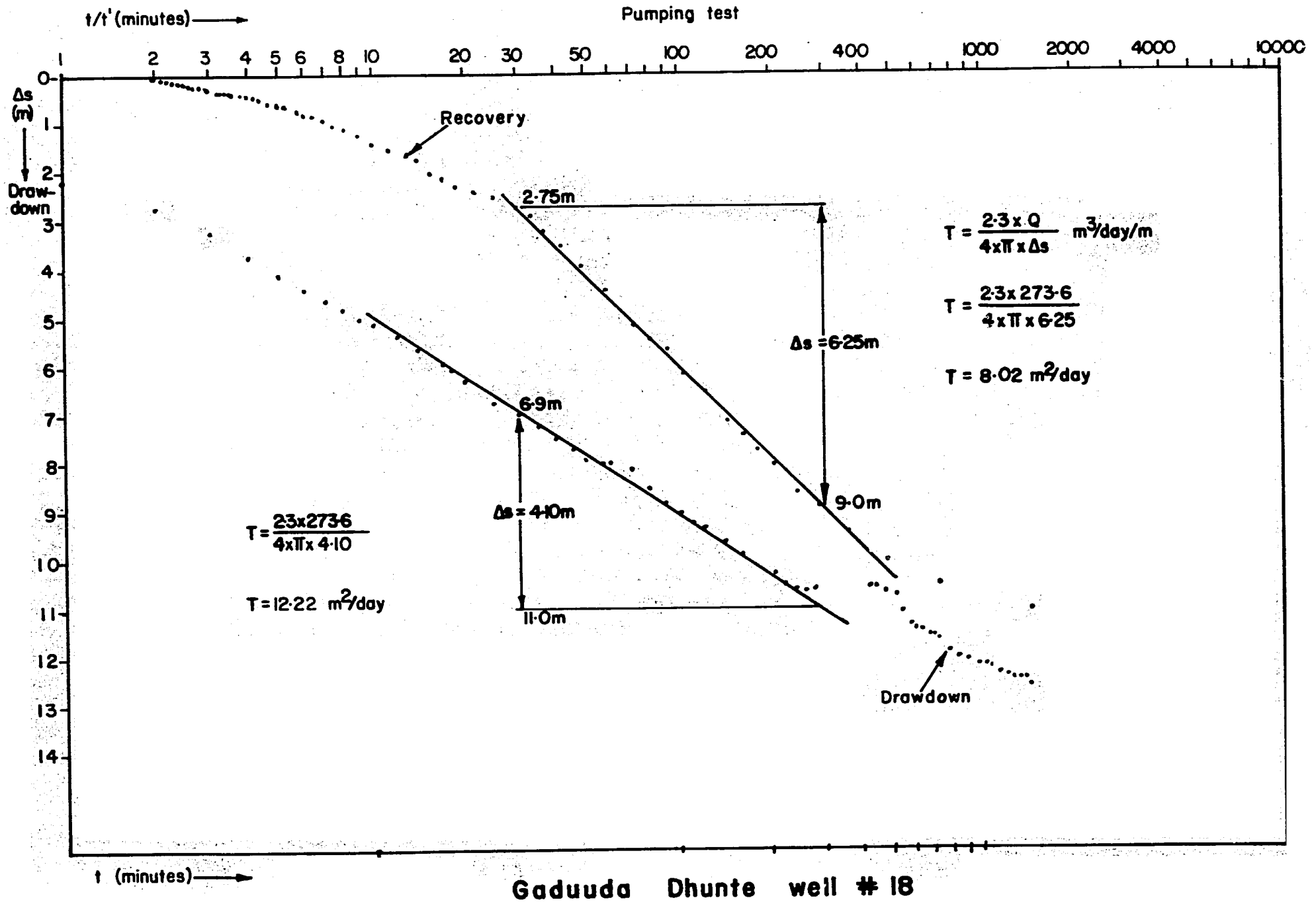
Hareero Jiifo well # 12



Taflow well # 16

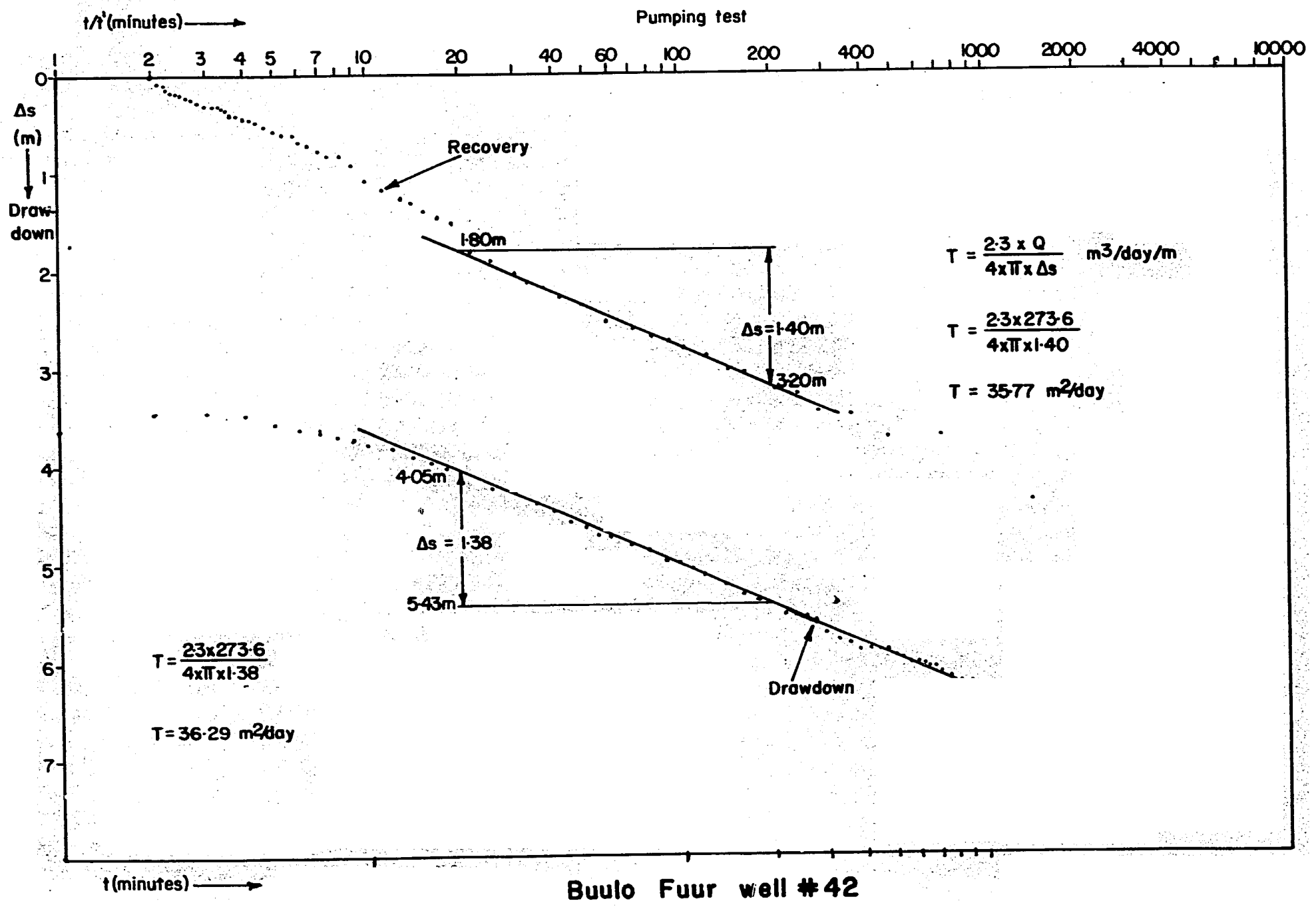


Gaduuda Dhunte well #18



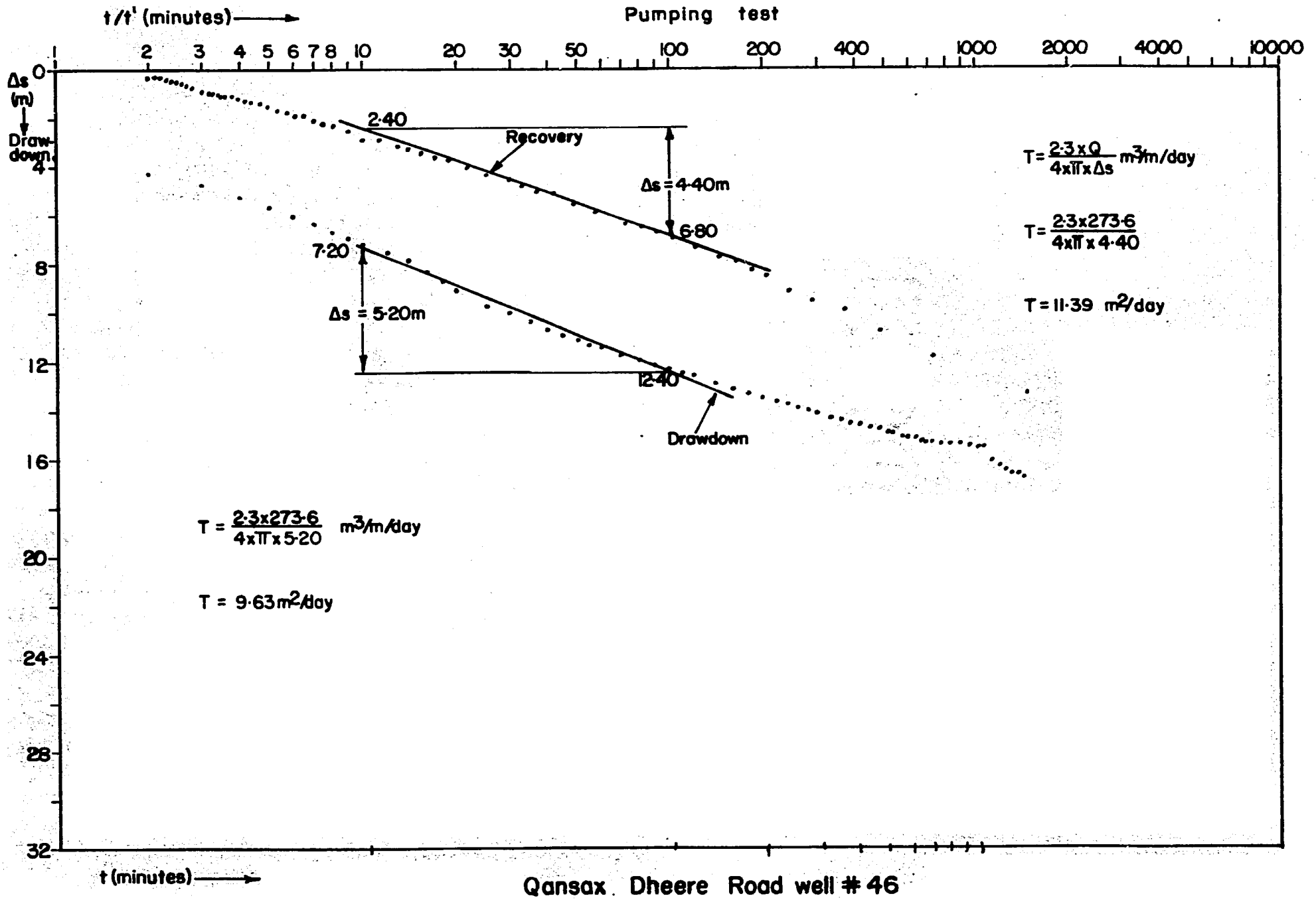
Gaduuda Dhunte well # 18

103



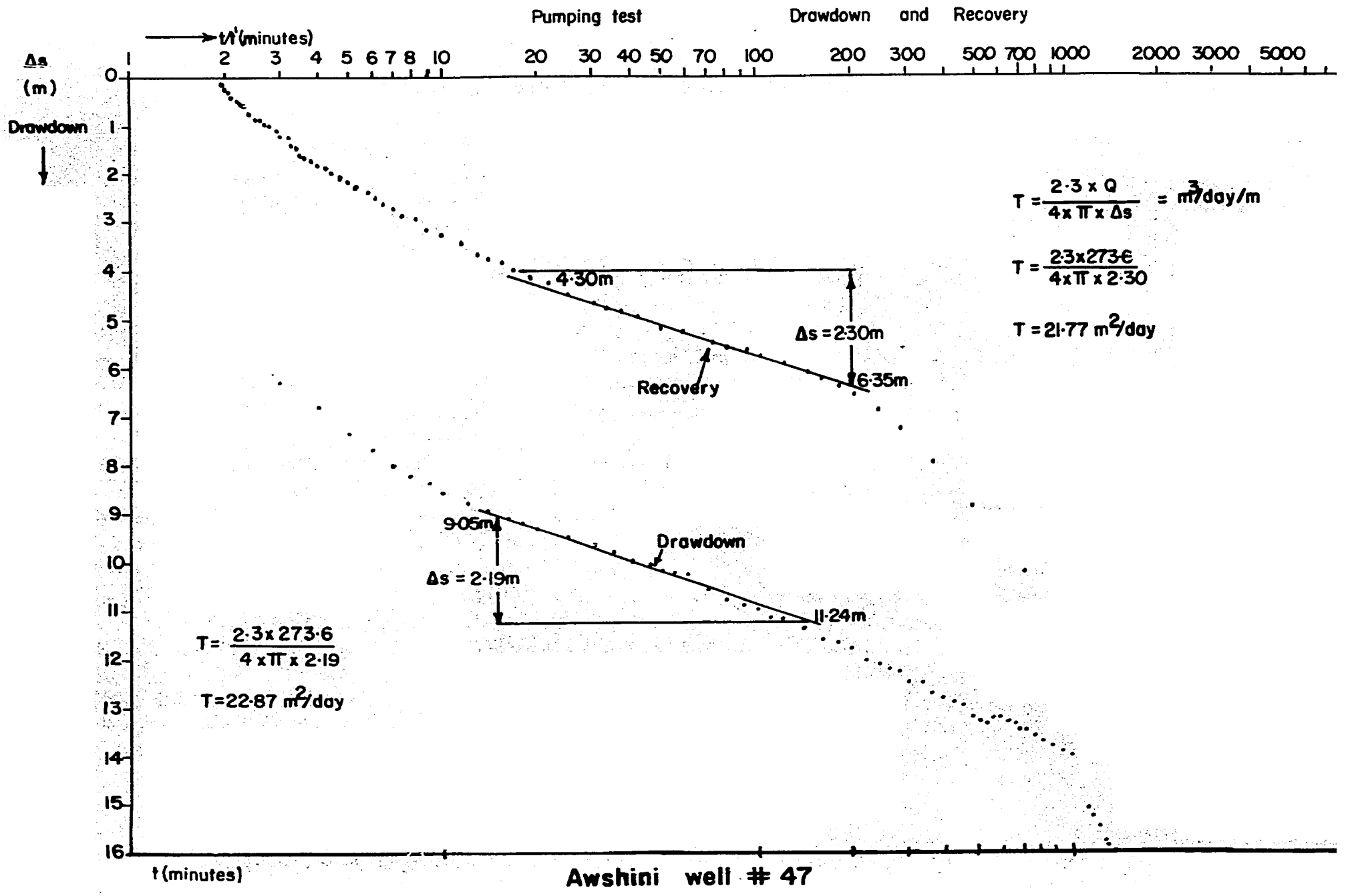
Buulo Fuur well #42

103

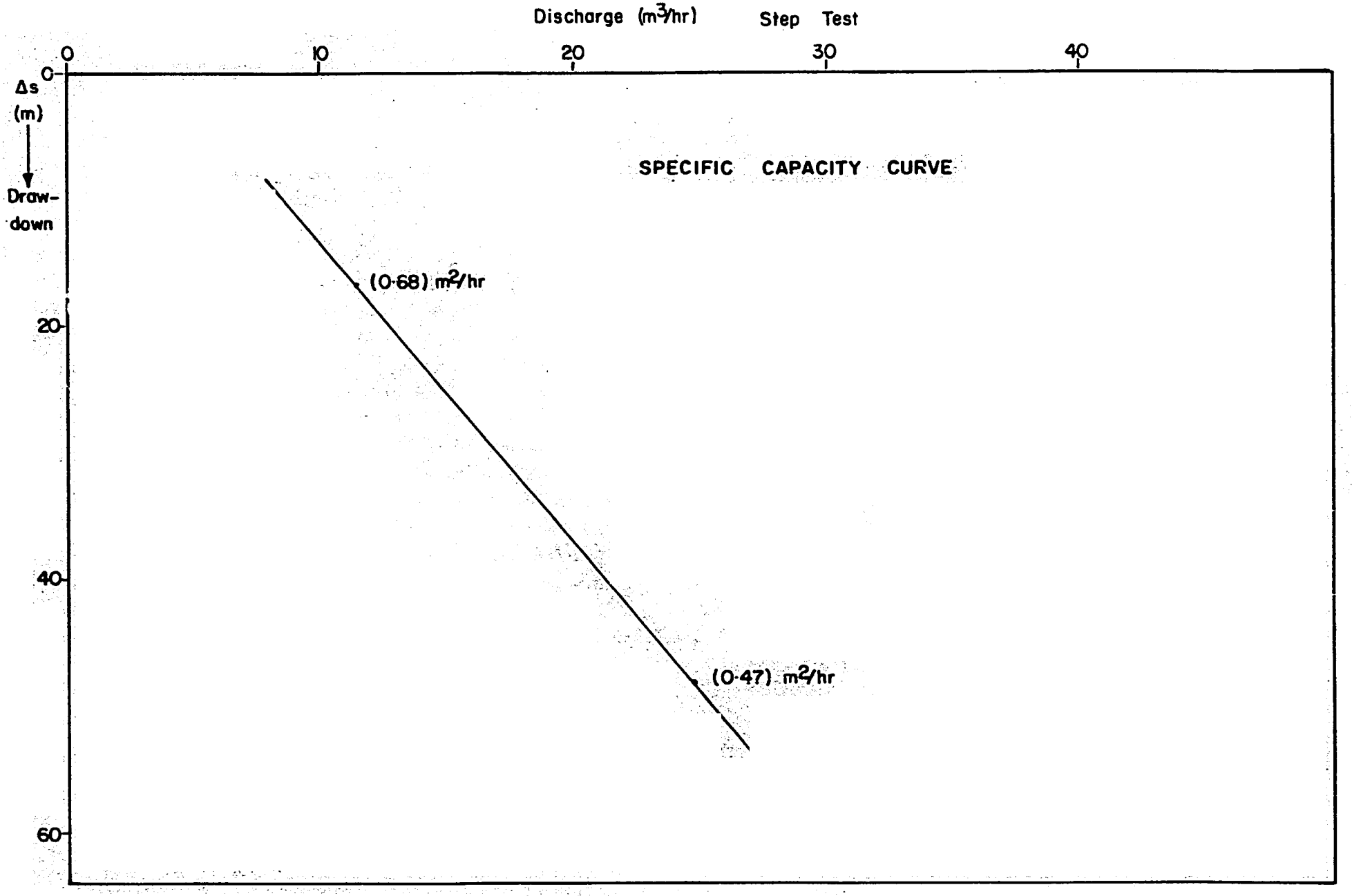


Qansax. Dheere Road well # 46

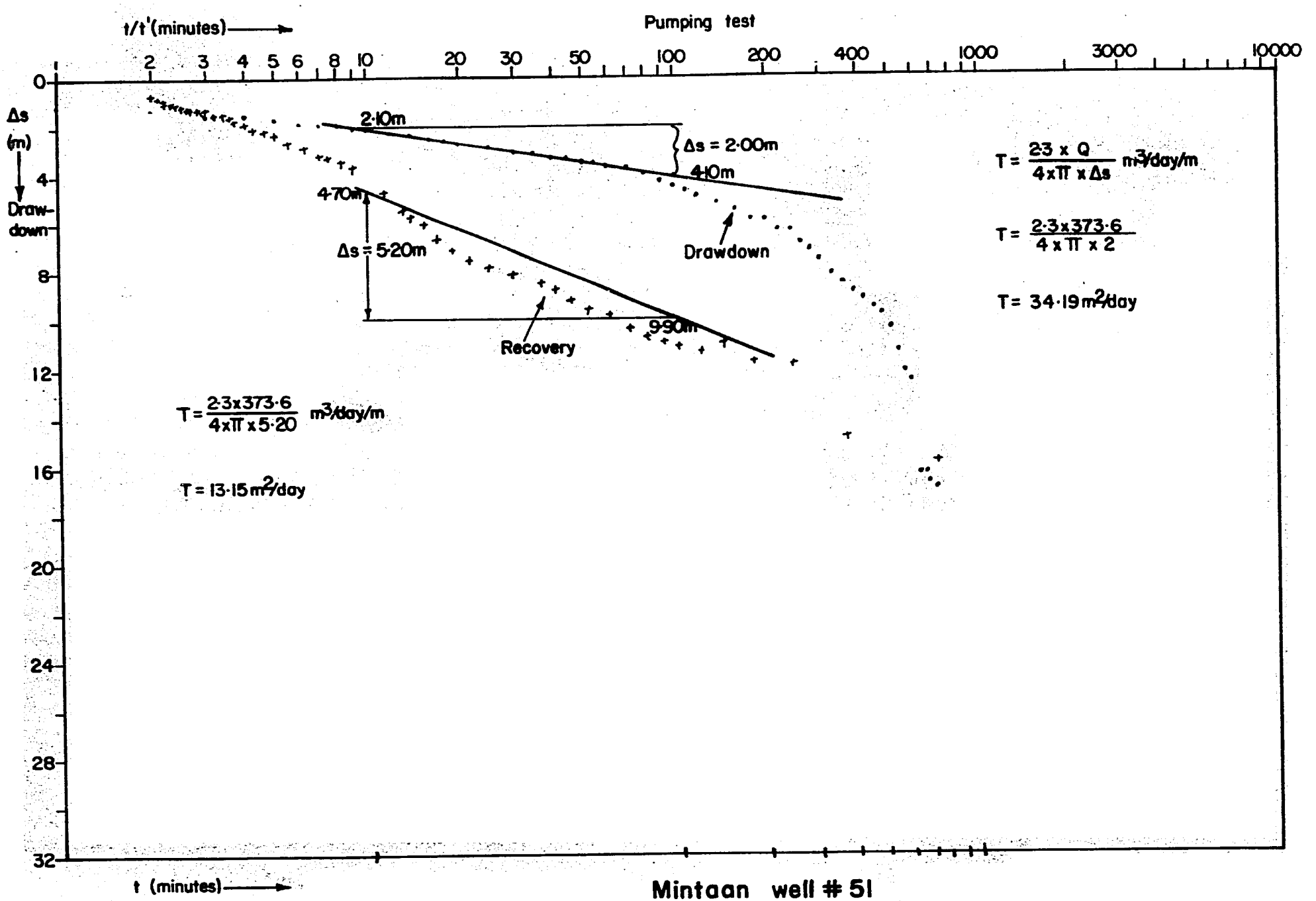
104



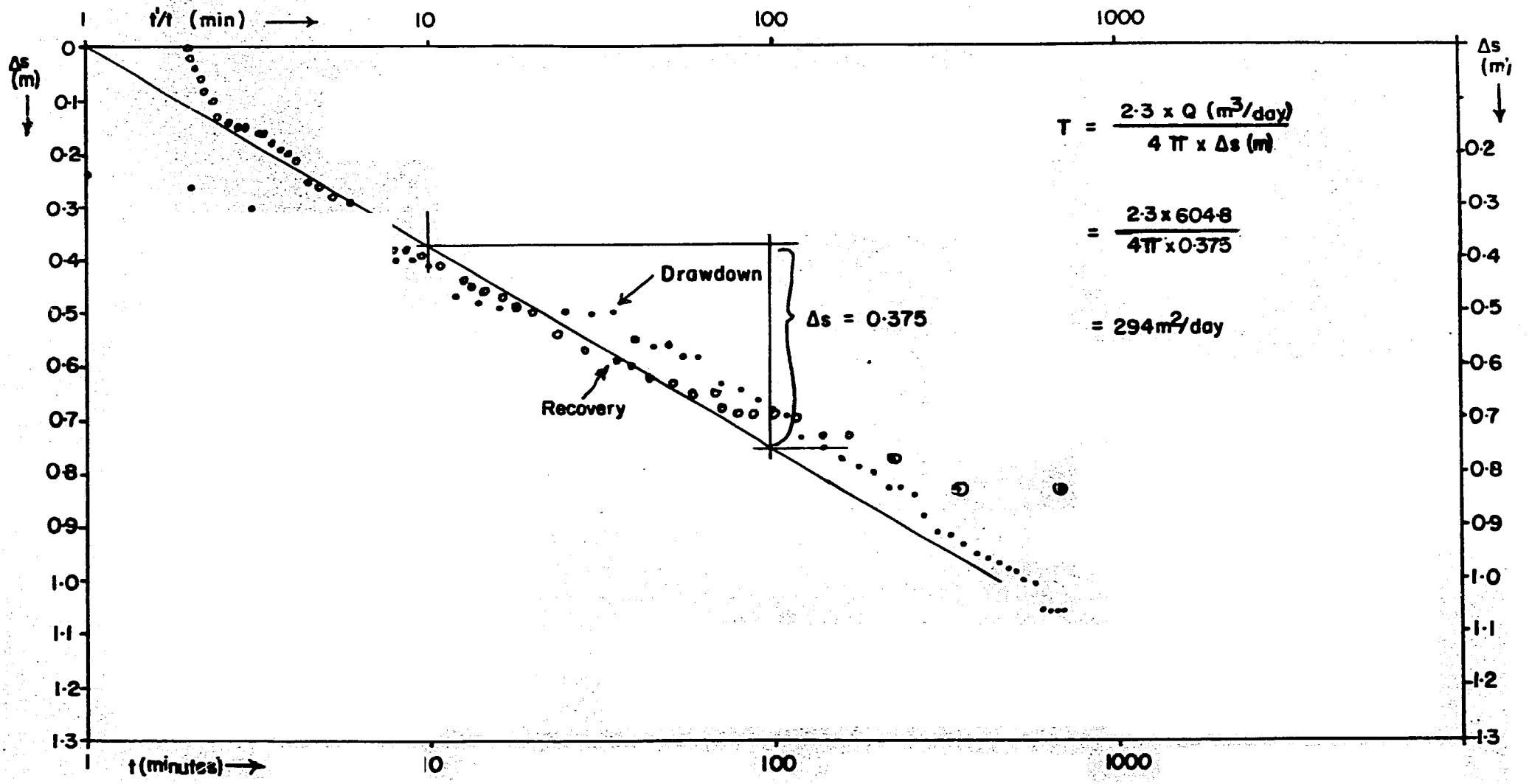
Awshini well # 47



Mintaan well # 51

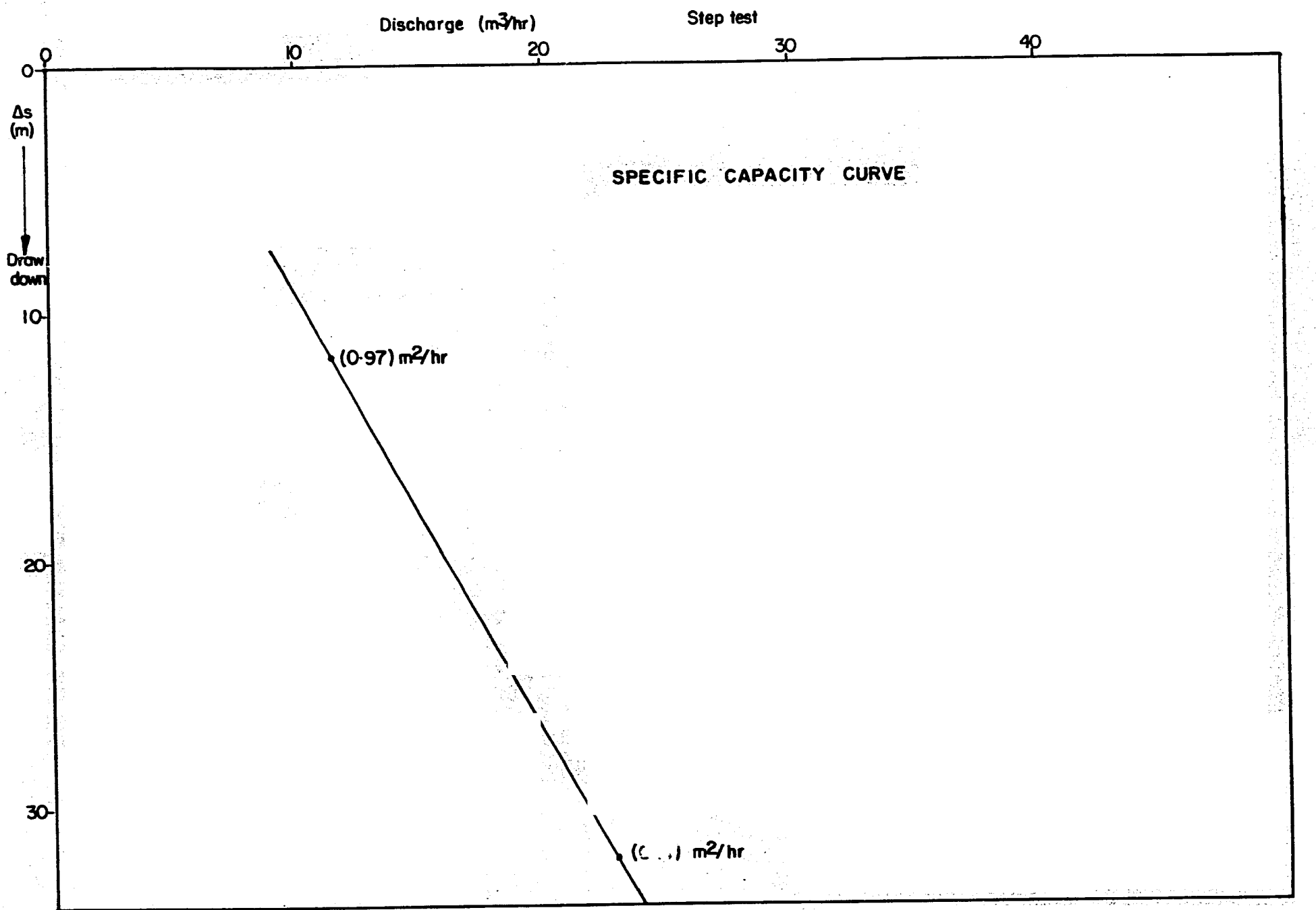


Mintaan well # 51

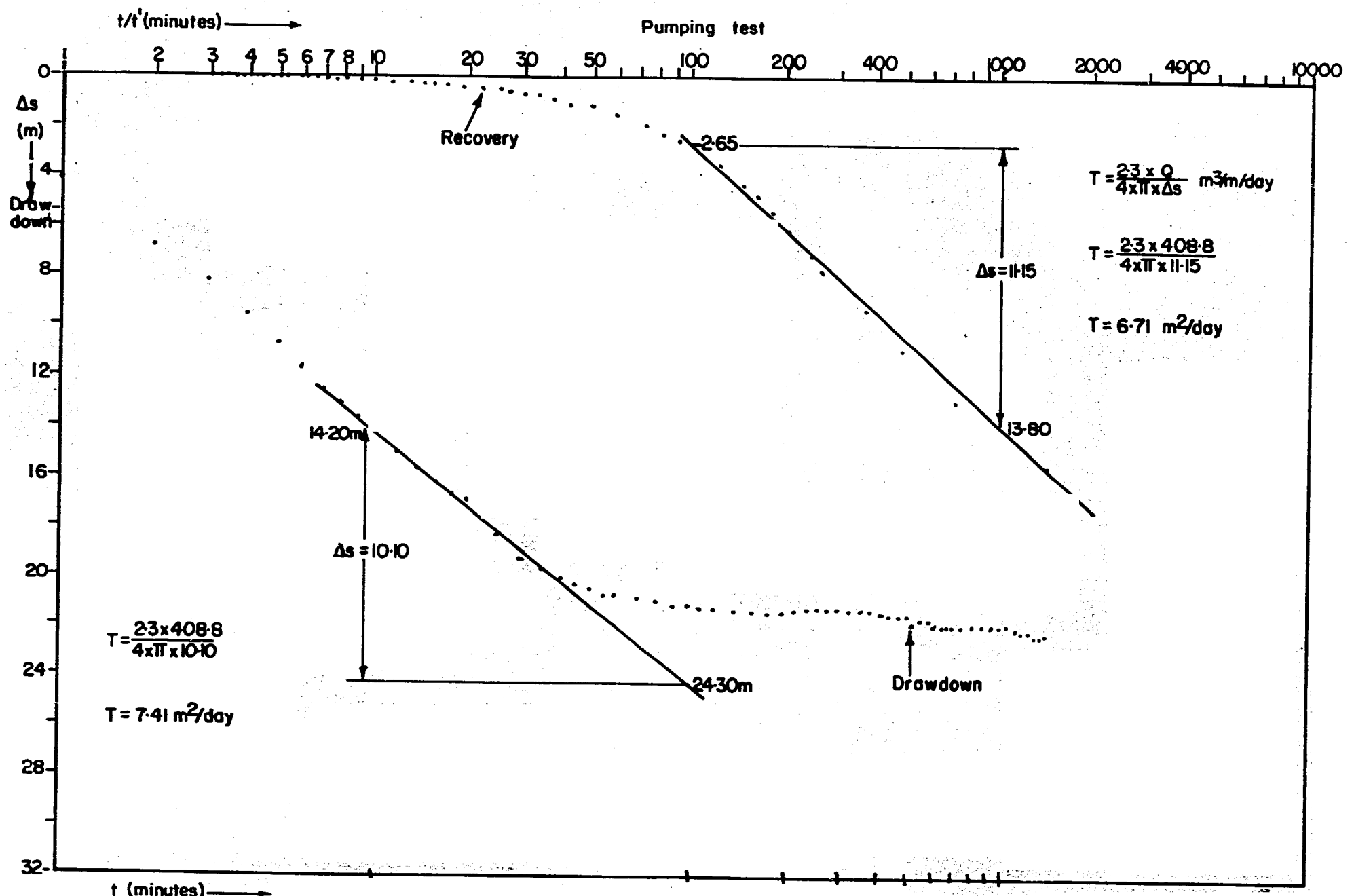


Drawdown and Recovery

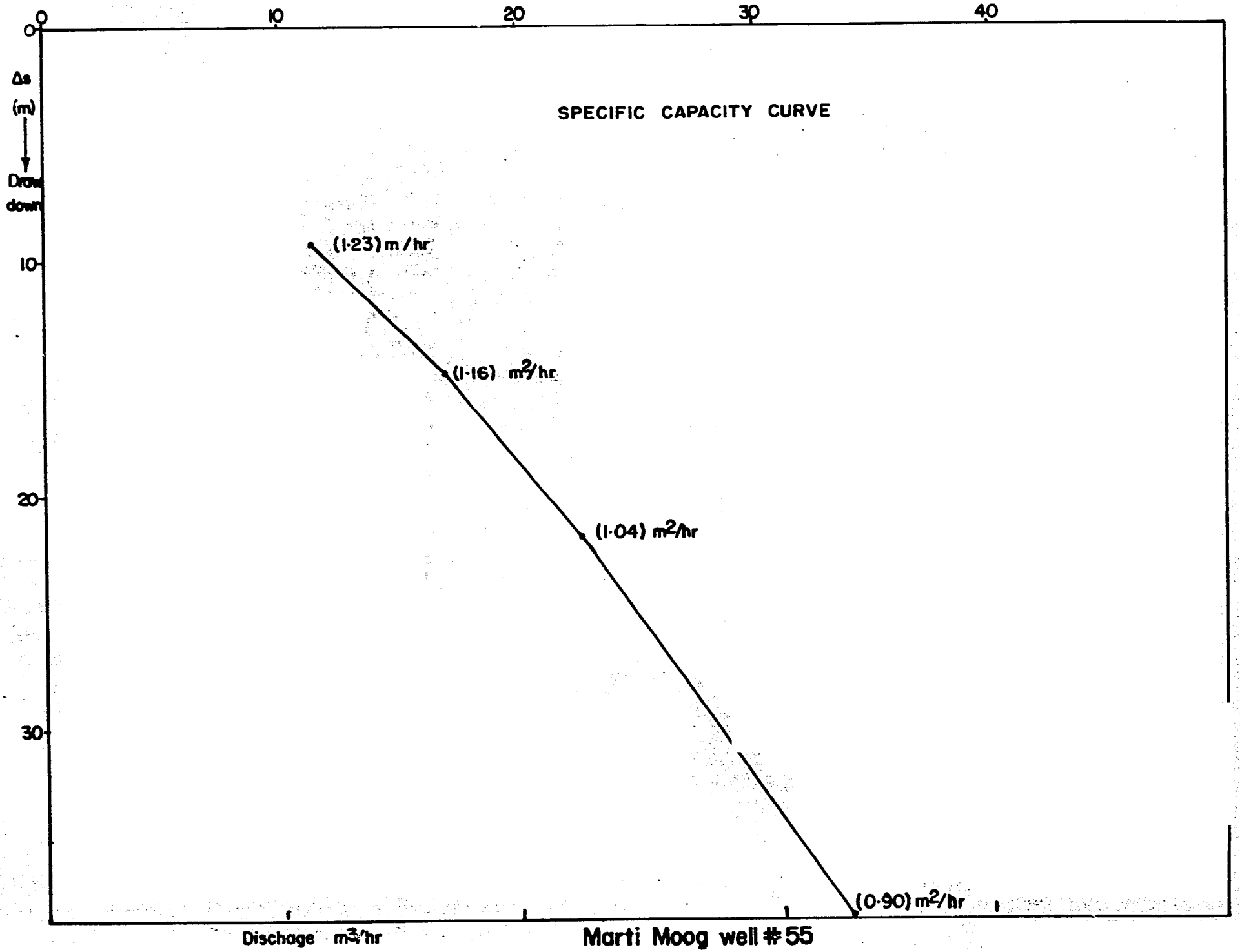
Maleel well # 52



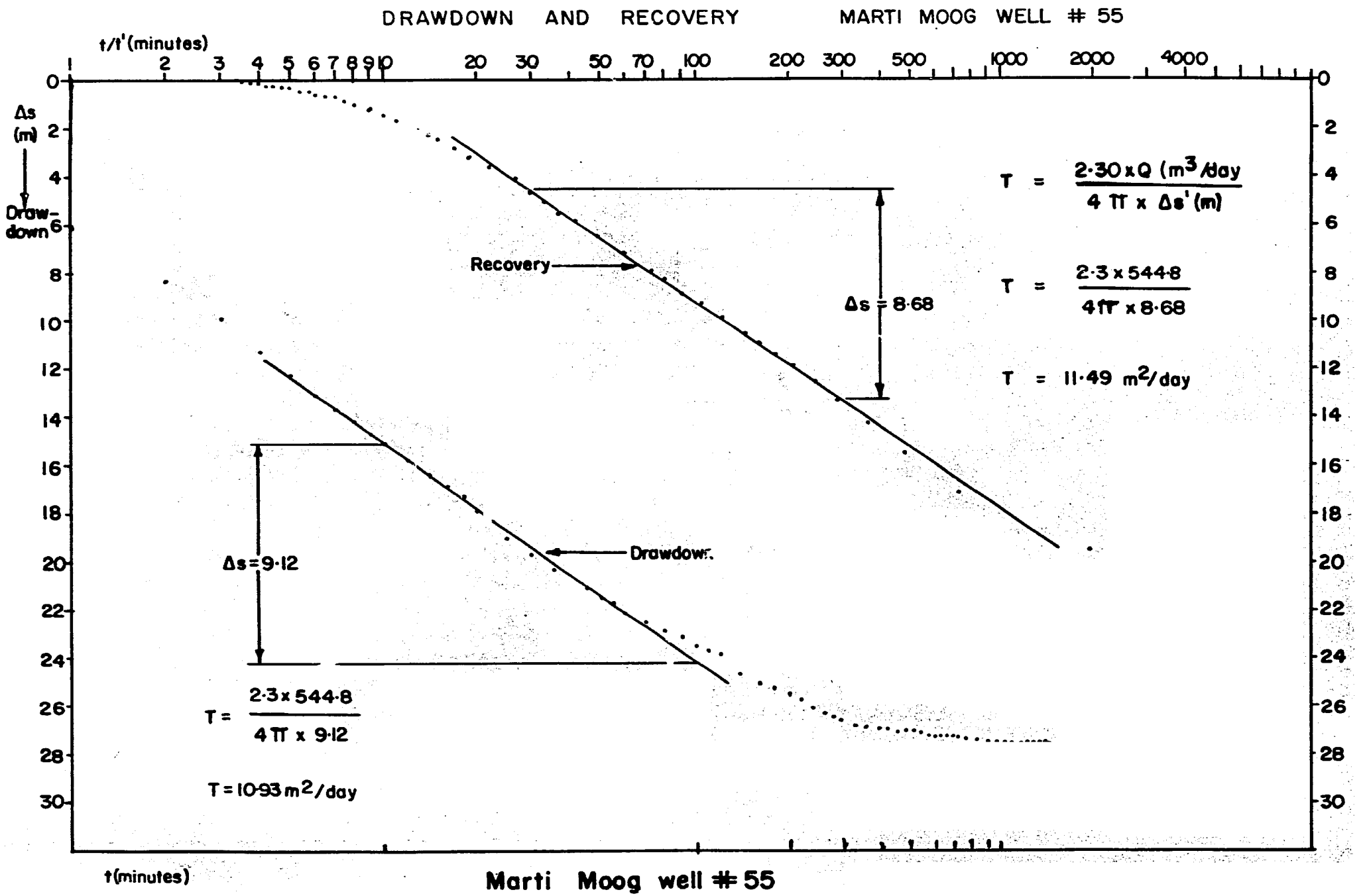
Isgeed well # 54



Isgeed well #54



Marti Moog well #55


DRAWDOWN AND RECOVERY MARTI MOOG WELL # 55
t/t' (minutes)
Δs (m)
Draw-down
Recovery
Drawdown
Δs = 8·68
Δs = 9·12
T = 2·30 x Q (m³/day) / 4 π x Δs' (m)
T = 2·3 x 544·8 / 4π x 8·68
T = 11·49 m²/day
T = 2·3 x 544·8 / 4 π x 9·12
T = 10·93 m²/day
t (minutes)
Marti Moog well # 55

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A5 WATER QUALITY DATA

Table A5.1

WATER QUALITY IN BAY REGION

LBI No.	UN No.	Idro-tech No.	WDA No.	Location	Sampling Date	Long	Lat.	pH	EC 10^6	TDS	Total Hardness as $CaCO_3$	Ca	Mg	Na	K	Tot Fe	NH_4-N	Cl	SO_4	HCO_3	F	NO_3-N	SiO_2	Remarks
										mg/l														
		79		EGHERTA	20/2/76	43°10'30"	2°05'30"	7.0	53,100	38,868	7,000	873	1,172	11,100	50.0			21,203	1,500	146				Spring
	1042			EGHERTA	11/9/70			6.8	2,850	1,782	800	128	117					852	97	830				Spring
		80		MALABLE	20/2/76	43°03'30"	2°07'00"	7.0	961	502	480	60	32	94	13.2			53	0	476				Hand dug well
	1256			MALABLE	11/4/70			7.0	1,825	1,674	760	96	126					483	79	878				Hand dug well
		81		DINSOR	21/2/76	42°59'00"	2°26'00"	7.5	8,150	4,802	540	32	112	1,475	5.4			1,996	410	909				Hand dug well
		82		DINSOR	21/2/76			7.3	2,150	1,436	350	48	56	355	1.9			238	81	720				Hand dug well
		83		DINSOR	21/2/76			7.4	16,000	9,850	1,390	60	301	2,900	46.0			4,725	575	732				Hand dug well
		84		DINSOR	21/2/76			7.2	6,433	4,022	690	72	124	1,100	3.3			1,386	362	525				Hand dug well
	1119			DINSOR	12/9/70			6.4	7,400	5,160	2,000	400	243					2,158	412	976				
508				DINSOR	9/3/82			6.9	20,000	-	182	20	32	18	5.0	0.08	0.03	3,600	994	1,208				
		65		DEYMUNAY	18/2/76	43°47'40"	3°02'25"	8.2	1,900	1,292	130	12	24	400	3.5			89	92	976				5 hand dug wells in cluster
				DEYMUNAY	12/4/82			7.2	2,300		510	99	64	264	12.0	0.04	0.01	412	132	518		14		Drilled well
				DEYMUNAY	29/6/82			7.7	2,000	1,600	440	74	62	5	9.0	0.0	0.033	410	84	546	1.1		36	Drilled well
	1110			DEYMUNAY	26/3/70			7.4	779	676	300	72	29					50	41	329				Hand dug well
		91		KURINGIS	22/2/76			6.5	2,850	1,878	860	253	56	260	3.5			620	67	370				5 Hand dug wells in cluster
		93		ASHARO	22/2/76			6.6	1,900	1,306	540	139	48	205	4.3			347	96	318				3 Hand dug wells in cluster
		94		EL BISSGH ADDE	23/2/76	43°46'30"	2°27'50"	8.2	3,700	2,318	140	8	5	870	6.8			386	170	1,464				30 Hand dug wells in cluster
	1148			EL BISSGH ADDE	28/3/70			7.5	1,760	894	280	48	39					42.6	70	769				
		95		SOUTH BAIDOA	1/3/76	43°39'00"	3°07'00"	7.4	1,350	1,140	510	116	55	104	4.2			209	110	342				Hand dug well
		96		SOUTH BAIDOA	1/3/76			7.4	1,700	1,084	480	142	30	135	3.2			273	93	305				Hand dug well
		97		SOUTH BAIDOA	1/3/76			-	2,050	1,364	540	154	36	279	2.6			395	97	310				Hand dug well
	1250			MADAGOI	11/9/70	43°07'30"	1°59'20"	6.6	3,600	2,498	1,000	176	136					1,193	96	586				Hand dug well
	1213			ELTUR	27/3/70	43°56'00"	2°56'00"	7.8	1,300	1,092	680	120	44					57	482	183				Hand dug well
		34		MAHABOI	8/2/76	43°38'20"	2°29'00"	7.2	2,100	1,316	450	80	61	256	16.0			259	150	573				15 Hand dug wells in cluster
		35		BUDDO	9/2/76	43°44'10"	2°35'45"	7.2	5,200	3,060	460	44	85		17.0			1,074	225	732				20 Hand dug wells in cluster
	1140	37		EL ADDE	9/2/76	43°42'00"	2°40'00"	7.1	8,500	5,532	1,930	228	331	1,130	27.0			2,159	450	610				2 Hand dug wells in cluster
		31		EL AVEDO	7/2/76	43°49'00"	2°31'20"	7.3	6,200	4,122	1,670	228	267	595	25.0			1,549	275	598				8 Hand dug wells in cluster
	1167			EL AVEDO	28/3/70			7.5	3,625	2,428	980	128	160	-	-			231	165	634				8 Hand dug wells in cluster
		32		DODOLE	8/2/76	43°34'20"	2°19'20"	7.3	870	450	410	88	46	27	11.0			11	14	500				Hand dug wells
	1120			DODOLE	8/3/70			7.6	776	768	280	72	24	-	-			21	45	500				8 in cluster
		33		BUR ZIAVE	8/7/71	43°32'00"	2°17'00"		630	664	50	16	2	104	6.9			39	45	238				Hand dug well
509				KOORAAR	15/8/82	43°07/30"	3°12'00"	7.2	4,000	3,620	1,430	317	155	25	19.0	<0.01	<0.01	1,197	112	572	0.65		34	Hand dug well

Table A5.1 (Cont.)

LBI No.	UN No.	Idro-tech No.	WDA No.	Location	Sampling Date	Long	Lat.	pH	EC x 10^6	TDS (mg/l)	Total Hardness as $CaCO_3$ (mg/l)	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	K (mg/l)	Tot Fe (mg/l)	NH_4^- N (mg/l)	Cl (mg/l)	SO_4 (mg/l)	HCO_3 (mg/l)	F (mg/l)	NO_3^- N (mg/l)	SiO_2 (mg/l)	Remarks
	?	38		EL HAVO DASILO	9/2/76	-	-	7.1	2,750	1,546	620	104	88	330	11.0			493	85	476				13 Hand dug wells in cluster
		39		MANSUR	9/2/76	43°42'30"	2°41'30"	7.8	3,650	1,844	170	20	29	750	20.0			578	200	805				Hand dug wells
	1,170	40		FARALE	9/2/76	43°45'20"	2°42'25"	7.2	3,450	2,012	440	56	73	480	30.0			691	135	586				5 Hand dug wells in cluster
	1,170			FARALE	11/8/82			7.05	2,900	1,756	510	51	93	625	19.0			642	116	930	2.4			
	1,223	41		GARAS GOT	9/2/76	43°51'00'	2°42'40"	7.2	4,650	2,844	660	60	124	775	19.4			897	265	793				11 Hand dug wells in cluster
	1,223			GARAS GOT	11/8/82			7.0	3,600	2,000	770	112	120	625	33.0			868	176	691				
	1,082	42		BUR DUR	10/2/76	43°32'00"	2°33'30"	6.6	510	428	140	36	12	19.5	15.6			32	40	155				Hand dug wells
	1,093	43		BUR GALAAN	10/2/76	43°26'30"	2°34'00"	6.6	2,150	1,366	150	28	19	310	85.0			358	212.5	220				
	1,089	44		BUR DEDDANE	11/2/76	43°24'00"	2°06'00"		950	622	290	52	39	46	51.0			53	62.5	390				
		46		NIP KASAR	11/2/76	43°24'00"	2°11'00"	7.0	38,000	29,836	3,870	613	569	6,900	35.0			13,970	395	610				
	1,095	47		BUR GOSSIA	11/2/76	43°25'50"	2°11'50"	4.1	1,950	1,390	260	40	39	224	41.0			329	168	31				
		49		EL GIFELE	12/2/76	43°27'10"	2°39'40"	7.2	6,850	4,174	1,320	132	241	1,000	23.0			1,670	425	622				Hand dug wells in cluster
	1,094			EL GIFELE	24/3/70			6.9	8,580	4,128	840	104	141	-	-			252	1,222	488				
		49B		EL GIFELE	12/2/76					2,374	790	96	134	540	18.4			798	225	561				
		50		MANAS	12/2/76	43°28'00"	2°53'30"	6.7	6,300	3,772	1,480	396	119	370	5.7			1,698	155	464				Spring
	1,049			MANAS	23/3/70			7.6	4,825	2,672	900	344	9.7	-	-			430.3	54	293				Spring
		3		ALIO GHELLE	6/2/76	43°42'00"	2°29'30"	8.6	3,190	1,768	110	8	22	590	60.0			401	350	683				Drilled well
	1,066			ALIO GHELLE	28/3/70			7.6	44,850	35,816	3,650	112	807	-	-			1,810	2,049	512				Hand dug wells
		8		ALIO GHELLE	6/2/76			9.9	1,000	522	-	-	-	131	57.3			156	60	98				Drilled well
		9		ALIO GHELLE	6/2/76			9.0	1,300	692	90	8	17	176	60.0			252	10	293				Drilled well
		10		ALIO GHELLE	6/2/76			10.8	710	330	-	-	-	74	34.0			53	27.5	146				Drilled well
		25		MISSARE	7/2/76	43°55'50"	2°35'30"	6.9	4,250	2,946	1,090	160	168	462	19.5			854	263	451				11 Hand dug wells in cluster
	1,204			MISSARE	28/3/70			7.6	2,045	2,524	480	136	34	-	-			369	696	622				11 Hand dug wells in cluster
				MISSARE	11/8/82			6.7	3,400	2,592	890	157	122	625	19.0			885	216	551	3.0			11 Hand dug wells in cluster
507				CORRON BORREI	20/8/82	44°05'00"	2°42'50"	7.2	6,000	6,620	2,810	551	349	500	23.0			2,056	221	704	0.30		46	Hand dug wells
		26		CORRON BORREI	7/2/76	-		7.6	9,200	7,460	3,230	513	474	695	30.0			2,655	180	720				5 Hand dug wells in cluster
	1,101			CORRON BORREI	28/3/70			7.6	5,960	3,584	1,980	360	262	-	-			1,569	332	439				5 Hand dug wells in cluster
		27		BUR AKABA	7/2/76	44°05'00"	2°48'00"	-	-	1,340	520	120	55	189	3.4			209	262	293				5 Hand dug wells in cluster
		28		BUR AKABA	7/2/76			-	-	560	320	84	27	47	20.0			32	30	414				5 Hand dug wells in cluster
		29B		BUR AKABA	7/2/76			7.3	6,300	4,716	1,210	244	146	820	2.3			727	699	620				5 Hand dug wells in cluster
		30		BUR AKABA	7/2/76			7.5	8,100	5,838	940	272	63	1,135	7.4			1,231	805	355				Drilled well
				BUR AKABA	29/6/82			7.3	900	676	350	103	23	65	29.0			51	32	540				Hand dug well

Table A5.1 (Cont.)

LBI No.	UN No.	Idro-tech No.	WDA No.	Location	Sampling Date	Long	Lat	pH	EC x 10^6	TDS	Total Hardness as $CaCO_3$	Ca	Mg	Na	K	Tot Fe	NH_4^- N	Cl	SO_4	HCO_3	F	NO_3^- N	SiO_2	Remarks
20				DUREI AL GELLE	7/10/82	42°56'15"	2°52'30"	7.2	1,900	2,072	1,093	192	149	125	25	0.20	-	400	440	433	0.33		46	Drilled well
11				BAIDOA AID COMPOUND	11/10/82	42°39'00"	3°07'00"	7.0	1,350	1,280	581	198	24	82	17	0.32	<0.01	329	103	239	0.14		6	Drilled well
4				TUGEREW	4/8/82	43°44'00"	3°01'00"	7.3	1,100	868	472	138	31	58	5	0.88	-	243	31	488	0.20		17	Drilled well
	1,049	51		MANAS	12/2/76	43°28'00"	2°53'30"	-	7,500	4,950	1,620	444	124	840	5.5	-	-	2,102	175	293				Spring well
				MANAS	13/4/82			5.5	10,000		1,793	512	125	280	7	0	-	2,770	249	470	-	16		Spring well
				MANAS	13/4/82			6.9	9,000		1,798	519	122	141	7	0.04	0.05	2,600	253	457	-	14		Spring well
		52		HOYAME	12/2/76	43°38'30"	2°43'00"	-	7,500	4,662	1,750	176	318	850	27			2,003	275	537				3 Hand dug wells in cluster
		53		DA, FAD FJRUDKA	12/2/76	43°37'40"	2°41'35"	-	4,700	2,830	200	48	19	960	7.6			932	154	1,025				Hand dug well
		54		REIDABO	13/2/76	43°54'10"	2°52'50"	7.8	4,100	2,600	320	28	61	700	5			578	325	659				Hand dug well
		55		REIDABO	13/2/76			7.3	1,800	1,082	650	100	97	101	8.5			287	36	476				Hand dug well
		56		MENIN CORON HOSOW	13/2/76	43°53'10"	2°51'10"	7.1	9,550	7,588	3,260	521	476	1,200	29			3,360	520	561				Hand dug well
		57		DDI GAB	13/2/76	43°48'30"	2°54'10"	7.7	2,350	1,542	80	120	122	150	12			365	145	420				Hand dug well
		58		ALIO DOIA	13/2/76	43°46'30	2°55'00"	7.8	7,350	4,274	190	28	29	1,575	7.4			1,365	825	695				Hand dug well
		59		BORAMA	13/2/76	43°42'10"	2°55'40"	7.0	7,800	5,046	1,720	284	246	1,095	8.6			2,201	280	476				Hand dug well
		60		BORAMA	13/2/76			6.8	4,600	4,550	1,680	284	236	940	5.1			1,719	487	525				Hand dug well
		61		VARABALE	13/2/76	43°48'35"	2°54'50"	7.8	3,950	2,768	1,280	341	105	360	9			1,017	275	415				Hand dug well
	1,293			VARABALE	23/6/70			7.1	3,705	2,780	800	232	53.4					1,015	235	476				Hand dug well
		62		MODO MODE	13/2/76	43°50'30"	3°01'20"	-	6,750	4,998	570	44	112	1,375	8.8			1,443	625	732				Hand dug well
		64		BARADA	17/2/76	43°35'20"	2°31'10"	7.6	3,800	2,302	650	72	114	595	20			776	155	708				Hand dug well
		66		BAGNALE	18/2/76	43°44'50"	2°58'50"	7.2	9,400	6,028	950	164	131	1,720	4.0			2,520	770	573				Hand dug well
		67		NORTH MODO MODE	18/2/76	43°50'30"	3°02'00"	7.2	2,750	1,776	970	145	150	142	7.1			478	155	366				Hand dug well
		68		NORTH MODO MODE	18/2/76			7.0	1,250	946	460	80	63	87	8.9			110	48	439				Hand dug well
		69		BAIDOA	18/2/76	43°39'00"	3°07'00"	7.5	1,900	1,312	480	135	35	258	4.7			340	102	321				Hand dug well
		70		BAIDOA	18/2/76			6.8	2,000	1,352	630	176	46	150	1.0			379	48	329				Spring well
		71		BAIDOA	18/2/76			6.9	2,850	2,016	570	104	75	455	12.1			351	650	390				Drilled well
				BAIDOA	16/6/82			7.5	900	600	345	115	14	625	27.0	0	0.030	118	46	440	1.0	8.0		Spring
		73		BONKA	18/2/76	43°39'00"	3°07'00"	7.2	1,550	842	390	68	53	160	6.7			188	160	366				Drilled well
		75		GARABEDA	18/2/76	43°39'00"	3°07'00"	-	2,000	1,280	640	189	41	205	7.3			309	180	367				Spring
		77		YUBKA	19/2/76	44°00'50"	2°37'30"	7.1	4,850	2,960	1,550	301	194	330	15			1,508	387	366				Hand dug well
	1,131			EL ABAULE	29/3/70	44°02'00"	2°37'00"	7.3	1,425	1,048	140	40	9.7	-	-			85.2	166	476				Hand dug well
		78		YAAO BRAAME	20/2/76	43°13'30"	1°58'00"	7.0	43,400	34,170	6,300	733	1,087	7,650	8.0			15,772	1,950	334				Hand dug well
	1,238			YAAO BRAAME	9/4/70			7.2	34,000	18,840	4,840	640	787	-	-	-	-	8,633	2,569	1,122				Hand dug well

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Table A5.1 (Cont.)

LBI No.	TM No.	Idro-tech No.	WDA No.	Location	Sampling Date	Long	Lat	pH	EC x 10^6	TDS	Total Hardness as $CaCO_3$	Ca	Mg	Na	K	Tot Fe	NH_4-N	Cl	SO_4	HCO_3	F	NO_3-N	SiO_2	Remarks
										mg/l														
			1	GOF GADUUD SHABEELOW	29/6/82	43°29'15"	2°57'20"	7.1	4,700	2,496	788	144	104	500	13	0.64	0.075	1,435	132	515	0.75		8	Drilled well
			1	GOF GADUUD SHABEELOW	8/3/82			6.5	6,000		881	104	151	500	17		0.01	1,620	140	579			7	Drilled well
	240B		1	GOF GADUUD SHABEELOW	23/3/70			7.7	2,940	1,900	500	136	38.8	-	-	-	-	731.3	99.3	427				Drilled well
	232		2	DUSTA	29/6/82	43°20'45"	2°58'10"	7.1	1,700	1,388	615	106	85	90	5	0	0.067	290	52	352	0.17		15	Drilled well
			2	DUSTA	25/1/82			6.6	1,700		900	108	153	95	5	0.01	0.02	302	51	653			16	Drilled well
		89	2	DUSTA	22/2/76			6.6	2,300	1,722	750	140	197	200	6.7			429	87.5	439				Drilled well
			3	WABOORE	7/7/82	43°18'00"	2°53'30"	6.7	1,100	1,132	334	99	21	42	4	0.020		102	59	596			17	Drilled well
				WABOORE	8/3/82			7.0	900		370	112	22	40	4	0.06	0.01	119	19	610			14	Drilled well
	240A		4	XAWAL BARBAAR	29/6/82	42°09'00"	2°44'30"	7.0	3,900	3,644	1,272	244	161	125	2	0	0.050	991	92	377	0.38		18	Drilled well
				XAWAL BARBAAR	16/2/82			7.2	5,000		1,592	237	243	130	2	0.26	0.04	1,108	118	500		40	32	Drilled well
		87		XAWAL BARBAAR	22/2/76			7.6	3,000	2,162	820	132	119	285	2.6			663	48	450				Drilled well
	234		5	KOR UNBOD	29/6/82	43°04'30"	2°48'30"	6.9	2,700	2,776	856	186	95	125	2	0	0.048	615	93	453	0.28		19	Drilled well
				KOR UNBOD	26/1/82			7.0	3,800		1,216	215	165	90	3	0.53	0.10	737	96	579		23	34	Drilled well
	233		6	LOMRAAR	29/6/82	43°03'50"	2°49'40"	7.2	3,400	3,384	1,159	365	187	125	16	0	0.075	495	956	390	0.24		15	Drilled well
				LOMRAAR	26/1/82			7.0	4,000		1,352	449	56	88	15	0.13	0.07	454	1,218	476		23	27	Drilled well
			7	QANSAX DHEERE	29/6/82	43°00'15"	2°52'10"	7.3	1,600	1,492	583	128	64	92	12	0.48	0.067	376	49	427	0.33		12	Drilled well
			7	QANSAX DHEERE	26/1/82			7.3	2,000		730	157	82	40	8	0.53	0.06	333	38	555		6	27	Drilled well
			8	QANSAX DHEERE	29/6/82			7.0	3,300	3,156	1,032	311	62	250	4	0.4	0.06	820	112	301	-		13	Drilled well
			8	QANSAX DHEERE	26/1/82			6.9	4,000		1,153	343	72	105	2	0.33	0.06	808	106	476		27	26	Drilled well
	251		9	UFUROW	6/7/82	42°53'15"	2°45'32'	7.6	1,950	1,984	807	170	93	112	9	0.2	0.067	359	272	466	-		29	Drilled well
			9	UFUROW	26/1/82			6.8	2,200		867	151	119	55	9		0.04	347	295	451		3	33	Drilled well
			10	UFUROW	6/7/82			7.7	1,850	2,184	919	170	120	125	10	0.6	0.07	410	334	188	-		2	Drilled well
			10	UFUROW	26/1/82			7.1	2,500		968	160	138	60	10		0.05	496	395	427			28	Drilled well
	252		11	MISRA	8/3/82	43°05'00"	2°34'50"	6.6	900		461	132	32	50	3	0.01	0.01	165	48	531			24	Drilled well
		85	11	MISRA	21/2/76			6.8	1,250	808	370	108	24	72	3.9			135	35	285				Drilled well
			12	XAAFATO	12/7/82	42°47'20"	2°23'25"	6.7	5,000	3,352	195	86	11	12	13	0.4	-	1,683	153	421	1.1		2	Drilled well
			13	XABIBIYAAL	9/3/82	42°39'40"	2°21'00"	7.3	6,500		1,329	120	250	425	3	0.01	0.02	1,299	249	671			25	Drilled well
	253		14	AUDENLE	29/6/82	43°24'30"	3°10'20"	6.7	3,900	3,564	2,070	285	330	125	8	0	0.04	1,059	140	465	0.32		16	Drilled well
			14	AUDENLE	10/3/82				3,900						Sample Lost									Drilled well
			15	TOSMEYNE	6/7/82	43°12'30"	3°06'20"	7.6	1,600	1,544	768	192	70	70	8	0	0.050	239	53	628	-		41	Drilled well
			15	TOSMEYNE	10/3/82			7.0	1,600		831	92	146	70	6		0.01	238	70	653			24	Drilled well
			16	TOSMEYNE	6/7/82			7.5	2,550	2,904	1,578	338	148	102	10	0	0.050	222	1,052	503	0.38		36	Drilled well

Table A5.1 (Cont.)

LBI No.	UN No.	Idro-tech No.	WDA No.	Location	Sampling Date	Long	Lat	pH	EC x 10^6	TDS	Total Hardness as $CaCO_3$	Ca	Mg	Na	K	Tot Fe	NH_4^- N	Cl	SO_4	HCO_3	F	NO_3^- N	SiO_2	Remarks
			17	QANSAX OMANE	27/1/82	43°02'20"	3°20'50"	7.2	27,000		5,402	552	977	18	5			8,190	288	500			18	Dug well
			18	GOF GADUUD BUURAY	28/6/82	43°28'20"	3°18'50"	6.8	2,400	2,628	1,026	230	109	113	4	0.64	0.05	581	82	427	-		11	Dug well
				GOF GADUUD BUURAY	27/1/82			6.9	2,600		928	164	126	50	5		0.02	496	86	451		15	22	Dug well
	236		19	BARABARAY	29/6/82	43°44'10"	3°25'25"	7.6	2,400	2,568	1,193	285	117	102	1			683	61	622	0.19		27	Dug well
				BARABARAY	12/4/82			6.7	2,500		1,357	288	155	342	1			456	111	244		31		Dug well
			20	SAYDHELOW	28/6/82	43°40'5"	3°21'35"	6.6	1,000	872	544	137	49	40	1	0.4	0.03	111	25	615	-		10	Dug well
				SAYDHELOW	26/1/82			6.8	1,200		335	93	25	20	0.07	0.33	0.03	106	3	579		3	18	Dug well
	228			SAYDHELOW	14/3/70			-	751	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Dug well
	571		21	LABATAN JIROW	28/6/82	43°45'30"	3°32'15"	6.6	1,000	956	566	141	52	30	2	0.2	0.05	120	18	641	-	-	-	Dug well
		a2		BAIDOA	22/2/76			6.7	2,400	1,588	690	212	39	240	3.9			429	370	329				Spring well
				BAIDOA	16/6/82			7.5	900	2,016	345	115	14	625	27	0	0.030	118	46	440	1.0		8	Spring well
	1,141	88		EL DAI	22/2/76	43°17'50"	2°46'20"	6.9	3,100	1,984	700	208	44	370	1.1			684	100	378				Hand dug well
501				BARDAALE	16/6/82	43°12'00"	3°12'40"	7.4	2,750	2,292	864	275	43	112.5	2.5	0	0.02	692	86	565	0.93		13	Spring well
15				QUANSAX OMANE	16/6/82	43°00'30'	3°19'55"	8.0	24,000	16,436	5,461	856	1,158	250	105	0	0.05	8,740	362	1,194	1.2		14	Dug well
13				SHABEELE DUGSILO	26/6/82	43°13'00"	3°17'15"	6.8	24,000	19,772	12,210	2,761	1,291	250	34	0	0.04	9,618	284	354	0.36		12	Dug well
10				SARMAN DHERE	29/6/82	43°21'15"	3°17'35"	7.1	24,000	3,004	1,071	269	97	102	0	0	0.05	649	47	509	0.16		31	Dug well
502				HONBEEGAY	7/7/82	43°04'30"	2°44'00"	7.3	6,500	7,812	2,193	324	336	625	14	0.2	0.06	2,307	225	666	0.61		20	Hand dug well
	1,038			DALANDOLE	28/3/70	44°07'50"	3°17'15"	6.8	566	416	280	-	-	-	-	-	-	-	-	-	-			Spring well
				DALANDOLE	4/8/82			7.2	800	444	1,610	414	140	23	0.4			87	14	553	0.10		14	Spring well
	1,058			WANAY	25/3/70	43°46'50"	3°10'20"	7.0	973	628	360	96	29.1	-	-			191.7	59.2	280				Spring well
	1,056			SUS	28/3/70	44°09'40"	3°15'40"	6.7	875	1,236	360	96	29.1	-	-			170.4	781	683.2				Spring well
	1,054			SIGLO	29/3/70	44°18'30"	3°15'20"	6.5	1,515	1,496	480	178	16	-	-			284	101.2	781				Spring well
	1,029			AVER	25/3/70	43°48'00"	3°14'00"	7.1	587	550	220	56	19.4	-	-			113.6	119.3	213.6				Spring well
	1,043			EL AU VAGHER	25/3/70	43°41'00"	3°09'00"	7.4	769	644	200	64	9.7	-	-			85	395	500				Spring well
	1,030			ISCIA BAIDOA	26/3/70	43°38'00"	3°07'00"	7.1	1,374	1,050	420	96	44	-	-			319.5	102	463.6				Spring well
	1,051			NAHA	13/7/82	43°[illegible]2'00"	3°15'00"	6.7	580	384	325	99	19	20	2	0.28	-	347	2	377	-	-		Spring well
503				CEEL DOON	13/7/82	43°41'40"	3°13'20"	7.3	900	932	405	121	25	35	5	0.2	-	130	12	553	0.45		15	Hand dug well
	1,039			DELEB	2/8/82	44°50'55"	3°13'20"	7.4	850	592	439	138	23	42	4	0	-	104	24	515	0.13		12	Spring well
	1,055			SURMEYN	10/8/82	43°53'40"	3°13'20"	7.6	800	524	527	173	23	25	1	0	-	121	6	478	-		11	Spring well
504				KUDA BARKOY	16/8/82	43°53'00"	3°15'00"	7.5	700	584	470	147	25	22	2	0	-	87	10	478	-		13	Spring well
505				ABAMEYSA	4/8/82	44°02'00"	3°24'00"	8.5	1,000	548		90	35	25	34	0.68	-	87	6	653	0.07		20	Spring well
506				BAABUR	2/8/82	44°50'30"	3°13'20"	7.6	700	412	351	106	21	30	2	0	-	113	18	390	0.14		19	Spring well

Table A5.1 (Cont.)

LBI No.	UN No.	Idro-tech No.	WEA No.	Location	Sampling Date	Long	Lat	pH	EC x 10^6	TDS	Total Hardness as $CaCO_3$	Ca	Mg	Na	K	Tot Fe	NH_4-N	Cl	SO_4	HCO_3	F	NO_3-N	SiO_2	Remarks
										mg/l														
				'AAQ BRAAME	9/4/70	43°13'30"	1°58'00"	6.7	6,010	4,406	1,160	160	185	-	-			2,059	252	830				Hand dug well
510				BUR AKABA	12/4/82	44°05'00"	2°48'00"	7.1	800	-	370	106	25	146	35			59	646	604		6		Hand dug well
511				CEEL-DHEER	15/8/82	43°04'30"	3°17'20"	7.2	4,100	3,968	1,559	288	204	625	33	<0.01	<0.01	1,214	157	867	0.50		33	Hand dug well
512				WADI	31/8/82	43°10'10"	2°04'20"	7.2	42,000	-	9,862	1,103	1,726	130	36	0.28	<0.01	19,600	1,581	201	0.19		0.6	Hand dug well
513				ADEEGOW	8/9/82	43°24'00"	3°25'20"	-	-	5,756	-	-	-	-	-	-	-	2,620	326	251	-		-	Hand dug well
2				BUULO GADUUD	6/9/82	42°37'40"	2°08'30"	7.0	5,500	4,696	1,793	484	142	23	4	0.32	<0.01	1,978	151	553	0.33			Hand dug well
21				BONKAY	12/4/82	43°39'00"	3°07'00"	7.8	2,300		353	77	39	260	16	1.11	0.62	229	648	397				Drilled well
				USAID NO. 1	15/4/83	43°39'00"	3°07'00"	7.5	3,000	1,868		170		77	0.1			105	528	388				Drilled well
				USAID NO. 2	15/1/83			6.8	2,300	2,928		200		8	0.1			341	64	243				Drilled well
522				HEBEEDOW	15/1/83	43°49'00"	2°31'30"	7.1	4,600	2,880		327		13	0.9			721	226	668				Hand dug wells
25				DODOLE	19/1/83	43°34'20"	2°19'20"	7.2	900	660		96	45	0.4				52	36	384				Drilled wells
523				DODOLE	15/1/83			7.2	700	720		106	26	0.2				26	38	303				Hand dug well
26				SHIDAALOW	20/1/83	44°16'00"	2°53'35"	6.8	33,000	32,092		1,918	8	1.6				10,000	1,25	284				Drilled wells
27				SHIDAALOW	21/1/83				28,000															Drilled wells
31				BUR AKABA	2/2/83				49,000															Drilled wells
32				BUR AKABA	2/2/83	44°05'00"	2°48'00"		1,100															Drilled wells
23				KURMAN	24/1/83	42°52'00"	2°29'00"		2,300															Drilled wells

Table A5.1 (Cont.)

LBI No.	UN No.	Idro-tech No.	WDA No.	Location	Sampling Date	Long	Lat	pH	EC x 10^6	TDS	Total Hardness as $CaCO_3$	Ca	Mg	Na	K	Cl	SO_4	HCO_3	F	Remarks
										mg/l										
	1049			MANAAS	4/12/83	43°28'00"	2°53'50"	7.3	9,600	7,795	2,530	680	202	1,057	5	3,191	284	531		Spring
529				LAHALEY I	4/4/84	43°56'50"	2°56'00"	7.9	1,200	1,044	310	83	25	88	4	252	115	189		Wadi
530				LAHALEY II	4/4/84	43°56'50"	2°56'00"	7.9	1,500	1,288	378	26	76	156	2	448	98	178		Wadi
531				ISHA SIGLE	22/3/84	43°18'56"	3°15'25"	8.0	1,120	1,060	401	93	41	94	2	308	43	241		Hand dug well
532				MANSHUR	5/3/84	40°42'58"	2°41'78"	8.0	2,100	1,600	363	45	62	230	16	336	140	441		Hand dug well
533				KURROW	8/3/81	44°00'17"	2°42'83"	8.1	4,050	4,136	1,491	292	185	230	16	1,092	190	199		Hand dug well
524				BAIDOA	31/10/83	43°39'00"	3°07'00"	7.1	3,040	2,650	890	279	47	154	1	850	78	318		Spring
525				BAIDOA WELLS	31/10/83	43°39'00"	3°07'00"	7.1	3,090	2,615	865	269	47	200	0.4	957	98	265		Composite Sample
			14	AWDINLE	1/11/83	43°24'50"	3°10'33"	7.5	3,900	3,300	1,041	234	111	304	3	1,064	195	201		Drilled Well
526				BERDAALE	1/11/83	43°12'00"	3°13'00"	7.2	3,140	2,775	1,203	289	117	146	3	957	83	289		Hand dug
527				BUR AKABA MOSQUE	3/11/84	44°05'00"	2°05'00"	7.5	6,870	6,085	1,314	269	156	857	19	993	830	530		Hand dug
528				BUR AKABA JIDA WELL	3/11/83	44°05'00"	2°48'00"	7.4	850	600	401	106	33	43	30	85	49	378		Hand dug

Table A5.2

IONIC COMPOSITION OF CGDP WELLS
Upper Line Meg/l, Lower Line %

LBI No.	Name	Date Collected	Ca	Mg	Na	K	Cl	HCO_3	SO_4	Cat	An	%E
2	BONKAY II	12/4/82	3.8	3.2	11.3	0.4	6.5	6.5	13.5	18.7	26.5	17.2
			20.3	17.1	60.4	2.1	24.5	24.5	50.9			
3	BONKAY III	10/9/82	11.4	2.9	5.9	0.1	15.0	7.0	0.3	20.3	22.3	4.7
			56.2	14.3	29.1	0.5	67.3	31.4	1.3			
4	TUGAAREY	4/8/82	6.9	2.6	2.5	0.1	6.8	8.0	0.6	12.1	15.4	12.0
			57.0	21.5	20.7	0.8	44.2	51.9	3.9			
8	TUGAAREY	2/2/84	10.9	3.7	4.3	0.1	13.0	8.8	1.1	19.0	22.9	9.3
			57.4	19.5	22.6	0.5	56.7	38.4	4.8			
8	TUGAAREY	6/2/84	7.8	3.5	4.2	0.2	13.0	8.8	1.2	15.7	23.0	18.8
			49.7	22.2	26.8	1.3	56.5	38.3	5.2			
10	SARMAN DHERE	29/6/84	13.4	8.0	4.4	0.2	18.2	8.3	1.0	26.0	27.5	1.9
			51.4	30.8	16.9	0.8	66.2	30.2	3.6			
10	SARMAN DHERE	29/6/82	13.8	8.8	4.6	0.1	17.8	8.0	1.0	27.3	26.8	0.9
			50.5	32.2	16.8	0.4	66.4	29.9	3.7			
10	SARMAN DHERE	29/6/82	13.6	7.3	4.3	0.1	17.8	7.9	1.1	25.3	26.8	2.9
			53.8	28.9	16.9	0.4	66.4	29.5	4.1			
10	SARMAN DHERE	18/1/84	15.4	11.0	7.2	0.1	29.9	10.2	2.5	33.7	42.6	11.7
			45.7	32.6	2.4	0.3	70.2	23.9	5.9			
11	USAID COMPOUND	15/1/83	8.5	6.1	3.3	0.0	8.6	6.3	2.2	17.9	17.1	23.3
			47.5	34.1	18.4		50.3	36.8	12.9			
12	HAREERO JIFFO	10/9/83	9.6	8.1	7.8	0.4	12.7	10.0	1.9	25.9	24.6	2.6
			37.1	31.3	30.1	1.5	51.6	40.7	7.7			
12	HAREERO JIFFO	10/1/84	10.2	19.0	4.8	0.2	18.0	7.9	4.5	34.2	30.4	5.9
			29.8	55.6	14.0	0.6	59.2	7.9	14.8			
12	HAREERO JIFFO	26/1/84	15.5	15.2	10.0	0.1	38.9	6.1	5.4	40.8	50.4	10.5
			38.0	37.3	24.5	0.2	77.2	12.1	10.7			

Table A5.2 (Cont.)

LBI No.	Name	Date Collected	Ca	Mg	Na	K	Cl	HCO_3	SO_4	Cat	An	%E
13	SHABELLE DUGSILO	26/6/82	138	106	10.9	0.9	271	5.8	5.9	256	283	5.0
			53.9	41.4	4.3	0.4	95.8	2.0	2.1			
14	WARTA JAFFA	10/9/83	29.9	31.4	32.6	0.6	85.2	7.3	2.2	94.5	94.7	0.1
			31.6	33.2	34.5	0.6	90.0	7.7	2.3			
15	QANSAX OMANE	16/6/82	33.4	75.7	10.9	2.7	246	19.6	7.5	123	273	37.8
			27.2	61.5	8.9	2.2	90.1	7.2	2.7			
16	TAFLOW	10/9/83	1.7	6.7	4.3	0.3	7.5	3.8	2.7	13.0	14.0	3.7
			13.0	51.5	33.1	2.3	53.5	27.1	19.3			
16	TAFLOW	25/2/84	10.2	6.8	4.3	0.3	11.0	10.3	2.6	21.6	23.9	5.1
			47.2	31.5	19.9	1.4	46.0	43.1	10.9			
17	ROBEY GADUUD	27/3/84	4.9	1.6	5.4	0.0	10.0	1.7	1.6	11.9	13.3	5.6
			41.2	13.4	45.4	0.0	75.2	12.8	12.0			
17	ROBEY GADUUD	4/11/84	4.6	1.6	4.9	0.1	9.0	1.3	1.5	11.2	11.8	2.6
			41.1	14.3	43.8	0.9	76.3	11.0	12.7			
17	ROBEY GADUUD	4/4/84	6.0	1.2	6.0	0.1	10.0	3.0	1.9	13.3	14.9	5.7
			45.1	9.0	45.1	0.8	67.1	20.1	12.8			
18	GADUUDO DHUNTE	13/3/84	8.3	9.5	6.3	0.0	16.0	6.4	2.1	24.1	24.5	0.8
			34.4	39.4	26.1	0.0	65.3	26.1	8.6			
18	GADUUDO DHUNTE	13/3/84	11.7	11.5	10.9	0.1	32.3	3.4	2.1	34.2	37.8	5.0
			34.2	33.6	31.9	0.3	85.4	9.0	5.6			
18	GADUUDO DHUNTE	13/3/84	11.5	12.2	10.4	0.1	32.3	1.9	4.3	34.2	38.5	5.9
			33.6	35.7	30.4	0.3	83.9	4.9	11.2			
18	GADUUDO DHUNTE	21/3/84	11.3	10.0	8.4	0.1	28.3	2.6	1.6	29.8	32.5	4.3
			37.9	33.6	28.3	0.3	87.0	8.0	4.9			
20	DUUREY CALI GAALE	30/6/83	10.4	8.8	5.2	0.4	22.2	8.0	1.2	24.8	31.4	11.7
			41.9	35.5	21.0	1.6	70.7	25.5	3.8			
20	DUUREY CALI GAALE	7/3/84	4.3	8.0	5.4	0.1	14.0	4.1	2.3	17.8	20.4	6.8
			24.2	44.9	30.3	0.6	68.6	20.1	11.3			
20	DUUREY CALI GAALE	29/4/84	1.7	15.8	5.2	0.2	12.6	7.7	4.2	22.9	24.5	3.4
			7.4	69.0	22.7	0.9	51.4	31.4	17.1			
20	DUUREY CALI GAALE	29/4/84	7.9	8.6	5.0	0.2	12.6	7.0	2.1	21.7	21.7	0.0
			36.4	39.6	23.0	0.9	58.1	32.3	9.7			

Table A5.2 (Cont.)

LBI No.	Name	Date Collected	Ca	Mg	Na	K	Cl	HCO_3	SO_4	Cat	An	%E
21	USAID COMPOUND	15/1/83	9.1	2.9	0.3	0.0	9.6	4.0	1.3	12.3	14.9	9.6
			74.0	23.6	2.4	0.0	64.4	26.8	8.7			
23	KURMAN	24/1/84	3.9	2.2	2.3	0.2	5.3	4.0	0.6	8.6	9.9	7.0
			45.3	25.6	26.7	2.3	53.5	40.4	6.1			
23	KURMAN	29/2/84	7.2	9.3	7.3	0.2	21.3	4.1	2.8	24.0	28.2	8.0
			30.0	38.8	30.4	0.8	75.5	14.5	9.9			
25	DODOLE	19/1/83	4.7	1.6	2.0	0.0	1.5	6.3	0.8	8.3	8.6	1.8
			56.6	19.3	24.1	0.0	17.4	73.3	9.3			
25	DODOLE	30/3/84	3.8	1.4	2.4	0.4	2.4	5.6	1.4	8.0	9.4	8.0
			47.5	17.5	30.0	5.0	25.5	59.6	14.9			
26	SHIDALOW I	20/1/83	95.3	321	35.4	0.0	28.2	4.7	26.0	452	313	18.2
			21.1	71.0	7.8	0.0	90.1	1.5	8.3			
27	SHIDALOW II	10/9/83	4.9	4.1	4.9	1.4	5.9	5.2	2.7	15.3	13.8	5.2
			32.0	26.8	32.0	9.2	42.8	37.7	19.6			
31	BUR ACABA IV	25/1/83										
32	BUR AKABA V	10/9/83	1.6	0.9	4.0	2.2	1.4	3.8	1.8	8.7	7.0	10.8
			18.4	10.3	46.0	25.3	20.0	54.3	25.7			
32	BUR AKABA	29/3/84	2.9	1.2	5.4	2.1	6.3	2.2	1.8	11.6	10.3	5.9
			25.0	10.3	46.7	18.1	61.2	21.4	17.5			
32	BUR AKABA	7/5/84	2.9	1.9	3.0	4.6	4.7	5.0	1.7	12.4	11.4	4.2
			23.4	15.3	24.2	37.1	41.2	43.9	14.9			
41	DOLONDOLE	10/9/83	6.7	3.4	1.3	0.5	2.0	10.4	1.5	11.9	13.9	7.8
			56.3	28.6	10.9	4.2	14.4	74.8	10.8			
42	BUULO FUUR	16/4/84	10.3	4.9	4.6	0.2	9.5	6.0	5.6	20.0	21.1	2.7
			51.5	24.5	23.0	1.0	45.0	28.4	26.5			
42	BUULO FUUR	16/4/84	9.1	7.5	4.6	0.2	8.7	6.2	5.4	21.4	20.3	
			42.5	35.0	21.5	0.9	42.9	30.5	26.6			
42	BUULO FUUR	16/4/84	9.6	8.5	4.6	0.2	11.8	6.9	5.2	22.9	23.9	2.1
			41.9	37.1	20.1	0.9	49.3	28.9	21.8			
42	BUULO FUUR	16/4/84	1.7	15.8	5.2	0.2	12.6	7.7	4.2	22.9	24.5	3.4
			7.4	69.0	22.7	0.9	51.4	31.4	17.1			
45	USAID COMPOUND	14/9/83	5.1	4.3	9.6	0.6	9.5	6.3	9.4	19.6	25.2	12.5
			26.0	21.9	49.0	3.1	37.7	25.0	37.3			

Table A5.2 (Cont.)

LBI No.	Name	Date Collected	Ca	Mg	Na	K	Cl	HCO_3	SO_4	Cat	An	%E
46	ABOREY	15/5/83	12.0	6.3	3.6	0.2	10.8	5.3	1.7	22.1	17.8	10.8
			54.3	28.5	16.3	0.9	60.7	29.8	9.6			
46	ABOREY	19/10/83	9.8	5.7	3.9	0.1	11.0	9.7	1.5	19.5	22.2	6.5
			50.3	29.2	20.0	0.5	49.5	43.7	6.8			
	ABOREY	16/5/84	2.9	8.6	3.5	0.1	8.7	6.2	1.3	15.1	16.2	3.5
			19.2	56.9	23.2	0.7	53.7	38.3	8.0			
47	AW SHIINLE	10/9/83	9.9	10.4	10.9	0.3	16.9	9.7	3.9	31.5	30.5	1.6
			31.4	33.0	34.6	1.0	55.4	31.8	12.8			
47	AW SHIINLE	10/4/84	10.1	9.3	11.2	0.3	24.0	4.8	7.7	30.9	36.5	8.3
			32.7	30.1	36.2	1.0	65.8	13.2	21.1			
47	AW SHIINLE	10/4/84	10.9	5.1	11.2	0.3	23.0	4.0	6.3	27.5	33.3	9.5
			39.6	18.5	40.7	1.1	69.1	12.0	18.9			
47	AW SHIINLE	11/4/84	9.6	8.1	10.9	0.3	23.7	3.3	5.2	28.9	32.2	5.4
			33.2	28.0	37.7	1.0	73.6	10.2	16.1			
50	BONKAY SEED FARM	17/8/83	5.4	8.0	8.7	0.4	7.4	6.0	14.6	22.5	28.0	10.9
			24.0	35.0	38.7	1.8	26.4	21.4	52.1			
50	BONKAY SEED FARM	20/11/83	52.6	21.4	32.1	0.2	113	7.8	4.6	106	125	8.2
			49.5	20.1	30.2	0.2	90.1	6.2	3.7			
51	MINTAAN	20/11/83	9.6	4.2	5.0	0.1	6.0	9.6	1.1	18.9	16.7	6.2
			50.8	22.2	26.5	0.5	35.9	57.5	6.6			
51	MINTAAN	8/2/84	9.7	3.5	2.5	0.3	7.0	11.1	0.8	16.0	18.9	8.3
			60.6	21.9	15.6	1.9	37.0	58.7	4.2			
52	MALEEL	20/11/83	4.5	5.8	1.9	0.1	3.0	8.7	0.8	12.3	12.5	0.8
			36.5	47.2	15.4	0.8	24.0	69.6	6.4			
52	MALEEL	1/3/84	2.2	4.8	4.3	0.1	3.2	4.8	1.4	11.4	9.4	9.6
			19.3	42.1	37.7	0.9	34.0	51.1				
54	ISGEED	28/1/84	7.3	6.1	2.5	0.1	7.5	9.9	1.1	16.0	18.5	7.2
			45.6	38.1	15.6	0.6	40.5	53.5	5.9			

Table A5.2 (Cont

LBI No.	Name	Date Collected	Ca	Mg	Na	K	Cl	HCO_3	SO_4	Cat	An	%E
54	ISGEED	28/1/84	5.4	10.7	2.5	0.1	8.0	10.7	0.8	18.7	19.5	2.1
			28.9	57.2	13.4	0.5	41.0	54.9	4.1			
54	ISGEED	28/1/84	9.1	6.7	3.2	0.1	6.7	8.8	1.1	19.1	16.6	7.0
			47.6	35.1	16.8	0.5	40.4	53.0	6.6			
54	ISGEED	28/1/84	9.3	4.8	2.5	0.1	7.0	11.8	1.1	16.7	19.9	8.7
			55.7	28.7	15.0	0.6	35.2	59.3	5.5			
54	ISGEED	28/1/84	8.9	6.6	2.6	0.1	8.0	10.3	0.8	18.2	19.1	2.4
			48.9	36.3	14.3	0.5	41.9	53.9	4.2			
54	ISGEED	1/3/84	6.2	11.9	4.1	0.1	12.6	4.1	1.3	22.3	18.0	10.7
			27.8	53.4	18.4	0.4	70.0	22.7	7.2			
55	MARTI MOG	22/4/84	8.5	3.3	1.7	0.1	5.0	10.3	0.4	13.6	15.7	7.2
			62.5	24.3	12.5	0.7	31.8	65.6	2.5			
55	MARTI MOG	22/4/84	8.5	4.9	1.7	0.1	5.0	10.3	0.4	15.2	15.7	1.6
			55.9	32.2	11.7	0.7	31.8	65.6	2.5			
55	MARTI MOG	22/4/84	8.3	3.3	1.6	0.1	4.0	9.4	0.4	13.3	13.8	1.8
			62.4	24.8	12.0	0.8	29.0	68.1	2.9			
55	MARTI MOG	27/2/84	7.3	5.0	1.7	0.1	5.0	8.0	0.3	14.1	13.3	2.9
			51.8	35.5	12.1	0.7	37.6	60.2	2.3			
57	XAGARKA	2/3/84	17.0	22.1	36.2	0.5	35.9	2.6	37.8	75.8	76.3	0.3
			22.4	29.2	47.8	0.7	47.1	3.4	49.5			
57	XAGARKA	5/4/84	10.9	4.3	8.4	0.2	15.8	3.6	3.9	23.8	23.3	1.1
			45.8	18.1	35.3	0.8	67.8	15.5	16.7			
59	SHAWKA	4/3/84	21.9	22.7	118	0.4	136	3.0	18.7	163	158	1.6
			13.4	13.9	72.4	0.2	86.1	1.9	11.8			
59	SHAWKA	4/3/84	20.5	22.9	87.0	0.4	134	3.8	16.2	131	154	8.1
			15.6	17.5	66.4	0.3	87.0	2.5	10.5			
62	WAR CASHA	28/4/84	1.3	11.2	1.9	0.1	7.1	6.5	0.9	14.5	14.5	0.0
			9.0	77.2	13.1	0.7	49.0	44.8	6.2			
63	BONKAY SEED FARM	6/5/84	3.0	7.7	9.6	0.3	11.8	5.2	6.8	20.6	23.8	7.2
			14.6	37.4	46.6	1.5	49.6	21.8	28.6			
63	BONKAY SEED FARM	6/5/84	2.2	7.5	9.0	0.3	11.0	6.0	6.6	19.0	23.6	10.8
			11.6	39.5	47.4	1.6	46.6	25.4	28.0			
66	BUULO HAWO	25/2/84	2.9	6.7	3.9	0.3	10.2	3.4	2.6	13.8	16.2	8.0
			21.0	48.6	28.3	2.2	63.0	21.0	16.0			
48	MORI ARIA	4/7/83	11.2	6.4	7.7	0.2	13.7	9.8	5.2	25.5	28.7	5.9
			43.9	25.1	30.2	0.8	47.7	34.1	18.1			

Table A5.2 (Cont.)

Sample No.	Location	Date	Ca	Mg	Na	K	Cl	HCO_3	SO_4	Cat	An	%E
B524	BAIDOA	31/10/83	13.9	3.9	6.7	0.0	23.9	5.2	1.6	24.5	30.7	11.2
			56.7	15.9	27.3	0.0	77.9	16.9	5.2			
B525	BAIDOA WELLS	31/10/83	13.4	3.9	8.7	0.0	27.0	4.3	2.0	26.0	33.3	12.3
			51.5	15.0	33.5	0.0	81.1	12.9	6.0			
W14	AWDIINLE	1/11/83	11.7	9.1	13.2	0.1	30.0	3.3	4.1	34.1	37.4	4.6
			34.3	26.7	38.7	0.3	80.2	8.8	11.0			
B526	BARDALE	1/11/83	14.4	9.6	6.3	0.1	27.0	4.7	1.7	30.4	33.4	4.7
			47.4	31.6	20.7	0.3	80.8	14.1	5.1			
B527	BUR AKABA	3/11/83	13.4	12.8	37.3	0.5	28.0	8.7	17.3	64.0	54.0	8.5
			20.9	20.0	58.3	0.8	51.9	16.1	32.0			
B528	BUR AKABA	3/11/83	5.3	2.7	1.9	0.8	2.4	6.2	1.0	10.7	9.6	5.4
			49.5	25.2	17.8	7.5	25.0	64.6	10.4			
U1099	MANAAS	4/12/83	33.9	16.6	45.9	0.1	90.0	8.7	5.9	96.5	105	4.0
			35.1	17.2	47.6	0.1	86.0	8.3	5.6			
B529	LAHALEY I	4/4/84	4.1	2.1	3.8	0.1	7.1	3.1	2.4	10.1	12.6	11.0
			40.6	20.8	37.6	1.0	56.3	24.6	19.0			
B530	LAHALEY II	4/4/84	1.3	6.3	6.8	0.1	12.6	2.9	2.0	14.5	17.5	9.4
			9.0	43.4	46.9	0.7	72.0	16.6	11.4			
B531	ISHA SIGLE	22/3/84	4.6	3.4	4.1	0.1	8.7	4.0	0.9	12.2	13.6	5.4
			37.7	27.9	33.6	0.8	64.0	29.4	6.6			
B532	MANSUUR	6/3/84	2.2	5.1	10.0	0.4	9.5	7.2	2.9	17.7	19.6	5.1
			12.4	28.8	56.5	2.3	48.5	36.7	14.8			
B533	KURROW BO	8/3/84	14.6	15.2	10.0	0.4	30.8	3.3	4.0	40.2	38.1	2.7
			36.3	37.8	24.9	1.0	80.8	8.7	10.5			

TABLE A 5.3 - WATER QUALITY DATA

CENTRAL RANGELAND, 1970

Id	Location	Long	Lat	Wtype	Date	pH	EC	TDS	TH	Ca	Mg	Na+K	Cl	SO4	HCO3
U705	ABARFI	472800	70400	HDW	100570	•	2625	•	•	•	•	•	•	•	•
U437	ABUDWAG	461800	61200	DW	230570	•	2550	1860	1000	240	97	322	511	211	927
U707	ABUDWAG	461800	61200	HDW	230570	6.3	3540	2268	800	128	116	455	753	421	366
U711	AD	475400	50400	HDW	040570	5.6	2900	1896	200	16	39	610	554	314	512
U425	ADADC	463700	60800	DW	290470	•	4985	•	•	•	•	•	•	•	•
U708	ADADC	463700	60900	HDW	290470	•	1445	1076	800	288	19	21	57	718	24
U718	AMUR	463000	51600	HDW	020570	•	3190	2608	1840	656	49	58	156	1649	29
U952	ARCLE	451700	41600	HDW	110370	•	6515	•	•	•	•	•	•	•	•
U721	ARTUDA	473600	63800	HDW	090570	•	2370	•	•	•	•	•	•	•	•
U726	BADUEN	473000	71000	HDW	080570	6.1	2400	2664	1680	656	10	85	57	1539	213
U727	BAHADC	471500	54600	HDW	300470	6.4	3150	3144	2120	720	78	29	128	1670	317
U412	BALLI BUSLE	480700	70900	DW	120570	6.1	3225	2140	1000	192	126	381	795	447	293
U956	BAR MEDEGHE	450500	43600	HDW	110370	•	2475	•	•	•	•	•	•	•	•
U734	BEIRA	472000	65800	HDW	100570	6.4	2610	2812	1760	672	16	77	57	1502	342
U958	BELET UEN	451300	44400	HDW	120370	•	2254	•	•	•	•	•	•	•	•
U465	BERGIANI	470500	43500	DW	050570	6.3	3850	2568	1080	338	58	368	951	444	98
U960	BERHAMC	451700	43800	HDW	100370	7.4	14400	12640	3820	648	535	2114	2932	3790	451
U961	BILHELLE	460300	42600	HDW	030570	•	3250	1822	1200	368	68	198	838	354	98
U962	BIC CULCUL	452900	31900	HDW	270170	7.0	5430	4528	1620	456	117	581	1179	1151	203
U963	BUGDA ACABLE	451500	40400	HDW	280170	7.6	2450	3900	1880	696	34	513	781	1613	195
U364	BUGDA COSAR	445000	43300	DW	110370	7.3	3120	3312	2080	584	151	90	78	1953	159
U964	BUGDA COSAR	445900	43300	HDW	120370	7.1	2685	2924	2100	808	19	993	21	1619	708
U743	BUGH BARRI	485100	63400	HDW	130570	6.7	6205	5812	2960	672	311	586	1008	2543	195
U966	CHIRCHIRE	444200	44300	HDW	120370	7.1	2460	2990	1800	656	39	7	64	1519	171
U752	COSSOLTIRE	481300	45500	HDW	031070	7.2	4250	3100	800	160	97	842	724	776	976
U761	DAB UGAZ	462200	43500	HDW	030570	•	320	156	240	•	•	•	•	•	•
U441	DABAD	472900	62400	DW	230570	6.5	6650	4576	1720	320	224	890	1420	1246	439
U756	DABAFC	484200	62100	HDW	090570	6.5	6465	5108	2400	640	194	725	1164	2154	98
U762	DADKE	465700	52000	HDW	300470	•	3200	•	•	•	•	•	•	•	•
U945	DAG FASARE	445000	34100	S	280170	7.6	1518	1080	440	168	5	182	227	63	545
U764	DAH-GIAMALE	481300	61700	HDW	100570	7.3	3950	•	•	•	•	•	•	•	•
U967	DAIA DERE	460300	43000	HDW	030570	5.4	3900	2420	1160	112	213	303	937	361	146
U766	DAMAIROR	462800	40900	HDW	040570	7.6	1965	•	•	•	•	•	•	•	•
U771	DERLEI	483100	51900	HDW	080570	6.1	2150	1828	760	112	117	189	355	435	268
U776	DIRRI	463600	42100	HDW	040570	6.2	3020	2292	760	208	58	287	710	325	62
U782	DUMALE	473300	44200	HDW	060570	5.5	370	368	120	32	10	73	14	36	268
U423	DUSA MAREB	462400	53300	DW	020570	6.2	3005	3214	520	128	49	761	667	1162	32
U785	DUSA MAREB	462400	53200	HDW	020570	•	4985	5640	2360	608	204	1010	1590	2181	51
U787	EL ABCI	475700	42900	HDW	031070	6.9	15020	8696	1480	240	214	2712	4203	893	634
U791	EL AF GUMASORREI	484600	62900	HDW	130570	7.3	6445	5500	2480	688	185	805	994	2559	195
U980	EL BELEL	453200	32800	HDW	270170	7.1	5610	3240	2260	708	1312	554	965	1872	244
U796	EL BILC CABANE	470100	34000	HDW	051070	7.2	2455	1550	840	128	126	189	511	165	439
U981	EL BIC NEF	453000	33900	HDW	270170	7.1	5590	5004	1680	440	140	859	1121	1349	•
U801	EL BUR	463700	44000	HDW	040570	6.6	3450	3840	2560	752	165	375	582	2144	390
U802	EL BUR DAMER	470300	34400	HDW	051070	6.1	8325	5102	1680	320	214	1210	2229	622	634
U803	EL CABORE	474400	41300	HDW	021070	6.2	3350	2500	640	128	78	722	781	258	1025
U982	EL CORIAS	445500	33200	HDW	280170	7.5	2290	1640	320	112	58	317	461	125	524
U805	EL CONCUREB	485200	71500	HDW	130570	5.7	925	648	400	32	78	99	99	53	512
U564	EL CULEI	451100	45800	DW	090370	7.1	3060	2864	1030	200	92	384	462	794	293
U807	EL DAH	462600	43700	HDW	030570	•	560	542	240	•	•	•	•	•	•
U809	EL DAUA	482200	50700	HDW	031070	6.8	2640	1840	680	128	87	304	524	191	488
U811	EL DERE	474000	40900	HDW	021070	6.7	10460	6146	1640	176	292	1720	2982	590	683
U813	EL DERE	485200	71200	HDW	130570	6.1	2075	1372	480	16	106	306	369	198	512
U814	EL DERF	471200	35100	HDW	051070	6.7	2685	2738	600	64	107	449	525	224	732
U844	EL EHELE	462500	40400	HDW	271070	6.4	6100	4098	1720	352	204	694	1562	325	1366

TABLE A 5.3 (Continued)

Id	Location	Long	Lat	Wtype	Date	pH	EC	TDS	TH	Ca	Mg	Na+K	Cl	SO4	HCO3
U995	EL GAN	451500	44700	HDW	090370	•	775	•	•	•	•	•	•	•	•
U824	EL GARAS	473300	51200	HDW	070570	6.3	3250	2936	1888	576	107	165	142	1744	268
U830	EL GERI GHESDERE	491500	64800	HDW	130570	6.2	5760	3300	920	128	146	886	1704	138	366
U825	EL GHAN	480000	43300	HDW	031070	6.4	7250	4228	1080	96	204	1208	1903	448	683
U827	EL GOOOL	473800	65800	HDW	120570	•	2915	•	•	•	•	•	•	•	•
U833	EL GUGNOR	480200	43600	HDW	031070	6.5	13100	7600	2200	144	340	2254	3848	573	781
U837	EL HANDULE	480300	43900	HDW	031070	6.6	6450	3604	1000	128	165	1000	1746	223	585
U1000	EL KAADO	451500	44900	HDW	090370	•	3525	•	•	•	•	•	•	•	•
U1002	EL LEHELI	452600	43800	HDW	100370	7.1	5425	2992	1540	576	24	135	99	1481	183
U1003	EL MCCOILE	451300	34800	HDW	260170	7.4	2795	2140	820	224	39	83	269	117	488
U1006	EL ROBLE	444800	44800	HDW	120370	7.0	2755	2522	1680	648	14	80	35	1556	219
U984	EL SAGNOUEN	451200	34900	HDW	260170	•	2480	2080	740	•	•	•	•	•	•
U1008	EL SANALE	451100	50200	HDW	090370	7.7	6895	8048	2220	744	87	841	1121	2183	241
U1007	EL SARIRALE	451000	50000	HDW	120370	7.2	2925	3252	1740	648	29	112	42	1634	268
U854	EL SCARIF	473100	70600	HDW	080570	•	2575	•	•	•	•	•	•	•	•
U1011	EL UARRE	451800	34200	HDW	260170	7.1	2718	2120	680	256	10	83	276	145	390
U856	EL UR	481600	50000	HDW	021070	6.7	14300	8194	2080	272	340	2376	4132	556	1025
U859	EMADLE	465600	51400	HDW	300470	•	4980	4256	1960	704	49	474	667	1943	31
U1013	FAR LIBAH	445200	45200	HDW	120370	7.2	2500	3300	1800	648	34	250	35	1996	252
U871	GAFANLE	474700	70300	HDW	120570	6.3	2965	3076	1920	752	10	75	243	1590	97
U866	GALCAIO-DOMIDGO	472600	64600	HDW	110570	7.2	5550	5048	2440	704	165	151	319	2023	256
U869	GARAD	491900	65900	HDW	120570	6.2	2825	1876	720	96	116	330	724	209	244
U870	GARADI	463600	55700	HDW	290470	•	1325	1478	840	•	•	•	•	•	•
U877	GELENSOR	464200	62500	HDW	230570	6.5	3395	3464	2000	656	87	110	71	1801	317
U550	GHAL CHARERI	471400	43500	DW	050570	7.4	5570	3498	620	200	29	1348	1427	882	756
U876	GHEDEIS	464100	60100	HDW	300470	6.5	4825	4404	2160	560	184	101	284	1745	195
U403	GHEL INSOR	464100	62500	DW	230570	6.2	•	1796	760	80	136	327	554	431	293
U468	GIAR	465600	43600	DW	050570	7.7	3810	3182	900	184	107	819	930	643	854
U881	GODINLABE	463800	55300	HDW	290470	•	7500	•	•	•	•	•	•	•	•
U831	GOPIRAN	485200	71200	HDW	130570	6.2	1240	900	320	32	58	225	241	86	464
U892	HANRO	475200	51500	HDW	070570	6.2	3075	3244	2000	656	87	74	71	1706	341
U893	HARADERE	475100	43800	HDW	040570	6.0	2460	1604	360	80	39	358	482	232	268
U897	HINDUGHEN	474400	63000	HDW	090470	6.0	2740	3478	2120	752	58	262	71	1673	1171
U899	HON FIDAR	482800	51500	HDW	031070	6.6	5800	3660	920	144	136	1030	1476	386	829
U947	JESCMME	454300	40400	S	271070	6.2	2000	1406	360	112	19	467	568	206	439
U1019	KM 300.00	454200	43600	HDW	100370	7.1	2740	2990	1800	664	53	206	99	1569	183
U1020	KM 310.00	451900	43800	HDW	100370	•	2850	•	•	•	•	•	•	•	•
U907	LAS ACALE	472600	63500	HDW	020570	•	865	•	•	•	•	•	•	•	•
U913	MAAS	460500	42300	HDW	020570	6.5	3080	2770	1120	240	126	614	1399	390	92
U914	MALIN NUGAL	462800	45800	HDW	020570	6.4	2360	2200	1600	576	38	18	42	149	32
U428	MATAFAN	453400	51200	DW	090370	7.5	2700	948	360	88	34	90	220	81	195
U916	MEGHIO ARAI	473400	40200	HDW	021070	7.2	3160	2602	1240	225	165	446	582	720	780
U435	MEREBGUR	463100	54500	DW	290470	6.6	1569	•	•	•	•	•	•	•	•
U918	MEREBGUR	463100	54500	HDW	290470	•	2180	220	560	16	126	556	624	832	31
U917	MESEGAWAY	470100	34100	HDW	051070	7.1	3775	2406	1280	160	214	443	781	253	1073
U920	MILAGC	473300	45000	HDW	060570	5.6	855	688	160	16	29	186	71	81	463
U921	MIRRICH	462500	54000	HDW	310370	5.5	2650	3422	1760	672	19	234	28	1561	732
U922	MIRRON	475200	45900	HDW	040570	7.7	1313	1492	460	80	63	416	120	15	1439
U949	MISSARALE	450100	32600	S	290170	7.4	2865	2604	660	246	29	451	724	170	537
U924	MITALE	480700	69100	HDW	100570	6.5	2500	2580	1800	560	97	121	42	1523	439
U379	MOBAH	461300	35100	DW	271070	6.6	9750	6884	2880	720	262	1426	2599	1534	878
U1021	MOGOCCRI	460800	40400	HDW	271070	6.9	12000	7402	3200	464	670	669	3180	972	1561
U376	MOGOCCRI	460800	40400	DW	271070	6.7	3700	2220	1440	320	157	271	838	162	830
U1023	NUR FANAA	452300	42400	HDW	100370	7.1	3130	1524	1000	32	48	303	21	740	170
U925	OBBIA I	483200	52000	HDW	080570	6.3	8650	4976	1040	128	174	1474	2541	405	317

TABLE A 5.3 (Continued)

Id	Location	Long	Lat	Wtype	Date	pH	EC	TDS	TH	Ca	Mg	Na+K	Cl	SO4	HCO3
U9259	OBBIA II	483200	52000	HDW	080570	6.1	2040	1408	480	48	87	277	355	300	195
U930	RACKAN	474600	60300	HDW	090570	.	3050	.	.	.	.	.	.	.	.
U934	SCIMBIRALE	475000	44200	HDW	060570	5.6	2875	240	160	32	174	32	14	28	219
U968	SEGIS	453700	32600	HDW	270170	7.3	45650	27944	7240	.	.	.	.	.	.
U933	SEMACE	483700	71000	HDW	120570	6.0	.	2172	680	224	29	289	312	160	854
U931	SEMEMEIO	473700	40600	HDW	021070	6.2	6900	4444	1400	224	204	1104	1704	620	878
U939	UAHA UEIN	474800	41900	HDW	021070	7.1	3350	2500	640	160	155	1053	1533	353	976
U453	UISIL	480900	52300	DW	070570	.	6900	.	.	.	.	.	.	.	.
U942	UMALCI	463100	51100	HDW	020570	7.6	2920	3490	740	216	49	910	319	1641	683
U943	YAMAIS	472700	64700	HDW	120570	.	1875	.	.	.	.	.	.	.	.
U884	YORAF	461500	42900	HDW	020570	7.8	2860	1992	1020	224	112	395	404	104	1164
U883	YORILE	473900	71100	HDW	100570	6.8	2325	2396	1620	632	10	25	14	1431	195

Table A5.3a

WATER QUALITY DATA FROM THE CENTRAL RANGELANDS, 1982-1984

LBI No.	UN No.	Idro-tech No.	WDA No.	Location	Sampling Date	Long	Lat	pH	EC x 10^6 (mmhos)	TDS (mg/l)	Total Hardness as $CaCO_3$ (mg/l)	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	K (mg/l)	Cl (mg/l)	SO_4 (mg/l)	HCO_3 (mg/l)	F (mg/l)	Remarks
H1	381			BUULO BERDI	9/2/83	45°.33'	3°.51'	8.2	2,700	2,508	800	284	75	113	11	213	1,130	24	0.44	Drilled well
H1	381	-		BUULO BERDI	14/5/84	45°.33'	3°.51	7.7	2,150	2,144	1,088	289	89	125	6	252	893	231		Drilled well
534				BUULO BERDI HOSPITAL	14/2/84	45°.33'	3°.51'	7.6	1,900	1,828	1,234	387	65	40	7	71	1,045	287		Hand dug well
H4	376			MOGOKOREY	9/2/83	46°.3'	4°.08'	8.0	3,000	2,060	888	241	124	1,500	35	941	340	31	0.39	Drilled well
535				SHABELLI RIVER	9/2/83	45°.33'	3°.51'	8.3	1,000	960	366	108	85	16	10	195	286	16	0.45	Surface water
536				BUGDA I	10/2/83	44°.46'	4°.00'	8.0	3,100	3,060	1,536	629	85	45	35	88	1,638	20	2.7	Hand dug well
537				BUDGA II	10/2/83	44°.46'	4°.00'	8.1	3,100	3,108	1,440	633	54	50	35	88	1,749	20	2.5	Hand dug well
H3				ABOOREY	9/2/83	45°.42'	4°.01'	8.0	4,200	3,808	2,280	261	109	690	50	1,420	506	37	0.10	Drilled well
538				MAXAAS	15/5/83	46°.06'	4°.23'	7.2	4,250	-	1,896	273	288	375	50	1,392	440	238	.05	Hand dug well
M10				WISIL	24/9/83	48°.07'	5°.26'	7.6	6,010	3,880	1,000	237	99	667	38	827	507	348		Drilled well
539				BAJEELE	26/9/83	47°.42	5°.48'	7.6	2,800	3,790	1,855	715	17	42	17	96	1,560	225		Hand dug well
540				#9	26/9/83	47°.57'	6°.01'	7.7	6,940	7,460	2,660	869	119	751	120	436	3,000	342		Hand dug well
M8-H15				BELET UEN	25/10/83	45°.12'	4°.45'	8.3	8,200	-	2,738	657	321	769	12	3,297	1,580	189		Drilled well
M8-H15				BELET UEN UNICEE # 1	14/2/84	45°.12'	4°.45'	7.8	3,200	2,488	1,459	365	133	193	10	426	1,186	344		Drilled well
M8-H15				BELET UEN UNICEE # 2	14/5/84	45°.12'	4°.45'	7.7	1,525	1,612	912	273	56	44	7	112	689	256		Drilled well
G13				EL DHERE	4/9/83	47°.15'	3°.50'	7.5	2,950	1,744	406	67	58	290	50	495	43	238		Drilled well
541				EL DHERE	15/2/84	47°.15'	3°.50'	7.6	1,470	1,156	526	115	58	125	42	266	82	459		Hand dug well
M4				GALCAIO	14/5/84	47°.26'	6°.45'	7.7	3,200	3,504	2,123	494	216	100	13	224	1,916	189		Drilled well
556				WARGALEH	13/5/84	47°.32'	6°.16'	7.6	2,900	3,468	2,066	641	113	60	20	168	1,806	283		Drilled well
557				WARGALEH	13/5/84	47°.32'	6°.16'	7.3	5,850	7,095	3,084	869	222	316	28	1,260	1,957	367		Hand dug well
G16				DOCOL	13/5/04	47°.37'	6°.55'	7.5	3,050	2,944	1,763	391	191	148	14	336	1,418	252		Drilled well

Table A5.3a (Cont.)

LBI No.	UN No.	Idro-tech No.	WDA No.	Location	Sampling Date	Long	Lat	pH	EC x 10^6 (mmhos)	TDS	Total Hardness as $CaCO_3$	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	K (mg/l)	Cl (mg/l)	SO_4 (mg/l)	HCO_3 (mg/l)	NO_3-N	F (mg/l)	Remarks
										mg/l											
547				MOSAGAMEYN	4/9/83	47°.00'	3°.50'	8.0	1,370	1,016	430	83	54	100	25	138	26	445			Hand dug well
548				EL HUR	21/9/83	48°.16'	5°.00'	7.6	9,770	7,940	1,457	135	272	1,585	96	1,811	403	323			Hand dug well
549				SAGUIRO	22/9/83	48°.22'	5°.15'	7.6	650	272	215	48	23	7	6	24	27	182			Hand dug well
550				HOBBIO	23/9/83	48°.32'	5°.21'	7.9	2,090	1,600	457	51	80	183	47	265	151	165			Hand dug well
551				HOBBIO	4/82	48°.32'	5°.21'	7.9	3,500	-	939	122	154	274	76	718	532	135	51	1.7	Hand dug well
552				BUD BUD	23/9/83	48°.41	6°.11'	7.6	9,060	7,510	1,712	308	229	1,168	51	1,394	1,190	201			Hand dug well
553				XINGOD	23/9/83	48°.26'	6°.15'	7.7	2,750	3,060	1,721	683	4	27	24	23	1,470	243			Hand dug well
554				EL DIBIR	24/9/83	48°.20'	5°.53'	7.3	3,070	2,910	1,808	673	31	63	48	59	1,580	281			Hand dug well
555				DUSA MAREB	4/82	46°.22'	5°.32'	7.9	2,250	-	409	50	69	274	28	522	306	173			Hand dug well
G5				DUSA MAREB	15/2/83	46°.22'	5°.32'	7.7	2,400	1,400	618	147	61	243	18	497	284	487			Drilled well
G5				DUSA MAREB	15/5/84	46°.22'	5°.32'	7.6	2,350	1,088	704	147	82	207	19	532	270	294			Drilled well
G8				CADADO	4/82	46°.36'	6°.08'	7.7	4,900	-	1,182	211	159	500	39	1,211	589	124			Drilled well
G8				CADADO	15/2/84	46°.36'	6°.08'	7.4	5,200	4,132	1,338	285	152	430	17	1,402	576	344	5	0.79	Drilled well
G9	403			GEHLINSOR	4/82	46°.42'	6°.25'	7.9	2,400	-	675	125	88	209	22	517	374	159	20		Drilled well
G9	403			GEHLINSOR	16/2/84	46°.42'	6°.25'	8.0	2,400	1,280	772	141	102	214	17	568	360	201			Drilled well
558				EL GAL	23/2/84	45°.15'	4°.51'	7.9	1,280	1,388	785	166	90	27	8	142	428	229			Hand dug well
559				GAROE	22/2/84	48°.40'	8°.20'	7.8	4,700	3,800	2,366	339	369	243	34	586	2,107	229			Hand dug well
542				GAROE	22/2/84	48°.40'	8°.20'	7.8	3,250	3,760	1,998	614	113	93	12	213	1,854	143			Drilled well
543				GALCAIO	22/2/84	47°.26'	6°.45	7.5	3,100	3,000	2,092	701	83	68	17	249	1,697	172			Hand dug well
H4				HALGAN VILLAGE	14/2/84	46°.34'	4°.12'	7.5	3,950	2,616	1,000	173	136	407	11	1,047	406	373			Drilled well
H8-H15				SIGALOW	14/2/84	45°.12'	4°.45'	7.8	3,200	2,488	1,472	365	133	193	10	426	1,186	344			Drilled well
544				WARIRIF	18/2/84	45°.32'	2°.49'	7.1	1,200	736	346	71	41	130	5	107	314	315			Hand dug well
H9	435			MAREER GUR	4/82	46°.32'	5°.45'	7.8	3,350	-	846	179	97	284	27	859	914	173	7	0.50	Drilled well
G7	440			GODIN LABE	4/82	46°.38	5°.51'	7.7	3,700	-	2,186	577	181	129	27	439	450	197	7	0.28	Hand dug well
M3				GOWALLO	4/82	47°.07'	6°.42'	7.5	3,400	-	1,462	310	167	191	19	668	614	134	16	0.75	Drilled well
545				GORGOIE	4/82	47°.30'	6°.50'	7.2	3,400	-	2,140	651	125	135	36	270	1,922	184	7	1.80	Hand dug well
546				GANA FALLE	4/82	47°.47'	7°.03'	7.0	2,800	-	2,004	702	61	62	39	178	1,637	173	8	1.4	Hand dug well
M8	412			BALLI BUSLE	4/82	48°.11'	7°.05'	7.0	4,000	-	1,419	321	150	284	17	975	756	332	0.2	0.75	Drilled well
560				JIRIBEN	4/82	48°.52'	7°.13'	7.8	1,200	-	327	93	23	98	21	233	96	258	13	0.22	Hand dug well
561				EL HAMMER	4/82	48°.54'	7°.14'	8.1	800	-	250	77	14	43	4	137	47	296	7	0.30	Hand dug well
562				GARCADO	4/82	49°.20'	6°.57'	8.1	13,000	-	1,654	214	272	306	76	3,340	652	468	43	0.48	Hand dug well
563				AFBARWAAQO	4/82	48°.45'	6°.30'	7.7	7,000		2,362	689	156	306	68	750	2,118	168			Hand dug well
564				HOBBIO	4/82	48°.33'	5°.22'	7.9	3,500	-	939	122	154	274	76	718	532	135	51	1.7	Hand dug well
565				XARARIHEERE	4/82	47°.52'	4°.39'	7.7	2,900	-	426	93	47	306	10	572	366	542	4	0.35	Hand dug well

TABLE A 5.4 - IONIC COMPOSITION OF WELLS IN CENTRAL RANGELANDS, 1970

Sum and % of cations and anions based on meq/l

ID	LOCATION	DATE	S_CAT	P_CA	P_MG	P_NA_K	S_ANI	P_CL	P_SO4	P_HCO3
U705	ABAREI	100570	•	•	•	•	•	•	•	•
U437	ABUDWAG	230570	33.95	35.27	23.49	41.23	33.98	42.36	12.93	44.72
U707	ABUDWAG	230570	35.71	17.89	26.71	55.40	35.98	58.96	24.36	16.68
U711	AD	040570	30.53	2.62	10.51	86.88	30.54	51.10	21.41	27.49
U425	ADADO	290470	•	•	•	•	•	•	•	•
U708	ADADC	290470	16.87	85.21	9.46	5.34	16.95	9.44	88.20	2.36
U718	AMUR	020570	39.29	83.32	10.26	6.42	39.21	11.21	87.57	1.22
U952	AROLE	110370	•	•	•	•	•	•	•	•
U721	ARTUDA	090570	•	•	•	•	•	•	•	•
U726	BADWEN	080570	37.23	87.92	2.14	9.94	37.14	4.32	86.28	9.40
U727	BAHADC	300470	43.60	82.40	14.71	2.89	43.57	8.28	79.80	11.93
U412	BALLI BUSLE	120570	36.51	26.24	28.38	45.37	36.50	61.35	25.49	13.16
U956	BAR MEDEGHE	110370	•	•	•	•	•	•	•	•
U734	BEIRA	100570	38.20	87.79	3.44	8.76	38.48	4.17	81.26	14.57
U958	BELET UEN	120370	•	•	•	•	•	•	•	•
U465	BERGIANI	050570	37.64	44.81	12.67	42.51	37.64	71.17	24.56	4.27
U960	BERHAMO	100370	168.25	19.22	26.15	54.63	168.89	48.90	46.72	4.38
U961	BILHELLE	030570	32.56	56.39	17.17	26.44	32.58	72.45	22.62	4.93
U962	BIO CULCUL	270170	57.64	39.48	16.69	43.83	60.50	54.89	39.61	5.50
U963	BUGDA ACABLE	280170	59.83	58.05	4.67	37.28	58.78	37.43	57.13	5.44
U364	BUGDA COSAR	110370	45.47	64.09	27.31	8.61	45.47	4.83	89.43	5.73
U964	BUGDA COSAR	120370	85.06	47.40	1.84	50.76	45.91	1.29	73.43	25.28
U743	BUGH BARRI	130570	84.59	39.64	30.24	30.12	84.54	33.59	62.63	3.78
U966	CHIRCHIRE	120370	36.23	90.36	8.85	0.79	36.23	4.98	87.29	7.74
U752	COSSELTIRE	031070	52.57	15.19	15.17	69.64	52.55	38.81	30.74	30.45
U761	DAB UGAZ	030570	•	•	•	•	•	•	•	•
U441	DABAD	230570	73.08	21.85	25.21	52.95	73.14	54.69	35.47	9.84
U756	DABARC	090570	79.41	40.22	20.09	39.69	79.24	41.38	56.59	2.03
U762	DADKE	300470	•	•	•	•	•	•	•	•
U945	DAG PASARE	280170	16.69	50.23	2.36	47.41	16.71	38.28	7.85	53.87
U764	DAH-GIAMALE	100570	•	•	•	•	•	•	•	•
U967	DAIA CEBE	030570	36.28	15.41	48.28	36.31	36.30	72.70	20.70	6.59
U766	DAMAIROR	040570	•	•	•	•	•	•	•	•
U771	DEBLEI	080570	23.43	23.86	41.07	35.08	23.45	42.64	38.62	18.74
U776	DIRRI	040570	27.63	37.57	17.26	45.17	27.78	71.99	24.36	3.66
U782	DUMALE	060570	5.59	28.55	14.70	56.75	5.54	7.12	13.54	79.34
U423	DUSA MAREB	020570	43.50	14.68	9.26	76.06	43.51	43.19	55.61	1.21
U785	DUSA MAREB	020570	91.03	33.33	18.43	48.24	91.03	49.20	49.88	0.92
U787	EL ABDI	031070	147.49	8.12	11.93	79.95	147.38	80.33	12.62	7.05
U791	EL AF GUMASCRREI	130570	84.55	40.61	17.99	41.40	84.48	33.15	63.07	3.78
U980	EL BELEL	270170	167.31	21.12	64.49	14.40	70.16	38.75	55.55	5.70
U796	EL BILO CABANE	051070	24.97	25.58	41.50	32.91	25.03	57.52	13.73	28.76
U981	EL EIC NEF	270170	70.82	31.00	16.26	52.74	•	•	•	•
U801	EL BUR	040570	67.40	55.66	20.13	24.19	67.43	24.31	66.20	9.48
U802	EL BUR DAMER	051070	86.18	18.33	20.42	61.05	86.13	72.90	15.04	12.07
U803	EL CABOBE	021070	44.19	14.45	14.51	71.03	44.17	49.80	12.16	38.04
U982	EL COBIAS	280170	24.17	23.13	19.84	57.03	24.18	53.71	10.76	35.53
U805	EL CONCURER	130570	12.32	12.97	52.08	34.95	12.29	22.70	8.98	68.32
U564	EL CULEI	090370	34.24	29.15	22.10	48.76	34.35	37.89	48.13	13.98
U807	EL DAH	030570	•	•	•	•	•	•	•	•
U809	EL DAUA	031070	26.76	23.87	26.74	49.39	26.74	55.21	14.87	29.92
U811	EL DERE	021070	107.58	8.16	22.32	69.51	107.48	78.15	11.43	10.42
U813	EL DERE	130570	22.82	3.50	38.20	58.30	22.91	45.37	17.99	36.64
U814	EL DERE	051070	31.51	10.13	27.92	61.94	31.45	47.02	14.83	38.15
U844	EL EHELE	271070	64.52	27.23	26.00	46.77	73.16	60.14	9.25	30.61

TABLE A 5.4 (Continued)

Sum and % of cations and anions based on meq/l

ID	LOCATION	DATE	S_CAT	P_CA	P_MG	P_NA_K	S_ANI	P_CL	P_SO4	P_HCO3
U995	EL GAN	090370	•	•	•	•	•	•	•	•
U924	EL GARAS	070570	44.72	64.28	19.68	16.04	44.70	8.95	81.22	9.83
U830	EL GERI GHESDERE	130570	56.92	11.22	21.10	67.68	56.87	84.40	5.05	10.55
U825	EL GHAN	031070	74.09	6.47	22.64	70.89	74.13	72.31	12.58	15.10
U827	EL GOCOL	120570	•	•	•	•	•	•	•	•
U833	EL GUGNOR	031070	133.15	5.40	21.00	73.60	133.13	81.42	8.96	9.62
U837	EL HANDULE	031070	63.43	10.07	21.39	68.54	63.42	77.56	7.32	15.12
U1000	EL KAADO	090370	•	•	•	•	•	•	•	•
U1002	EL LEHELI	100370	36.61	78.51	5.46	16.03	36.63	7.64	84.17	8.19
U1003	EL MOCO ILE	260170	17.98	62.18	17.75	20.07	18.01	42.07	13.52	44.41
U1006	EL ROELE	120370	36.96	87.48	3.11	9.41	36.97	2.67	87.62	9.71
U984	EL SAGNOUEN	260170	•	•	•	•	•	•	•	•
U1008	EL SANALE	090370	80.85	45.92	8.85	45.23	80.98	38.95	56.13	4.88
U1007	EL SARIRALE	120370	39.59	81.68	6.02	12.30	39.60	2.99	85.92	11.10
U854	EL SCARIF	080570	•	•	•	•	•	•	•	•
U1011	EL UAFRE	260170	17.18	74.35	4.64	21.00	17.19	45.24	17.57	37.20
U856	EL UR	021070	144.84	9.37	19.30	71.32	144.77	80.40	8.00	11.61
U858	EMACLE	300470	59.77	58.78	6.74	34.48	59.75	31.45	67.70	0.85
U1013	FAR LIEAH	120370	46.00	70.29	6.08	23.63	46.67	2.11	89.04	8.85
U871	GAFANLE	120570	41.58	90.24	1.92	7.84	41.54	16.48	79.69	3.83
U866	GALCAIC-DOMIDGO	110570	55.26	63.57	24.55	11.88	55.30	16.25	76.16	7.59
U869	GARAD	120570	28.68	16.70	33.26	50.03	28.75	70.95	15.14	13.92
U870	GARADI	290470	•	•	•	•	•	•	•	•
U877	GELENSOR	230570	44.67	73.28	16.02	10.71	44.69	4.47	83.90	11.63
U560	GHAL CHARERI	050570	70.98	14.06	3.37	82.57	70.95	56.65	25.68	17.47
U876	GHEDEIS	300470	47.47	58.87	31.88	9.25	47.53	16.83	76.44	6.73
U403	GHELINSOR	230570	29.39	13.58	38.05	48.37	29.38	53.11	30.54	16.35
U468	GIAR	050570	53.59	17.13	16.42	66.45	53.58	48.89	24.98	26.13
U881	GODINLABE	290470	•	•	•	•	•	•	•	•
U831	GORIBAN	130570	16.15	9.89	29.54	60.58	16.19	41.94	11.06	47.00
U892	HANRO	070570	43.09	75.97	16.60	7.43	43.11	4.64	82.39	12.97
U893	HARADERE	040570	22.75	17.55	14.03	68.42	22.80	59.55	21.18	19.27
U897	HINDUGHEN	090470	53.71	69.86	8.93	21.21	56.03	3.57	62.17	34.26
U899	HON BIDAR	031070	63.15	11.38	17.71	70.91	63.20	65.78	12.72	21.50
U947	JESCHME	271070	27.49	20.33	5.80	73.86	27.49	58.21	15.60	26.18
U1019	KM 300.00	100370	46.48	71.28	9.45	19.27	38.46	7.25	84.95	7.80
U1020	KM 310.00	100370	•	•	•	•	•	•	•	•
U907	LAS ACALE	020570	•	•	•	•	•	•	•	•
U913	MAAS	020570	49.03	24.42	21.13	54.44	49.04	80.37	16.56	3.08
U914	MALIN NUGAL	020570	32.65	88.03	9.57	2.40	4.80	24.62	64.56	10.82
U428	MATABAN	090370	11.10	39.56	25.19	35.25	11.08	55.93	15.22	28.85
U916	MEGHIC ARAI	021070	44.19	25.41	30.71	43.88	44.17	37.11	33.94	28.95
U435	MERERGUR	290470	•	•	•	•	•	•	•	•
U918	MERERGUR	290470	35.33	2.26	29.33	68.42	35.41	49.64	48.92	1.44
U917	MESEGAWAY	051070	44.84	17.80	39.24	42.75	44.86	49.04	11.74	39.21
U920	MILAGC	060570	11.27	7.08	21.16	71.76	11.28	17.74	14.96	67.31
U921	MIRRICH	310370	45.30	74.02	3.52	22.46	45.29	1.74	71.76	26.50
U922	MIRRON	040570	27.26	14.64	19.01	66.35	27.28	12.39	1.13	86.48
U949	MISSARALE	290170	34.27	35.82	6.96	57.22	32.74	62.30	10.81	26.89
U924	MITALE	100570	41.18	67.86	19.37	12.77	40.09	2.95	79.10	17.95
U379	MOBAH	271070	119.47	30.07	18.03	51.89	119.54	61.24	26.72	12.04
U1021	MOGOCCRI	271070	107.34	21.57	51.33	27.10	135.40	66.16	14.95	18.90
U376	MOGOCCRI	271070	40.66	39.27	31.75	28.98	40.59	58.16	8.31	33.53
U1023	NUR FANAA	100370	18.72	8.53	21.09	70.38	18.79	3.15	82.02	14.84
U925	OBEIA I	080570	84.78	7.53	16.88	75.59	85.21	84.00	9.50	6.10

TABLE A 5.4 (Continued)

Sum and % of cations and anions based on meq/l

ID	LOCATION	DATE	S_CAT	P_CA	P_MG	P_NA_K	S_ANI	P_CL	P_SO4	P_HCO3
U925B	DEBIA II	080570	21.59	11.09	33.13	55.77	19.44	51.43	32.13	16.44
U930	KACKAN	090570	.	.	.	.	.	.	.	.
U934	SCIMBIFALE	060570	17.30	9.23	82.70	8.07	4.57	8.64	12.72	78.64
U968	SEGIS	270170	.	.	.	.	.	.	.	.
U932	SEMADE	120570	26.13	42.78	9.13	48.09	26.12	33.65	12.75	53.60
U931	SENEMEIC	021070	75.95	14.72	22.09	63.20	75.30	63.74	17.14	19.11
U939	UAHA UEIN	021070	66.51	12.00	19.16	68.83	66.53	64.91	11.05	24.05
U453	UISIL	070570	.	.	.	.	.	.	.	.
U942	UMALOI	020570	54.34	19.84	7.35	72.81	54.35	16.53	62.86	20.60
U943	YAMAIS	120570	.	.	.	.	.	.	.	.
U884	YORAF	020570	37.56	29.76	24.52	45.72	32.63	34.88	6.64	58.48
U883	YORILE	100570	33.45	94.29	2.46	3.25	33.38	1.18	89.24	9.58

TABLE A 5.4 (Continued)

VARIABLE	N	MEAN	STD DEV	SUM	MINIMUM	MAXIMUM
PH	94	6.68936170	0.59179391	628.8000000	5.40000000	7.80000000
HCO3	96	459.18020833	346.40876937	44081.3000000	24.40000000	1561.00000000
SO4	97	914.45051546	779.90289969	88701.7000000	14.80000000	3790.00000000
CL	97	815.91958763	925.13182379	79144.2000000	14.00000000	4203.00000000
CA	97	345.70103093	254.72175035	33533.0000000	16.00000000	808.00000000
MG	97	128.39896907	161.05777399	12454.7000000	4.80000000	1312.00000000
NA_K	97	536.91855670	538.78593641	52081.1000000	6.60000000	2712.00000000
TH	102	1361.54901961	963.12321603	138878.0000000	120.00000000	7240.00000000
TDS	102	3384.96078431	3166.55572302	345266.0000000	156.00000000	27944.00000000
EC	120	4322.60000000	4731.67842270	518712.0000000	320.00000000	45650.00000000

CORRELATION COEFFICIENTS / PROB > |R| UNDER HO:RHO=0 / NUMBER OF OBSERVATIONS

	PH	HCO3	SO4	CL	CA	MG	NA_K	TH	TDS	EC
PH	1.00000 0.0000 94	0.15782 0.1396 89	0.24956 0.0177 90	0.04277 0.6890 90	0.21900 0.0381 90	0.07579 0.4777 90	0.12933 0.2244 90	0.23079 0.0277 91	0.23482 0.0251 91	0.14254 0.1753 92
HCO3	0.15782 0.1396 89	1.00000 0.0000 96	-0.29836 0.0032 96	0.34988 0.0005 96	-0.23151 0.0232 96	0.18573 0.0700 96	0.36149 0.0003 96	-0.02738 0.7912 96	0.17545 0.0873 96	0.28200 0.0059 94
SO4	0.24956 0.0177 90	-0.29836 0.0032 96	1.00000 0.0000 97	-0.00082 0.9937 97	0.84529 0.0001 97	0.22513 0.0266 97	0.08502 0.4077 97	0.82894 0.0001 97	0.57899 0.0001 97	0.26311 0.0100 95
CL	0.04277 0.6890 90	0.34988 0.0005 96	-0.00082 0.9937 97	1.00000 0.0000 97	-0.12238 0.2324 97	0.50826 0.0001 97	0.91322 0.0001 97	0.31769 0.0015 97	0.75622 0.0001 97	0.52359 0.0001 95
CA	0.21900 0.0381 90	-0.23151 0.0232 96	0.84529 0.0001 97	-0.12238 0.2324 97	1.00000 0.0000 97	0.11841 0.2480 97	-0.12314 0.2295 97	0.83594 0.0001 97	0.42079 0.0001 97	0.12061 0.2443 95
MG	0.07579 0.4777 90	0.18573 0.0700 96	0.22513 0.0266 97	0.50826 0.0001 97	0.11841 0.2480 97	1.00000 0.0000 97	0.39067 0.0001 97	0.44217 0.0001 97	0.46466 0.0001 97	0.55331 0.0001 95
NA_K	0.12933 0.2244 90	0.36149 0.0003 96	0.08502 0.4077 97	0.91322 0.0001 97	-0.12314 0.2295 97	0.39067 0.0001 97	1.00000 0.0000 97	0.24948 0.0137 97	0.74547 0.0001 97	0.85898 0.0001 95

TABLE A 5.4 (Continued)

CORRELATION COEFFICIENTS / PROB > |R| UNDER HO:RHO=0 / NUMBER OF OBSERVATIONS

	PH	HCO3	SO4	CL	CA	MG	NA_K	TH	TDS	EC
TH	0.23079	-0.02738	0.82894	0.31769	0.83594	0.44217	0.24948	1.00000	0.85671	0.75905
	0.0277	0.7912	0.0001	0.0015	0.0001	0.0001	0.0137	0.0000	0.0001	0.0001
	91	96	97	97	97	97	97	102	102	100
TDS	0.23482	0.17545	0.57899	0.75622	0.42079	0.46466	0.74547	0.85671	1.00000	0.96167
	0.0251	0.0873	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0000	0.0001
	91	96	97	97	97	97	97	102	102	100
EC	0.14254	0.28200	0.26311	0.92359	0.12061	0.55331	0.85898	0.75905	0.96167	1.00000
	0.1753	0.0059	0.0100	0.0001	0.2443	0.0001	0.0001	0.0001	0.0001	0.0000
	92	94	95	95	95	95	95	100	100	120

IONIC COMPOSITION OF WELLS IN THE CENTRAL RANGELANDS, 1982-1984
Upper line meg/l, lower %

Sample No.	Location	Date	Ca	Mg	Na	K	Cl	HCO_3	SO_4	Cat	An	%E
M4	GALCAIO	14/5/84	35.6	6.8	3.0	0.4	7.0	2.8	35.3	45.8	45.1	0.8
			77.7	14.8	6.6	0.9	15.5	6.2	78.3			
H1	BUULO BERDE	9/2/83	14.1	6.1	4.9	0.3	6.0	0.4	23.5	25.4	29.9	8.1
B381			55.5	24.0	19.3	1.2	20.1	1.3	78.1			
B534	BUULO BERDE HOSPITAL	14/2/84	19.3	5.3	1.7	6.2	2.0	4.7	21.7	26.5	28.4	3.5
			72.8	20.0	6.4	0.8	7.0	16.5	76.4			
H4	MOGOKOREY	9/2/83	12.0	10.2	65.2	0.9	26.5	0.5	7.1	88.3	34.1	44.3
U376			13.6	11.6	73.8	1.0	77.7	1.5	20.8			
B535	SHABELLI RIVER	9/2/83	5.3	7.0	0.7	0.3	5.5	0.3	6.0	13.3	11.8	6.0
			39.8	52.6	5.3	2.3	46.6	2.5	50.8			
B536	BUGDA I	10/2/83	31.4	7.0	2.0	0.9	2.5	0.3	34.1	41.3	36.9	5.6
				16.9	4.8	2.2	6.8	0.8	92.4			
B537	BUGDA II	10/2/83	31.6	4.4	2.2	0.9	2.5	0.3	36.4	39.1	39.2	0.1
			80.8	11.3	5.6	2.3	6.4	0.8	92.9			
H3	ABOOREY	9/2/83	13.0	9.0	30.0	1.3	40.0	0.6	10.5	53.2	51.1	2.1
			24.4	16.9	56.3	2.4	78.3	1.2	20.5			
B538	MAXAAS	15/5/83	13.9	23.7	16.3	1.3	39.2	3.9	9.2	55.2	52.3	2.7
			25.2	42.9	29.5	2.4	75.0	7.5	17.6			
M10	WISIL	24/9/83	11.8	8.1	29.0	1.0	23.3	5.7	10.6	49.9	39.6	11.5
			23.6	16.2	58.1	2.0	58.8	14.4	26.8			
B539	BAJEELE	26/9/83	35.7	1.4	1.8	0.4	2.7	3.7	32.5	39.3	28.9	5.1
			90.8	3.6	4.6	1.0	6.9	9.5	83.5			
B40	#9	26/9/83	43.3	9.8	32.6	3.1	12.3	5.6	67.5	88.9	80.4	5.0
			48.8	11.0	36.7	3.5	15.3	7.0	77.7			
H8-H15	BELET UEN	25/10/83	32.8	26.4	33.4	0.3	92.9	3.1	32.9	92.2	128.9	16.2
			35.3	28.4	36.0	0.3	72.1	2.4	25.5			
H8-H15	BELET UEN	14/2/84	18.2	10.9	8.4	0.3	12.0	5.6	24.7	37.8	42.3	5.6
	UNICEF #1		48.1	28.8	22.2	0.8	28.4	13.2	58.4			
H8-H15	BELET UEN	14/5/84	13.6	4.6	1.9	0.2	3.2	4.2	14.3	20.3	21.7	3.3
	UNICEF #2		67.0	22.7	9.4	1.0	14.7	19.4	65.9			

Table A5.5 (Cont.)

Sample No.	Location	Date	Ca	Mg	Na	K	Cl	HCO_3	SO_4	Cat	An	%E
B548	EL HUR	21/9/83	6.7	22.4	68.9	2.5	51.0	5.3	8.4	100.5	64.7	21.7
			6.7	22.3	68.6	2.5	78.8	8.2	13.0			
B549	SAQUIRO	22/9/83	2.4	1.9	0.3	0.2	0.7	3.0	0.6	4.8	4.3	5.5
			50.0	39.6	6.3	4.2	16.3	69.8	14.0			
B550	HOBBIO	22/9/83	2.5	6.6	8.0	1.2	7.5	2.7	3.1	18.3	13.3	15.8
			13.7	36.1	43.7	6.6	56.4	20.3	23.3			
B551	HOBBIO	4/82	6.1	12.7	11.9	1.9	20.2	2.2	11.1	32.6	33.5	1.4
			18.7	39.0	36.5	5.8	60.3	6.6	33.1			
B552	BUD BUD	23/9/83	15.4	18.8	50.8	1.3	39.3	3.2	24.8	86.3	67.3	12.4
			17.8	21.8	58.9	1.5	58.4	4.8	36.8			
B553	XINGOD	23/9/83	34.1	0.3	1.2	0.6	0.6	4.0	30.6	36.2	35.2	1.4
			94.2	0.8	3.3	1.7	1.7	11.4	86.9			
B554	EL DIBIR	24/9/83	33.5	2.6	2.7	1.2	1.7	4.6	32.9	40.0	39.2	1.0
			83.8	6.5	6.8	3.0	4.3	11.7	83.9			
B555	DUSA MAREB	4/82	2.5	5.7	11.9	0.7	14.7	2.8	6.4	20.8	23.9	6.9
			12.0	27.4	57.2	3.4	61.5	11.7	26.8			
G5	DUSA MAREB	15/2/84	7.3	5.0	10.6	0.5	14.0	8.0	5.9	23.4	27.9	8.8
			31.2	21.4	45.3	2.1	50.2	28.7	21.1			
G5	DUSA MAREB	14/5/84	7.3	6.7	9.0	0.5	15.0	4.8	5.6	23.5	25.4	3.9
			31.1	28.5	38.3	2.1	59.1	18.9	22.0			
G8	CADADO	4/82	10.5	13.1	21.7	1.0	34.1	2.0	12.2	46.3	48.2	2.0
			22.7	28.3	46.9	2.2	70.7	4.1	25.3			
G8	CADADO	15/2/84	14.2	12.5	18.7	0.4	39.4	5.6	12.0	45.8	57.0	10.9
			31.0	27.3	40.8	0.9	69.1	9.8	21.1			
G9 UN403	GHELINSOR	4/84	6.2	7.2	9.1	0.6	14.6	2.6	7.8	23.1	25.0	4.0
			26.8	31.2	39.4	2.6	58.4	10.4	31.2			
G9 UN403	GHELINSOR	16/2/84	7.0	8.4	9.3	0.4	16.0	3.2	7.5	25.1	26.7	3.1
			27.9	33.5	37.1	1.6	59.9	12.0	28.1			
B558	EL GAL	23/2/84	8.3	7.4	1.2	0.2	4.0	3.8	8.9	17.1	16.7	1.2
			48.5	43.3	7.0	1.2	24.0	22.8	53.3			
B559	GAROE	22/2/84	16.9	30.4	10.0	0.9	16.5	3.8	43.9	58.2	64.2	4.9
			29.0	52.2	17.2	1.5	25.7	5.9	68.3			
B542	GAROE	22/2/84	30.6	9.3	4.0	0.3	6.0	2.3	38.6	44.2	46.9	3.0
			69.2	21.0	9.0	0.7	12.8	4.9	82.3			

Table A5.5 (Cont.)

Sample No.	Location	Date	Ca	Mg	Na	K	Cl	HCO_3	SO_4	Cat	An	%E
G13	EL DHERE	4/9/83	3.3	4.8	12.6	1.3	13.9	3.9	0.9	22.0	18.7	8.1
			15.0	21.8	57.2	5.9	74.3	20.9	4.8			
B541	EL DHERE	15/2/84	5.7	4.8	5.4	1.1	7.5	7.5	1.7	17.0	16.7	0.9
			33.5	28.2	31.8	6.5	44.9	44.9	10.2			
B547	MOSAGAWEYN	4/9/83	4.1	4.4	4.3	0.6	3.9	7.3	0.5	13.4	11.7	6.8
			30.6	32.8	32.1	4.5	33.3	62.4	4.3			
H4	HALGAN VILLAGE	14/2/84	8.6	11.1	17.7	0.3	29.5	6.1	8.5	37.7	44.1	7.8
			22.8	29.4	46.9	0.8	66.9	13.8	19.3			
H8	SIGALOW	14/2/84	18.2	10.9	8.4	0.3	12.0	5.6	24.7	37.8	42.3	5.6
H15			48.1	28.8	22.2	0.8	28.4	13.2	58.4			
B544	WARIRIF	18/2/84	3.5	3.4	5.6	0.1	3.0	5.2	6.5	12.6	14.7	7.7
			27.8	27.0	44.4	0.8	20.4	35.3	44.2			
H9	MAREER GUR	4/82	8.9	8.0	12.3	0.7	24.2	2.8	19.0	29.9	46.0	21.2
UN435			29.8	26.8	41.1	2.3	52.6	6.1	41.3			
UN440	GODIN LABE	4/82	28.8	14.9	5.6	0.7	12.4	3.2	9.4	50.0	25.0	33.3
			57.6	29.8	11.2	1.4	49.6	12.8	37.6			
M3	GOWLALLO	4/82	15.5	13.7	8.3	0.5	18.8	2.2	12.8	38.0	33.8	5.8
			40.8	36.1	21.8	1.3	55.6	6.5	37.9			
B545	QARGOIE	4/82	32.5	10.3	5.9	0.9	7.6	3.0	40.0	49.0	50.6	1.0
			65.6	20.8	11.9	1.8	15.0	5.9	79.1			
B546	GANA FALLE	4/82	35.0	5.0	2.7	1.0	5.0	2.8	34.0	43.7	41.8	2.2
			80.1	11.4	6.2	2.3	12.0	6.7	81.3			
M8	BALLI BUSLE	4/82	16.0	12.3	12.3	0.4	27.5	5.4	15.8	41.0	48.7	8.6
UN42			39.0	30.0	30.0	1.0	56.4	11.1	32.4			
B560	JIRIBEN	4/82	4.6	1.9	4.3	0.5	6.6	4.2	2.0	11.3	12.8	6.2
			40.7	16.8	38.1	4.4	51.5	32.8	15.6			
B561	EL HAMMER	4/82	3.8	1.2	1.9	0.1	3.9	4.8	1.0	7.0	9.7	16.2
			54.3	17.1	27.1	1.4	40.2	49.5	10.3			
B562	GARCADO	4/82	10.6	22.2	13.3	1.9	94.1	7.6	13.6	48.1	115.3	41.1
			22.0	46.4	27.7	4.0	81.6	6.6	11.8			

Table A5.5 (Cont.)

Sample No.	Location	Date	Ca	Mg	Na	K	Cl	HCO_3	SO_4	Cat	An	%E
B563	AF BARWAAQO	4/82	34.4	12.8	13.3	1.7	21.1	2.8	44.1	62.0	68.0	4.5
			55.5	20.3	21.5	2.7	31.0	4.1	64.8			
B564	HOBBIO	4/82	6.1	12.7	11.9	1.9	20.2	2.2	11.1	32.6	33.5	1.4
			18.7	39.0	36.5	5.8	60.3	6.6	33.1			
B565	XARARDHEEERE	4/82	4.6	3.9	13.3	0.3	16.1	8.9	7.6	22.1	32.6	19.2
			20.8	17.6	60.2	1.4	49.4	27.3	23.3			
M4	GALCAIO	4/5/84	24.7	17.8	4.3	0.3	6.3	3.1	39.9	47.1	49.3	2.3
			52.4	37.8	9.1	0.6	12.8	6.3	80.9			
B556	WARGALEH	3/5/84	32.0	9.3	2.6	0.5	4.7	4.6	37.6	44.4	46.9	2.7
			72.1	20.9	5.9	1.1	10.0	9.8	80.2			
B557	WARGALEH	13/5/84	43.4	18.3	13.7	0.7	35.5	6.0	40.8	76.1	82.3	3.9
			57.0	24.0	18.0	0.9	43.1	7.3	49.6			
G16	DOCOL	13/5/84	19.5	15.7	6.4	0.4	9.5	4.1	29.5	42.0	43.1	1.2
			46.4	37.4	15.2	1.0	22.0	9.5	68.5			

Table A5.6

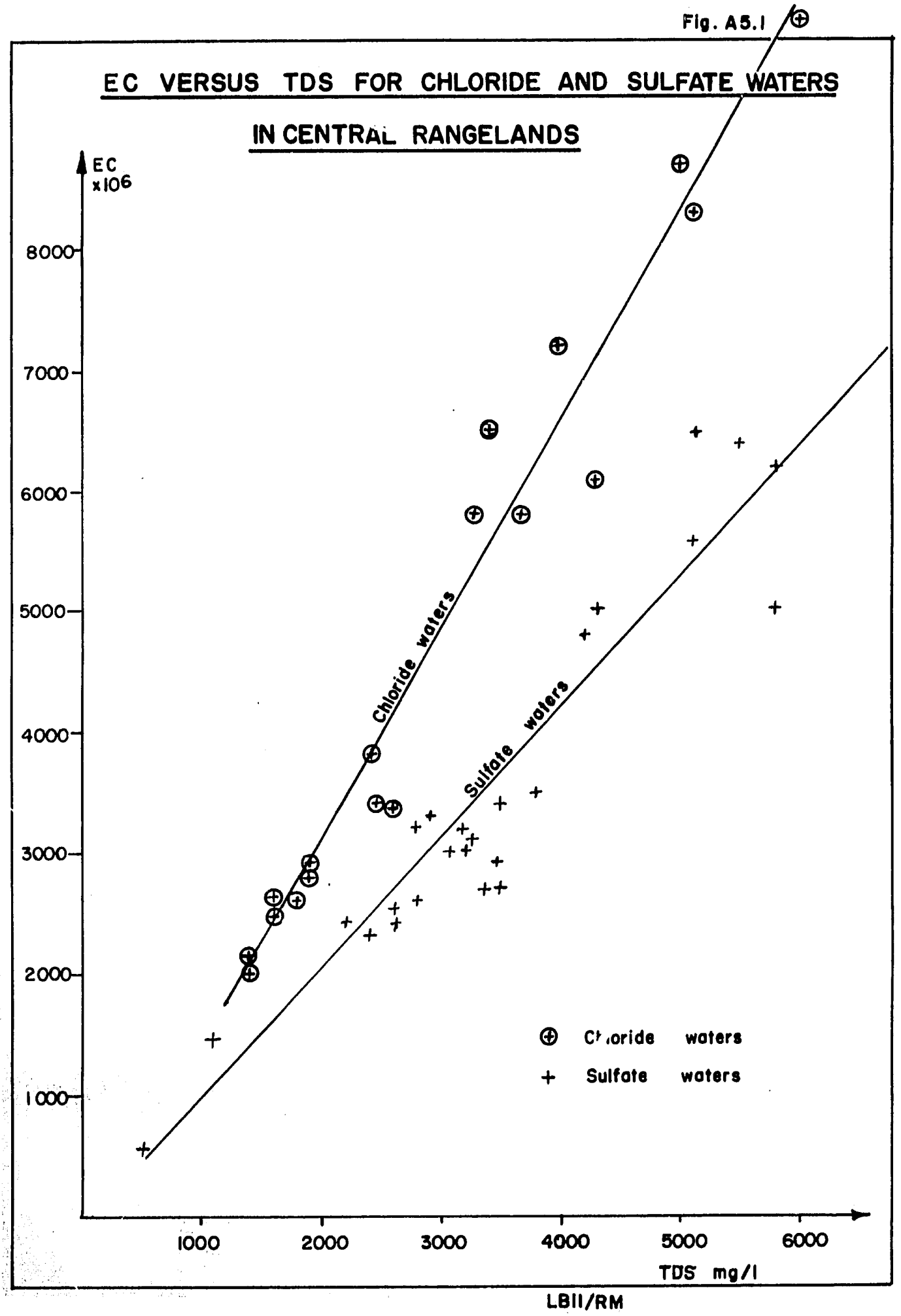
NITRATES & FLOURIDES IN THE CENTRAL RANGELAND

Location	Date	mg/l NO_3-N	F	Water Source
QARDHO 1	14.2.81	7	2.3	Drilled well
QARDHO 2	14.2.81	7	2.4	Drilled well
QARDHO	14.2.81	10	2.4	Drilled well
HALIN	14.2.81	nd.	2.8	Spring
GAROWE	15.2.81	nd.	3.0	Drilled well
GAROWE	15.2.81	7	1.5	Hand dug well
GAROWE	15.2.81	5	1.2	GTZ Drilled well
BURTINLE	16.2.81	2	2.6	Drilled well
BURIQAP	16.2.81	0.2	2.7	Drilled well
8 km N GALKAYO	16.2.81	2	2.7	Drilled well
HOTEL BULSHO	16.2.81	16	3.0	Hand dug well
GHELINSOR I	16.2.81	6	1.8	Drilled well
GHELINSOR II	16.2.81	5	1.7	Drilled well
ADADO	16.2.81	4	1.9	Drilled well
GODINLABE	16.2.81	nd.	1.1	Drilled well
DUSA MAREB I	16.2.81	8	0.8	Drilled well
DUSA MAREB II	16.2.81	4	1.2	Drilled well
AWSWEYNE	17.2.81	0.2	2.2	Drilled well
GALACAD	17.2.81	5	1.6	Drilled well
MAREER-GUR	5.4.82	7	0.5	Drilled well
GODINLABE	5.4.82	7	0.3	Hand dug well
CADADO	5.4.82	5	0.8	Drilled well

Table A5.6 (Cont.)

Location	Date	mg/l NO_3-N	F	Water Source
GALINSOR	5.4.82	20	-	Drilled well
GOWLALLO	6.4.82	16	0.8	Drilled well
QARGOIE	6.4.82	7	1.8	Hand dug well
GANA FALLE	8.4.82	8	1.4	Hand dug well
BALLI BUSLE	8.4.82	0.2	0.8	Drilled well
JIRIBAN	9.4.84	13	0.2	Dug well
EL HAMMER	9.4.84	1	0.3	Dug well
GARCADO	9.4.82	43	0.5	Hand dug well
HOBBIO	10.4.82	51	1.7	Dug well
XARAR DHEERE	10.4.82	4	0.4	Hand dug well
MOQOREEY	9.2.83		0.39	Drilled well
SHABELLI RIVER	9.2.83		0.45	Surface water
BUGDA I	10.2.83		2.7	Hand dug well
BUDGA II	10.2.83		2.5	Hand dug well
ABOOREY	9.2.83		0.10	Drilled well
BUULO BERDI	9.2.83		0.44	Drilled well

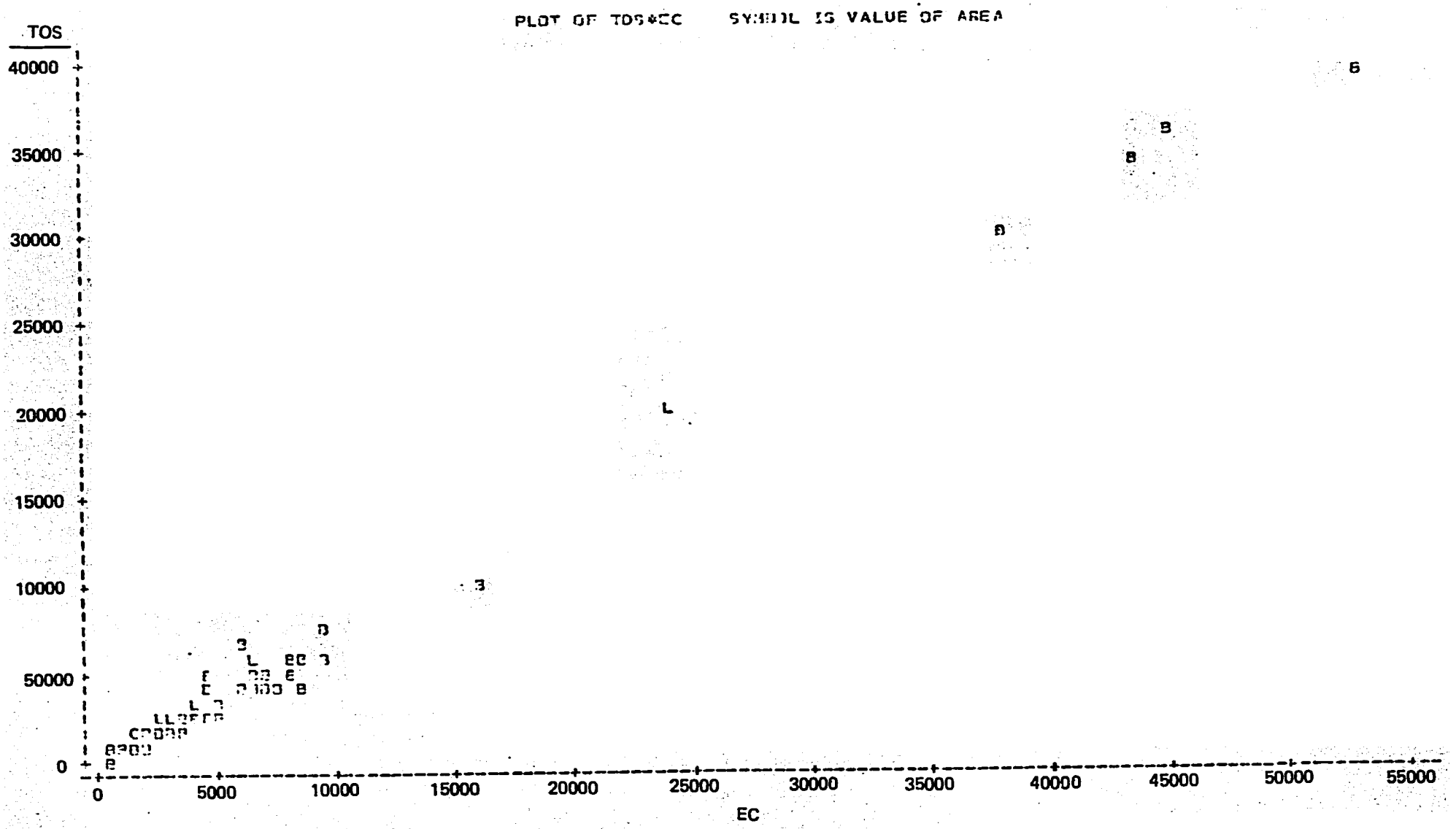
Fig. A5.1



LBII/RM

Water quality of Somali wells

Figure A.5.2

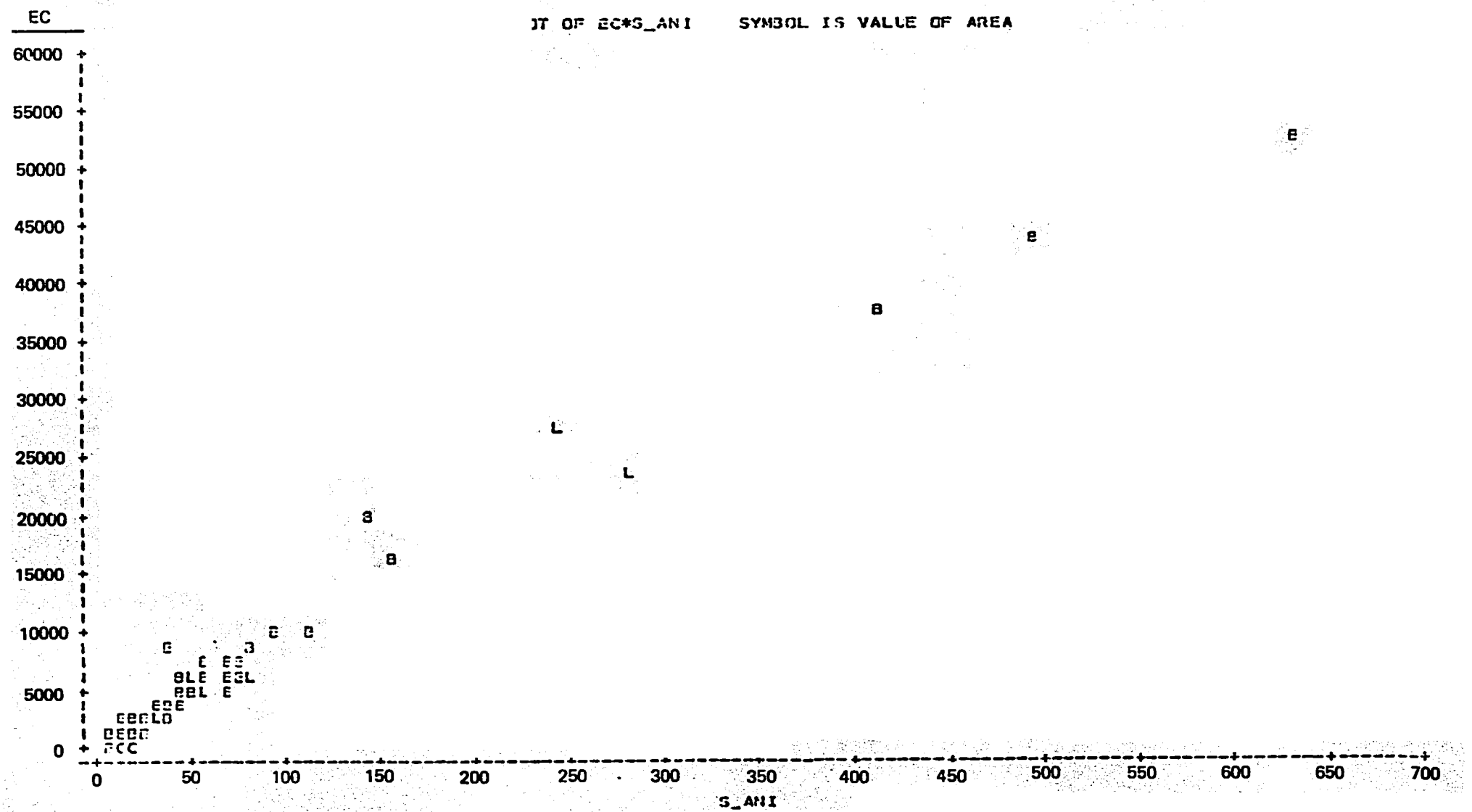


NOTE: 21 OBS HAD MISSING VALUES 50 OBS HIDDEN

Water quality of Somali wells

S_ANI=S04/42+HCO3/61+CL/35.5

Figure A.5.2A

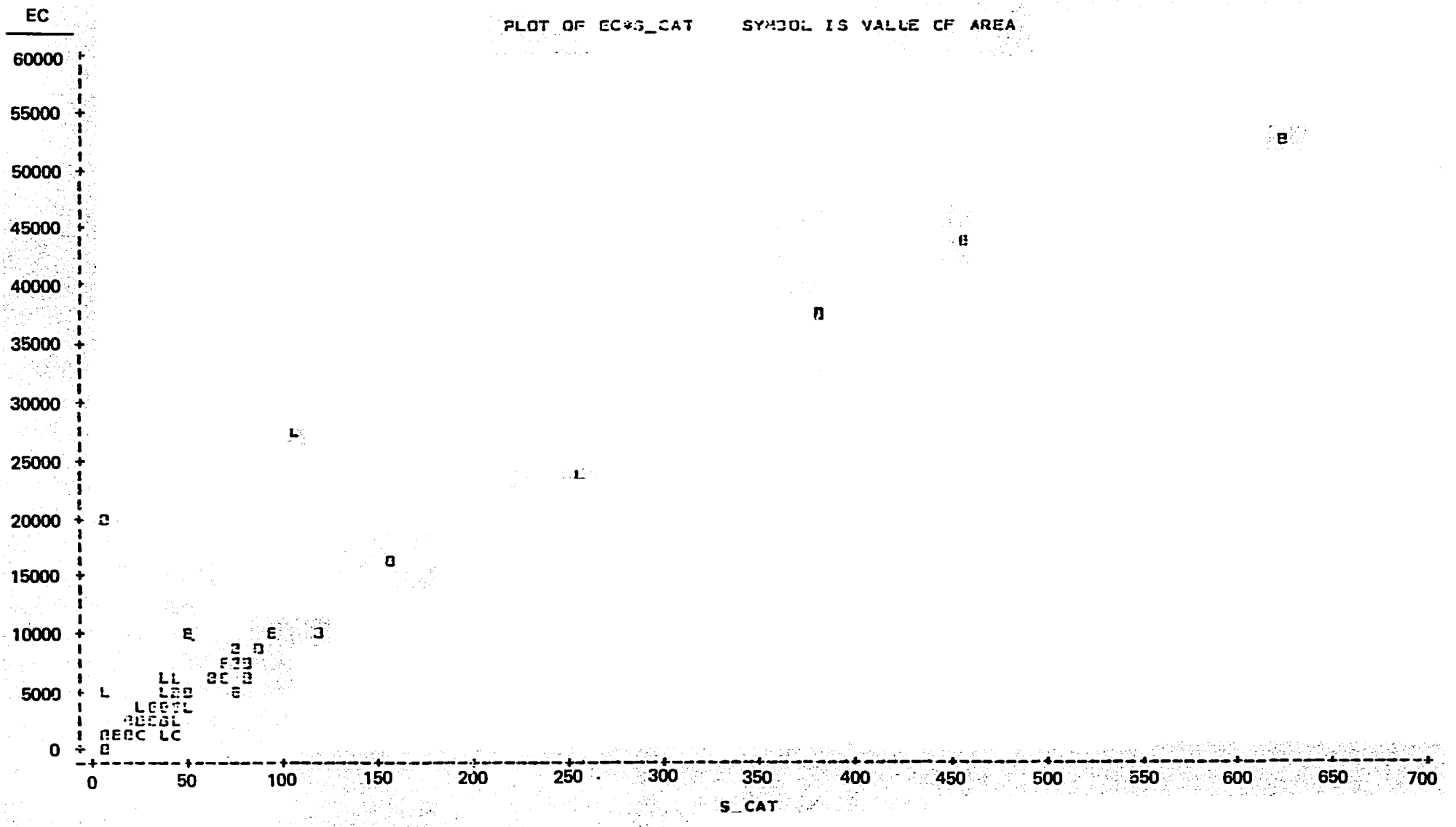


NOTE: 1 OBS HAD MISSING VALUES 70 OBS HIDDEN

Water quality of Somali wells

S_CAT=MG/12.16+CA/20.04+NA/23+K/39.1

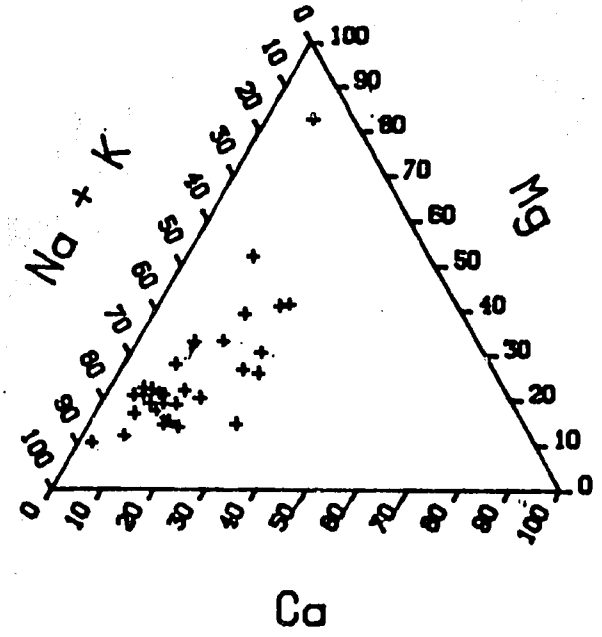
Figure A5.2B



NOTE: 13 OBS HAD MISSING VALUES 55 OBS HIDDEN

Figure A.5.5. Ionic composition of the Qc-area in the geological map (See Plate 15)

Central Rangeland Qc



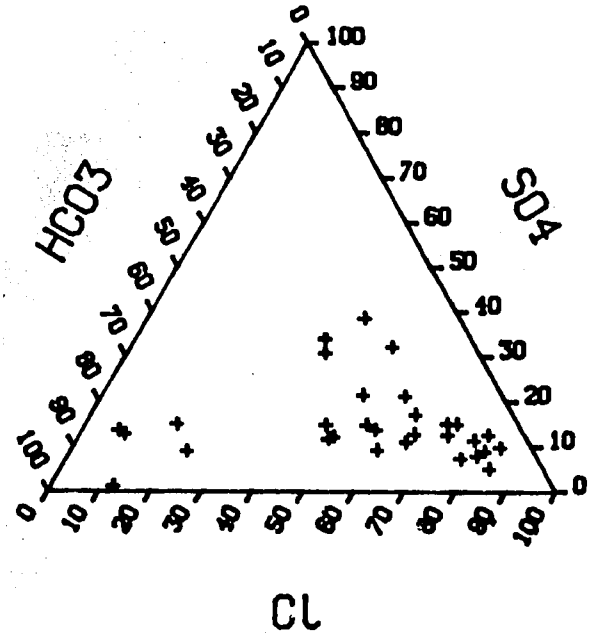
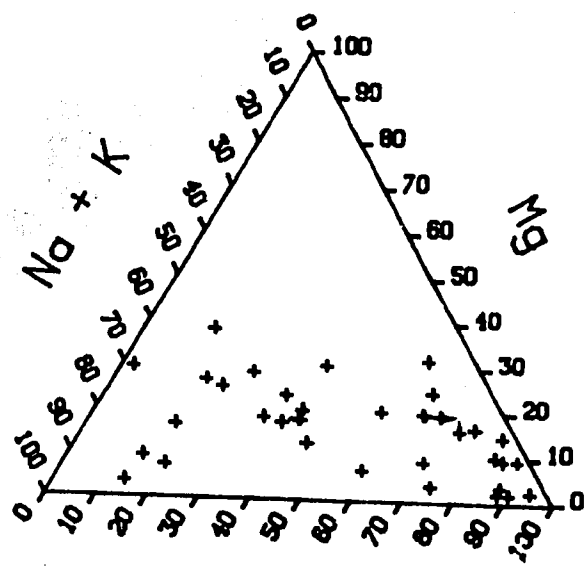


Figure A.5.6 Ionic composition of the Et-area in the geological map (See Plate 15)

Central Rangeland Et



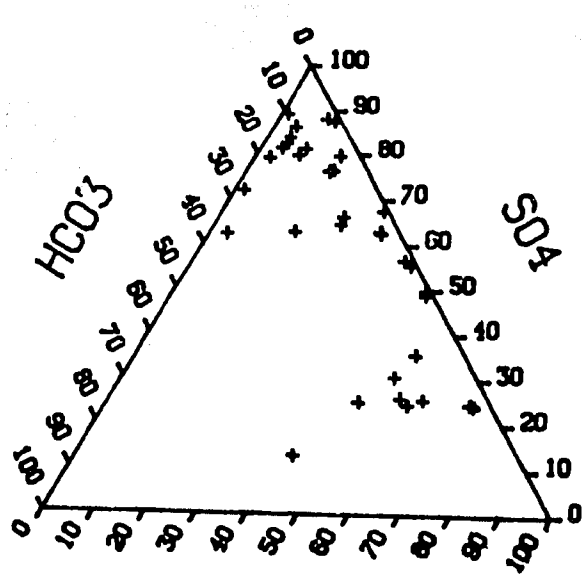
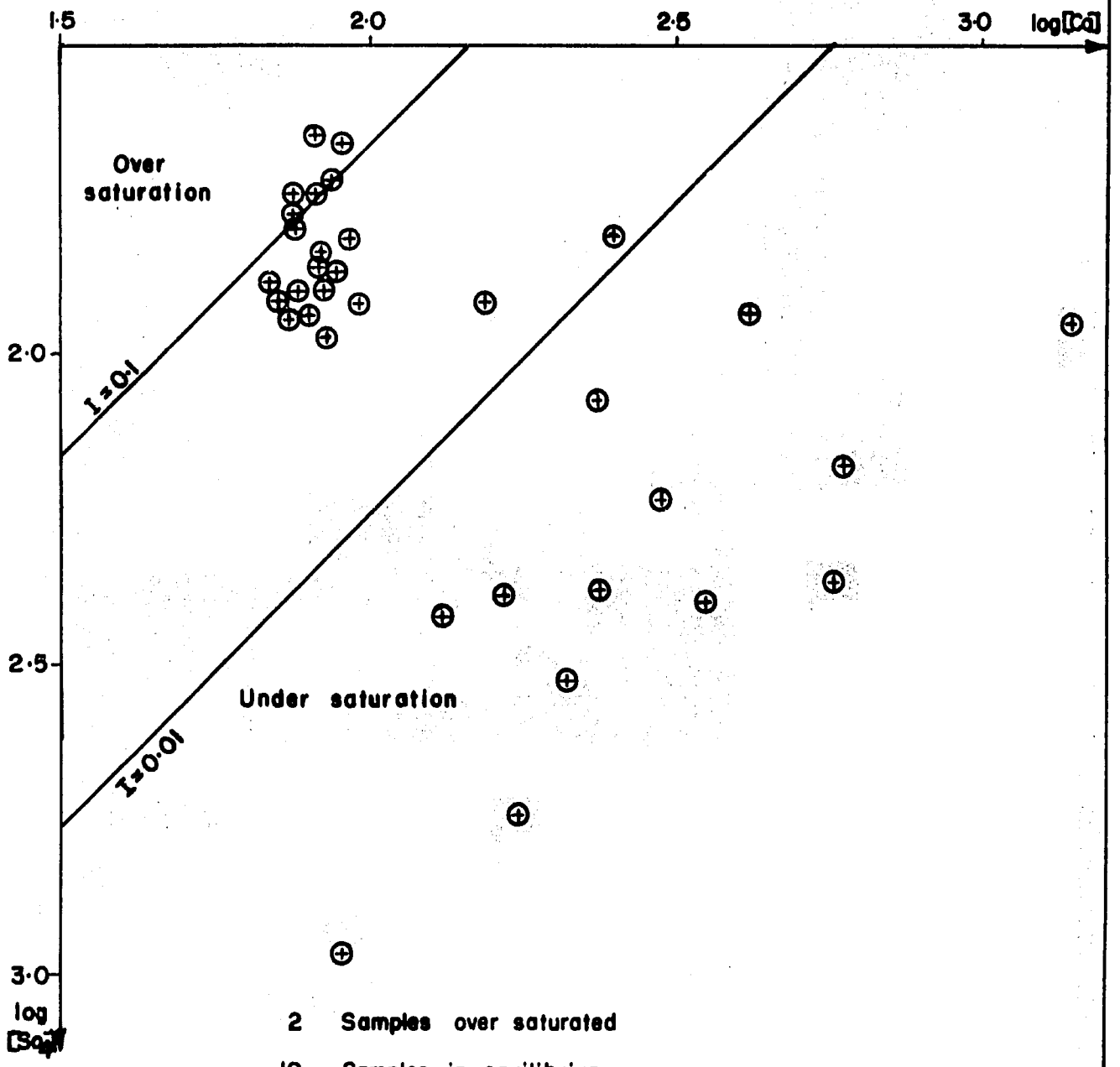


Fig. A5.7

RELATIONS BETWEEN CALCIUM AND SULFATE IN THE Et- AREA OF THE CENTRAL RANGELANDS

Log [x] = Log mol/l of x

I = Ionic strength



2 Samples over saturated

19 Samples in equilibriun

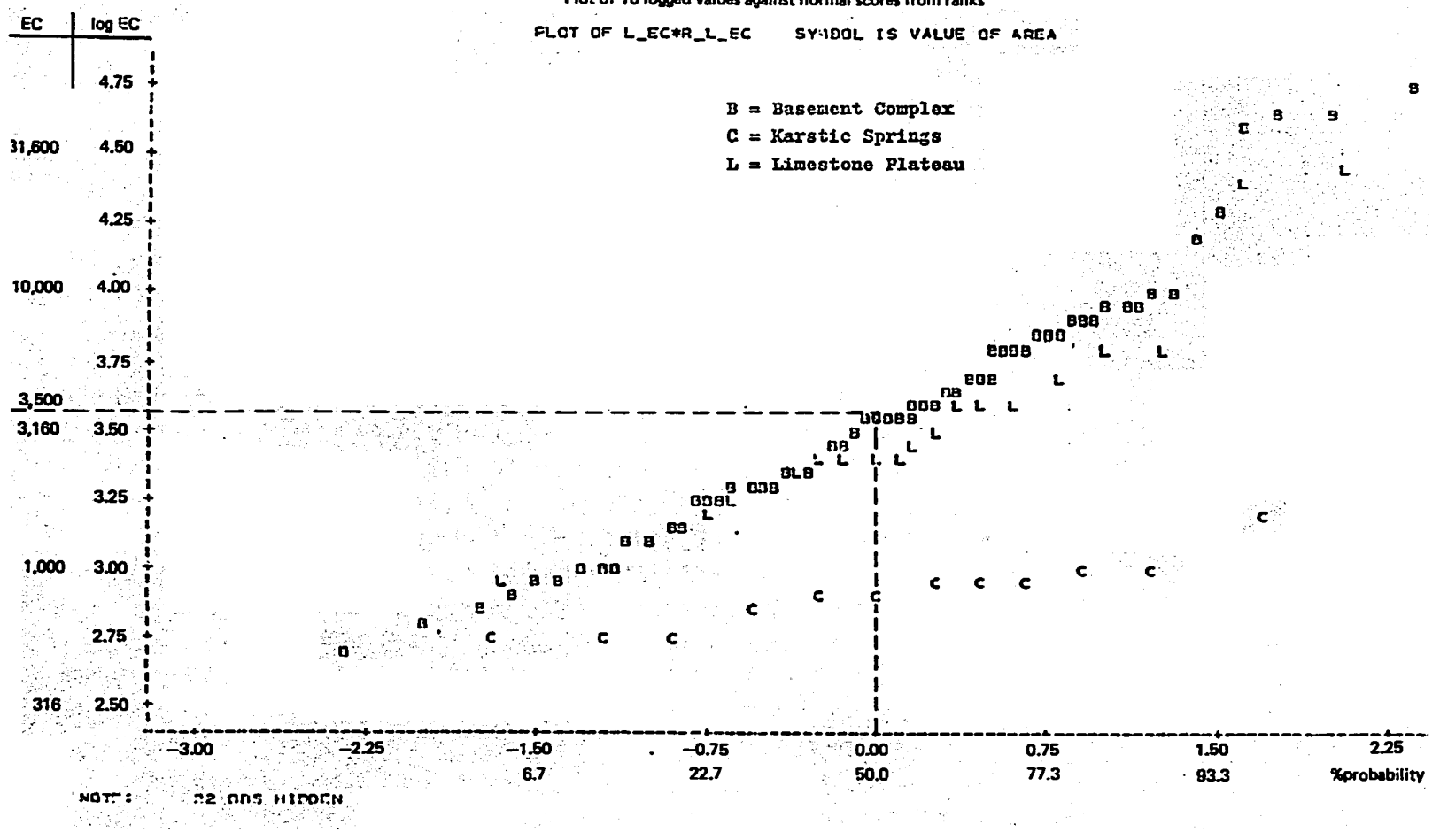
13 Samples under saturated

LBII / RM

Water quality of Somali wells

Plot of 10 logged values against normal scores from ranks

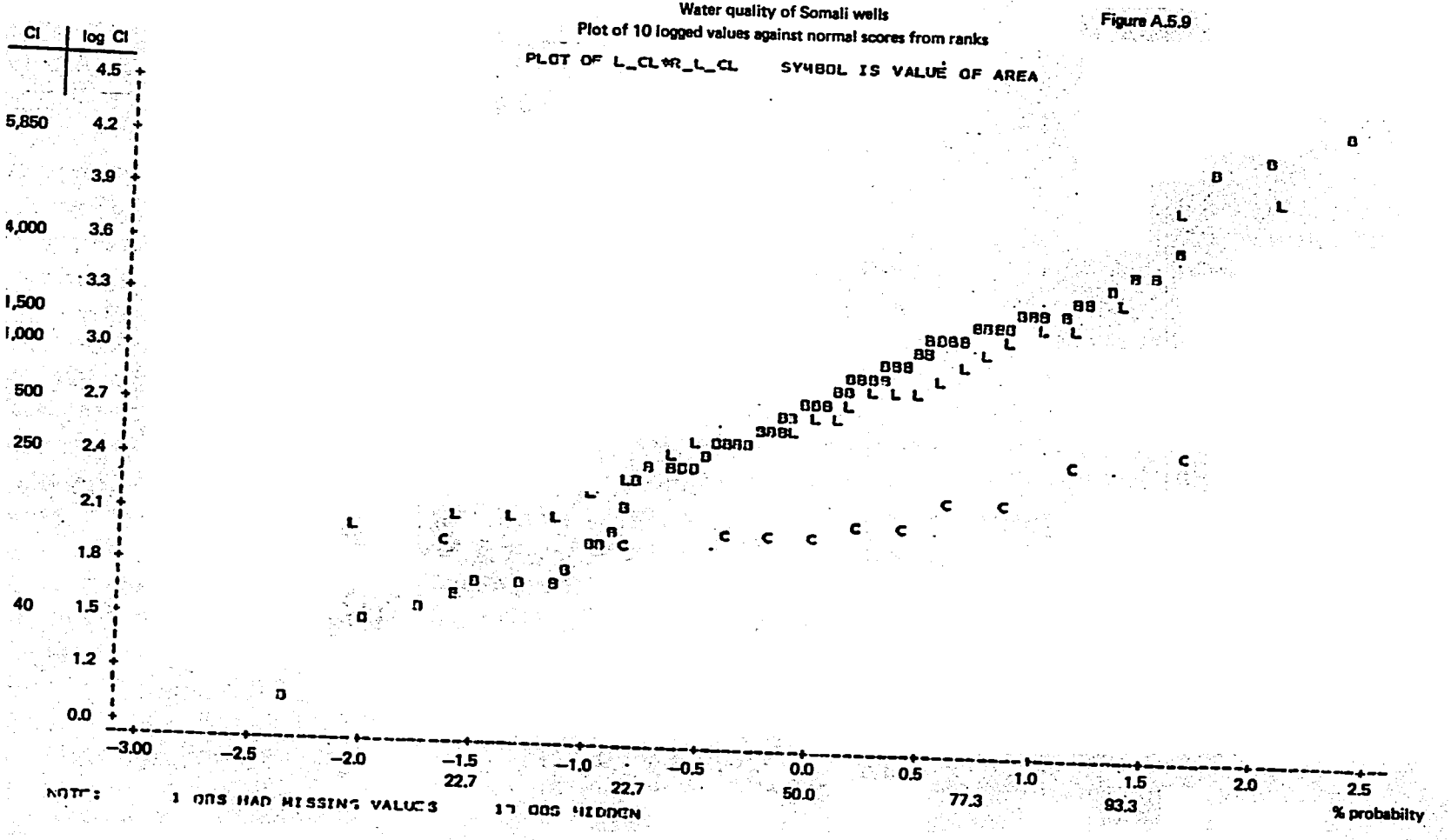
Figure A.5.8



Water quality of Somali wells

Plot of 10 logged values against normal scores from ranks

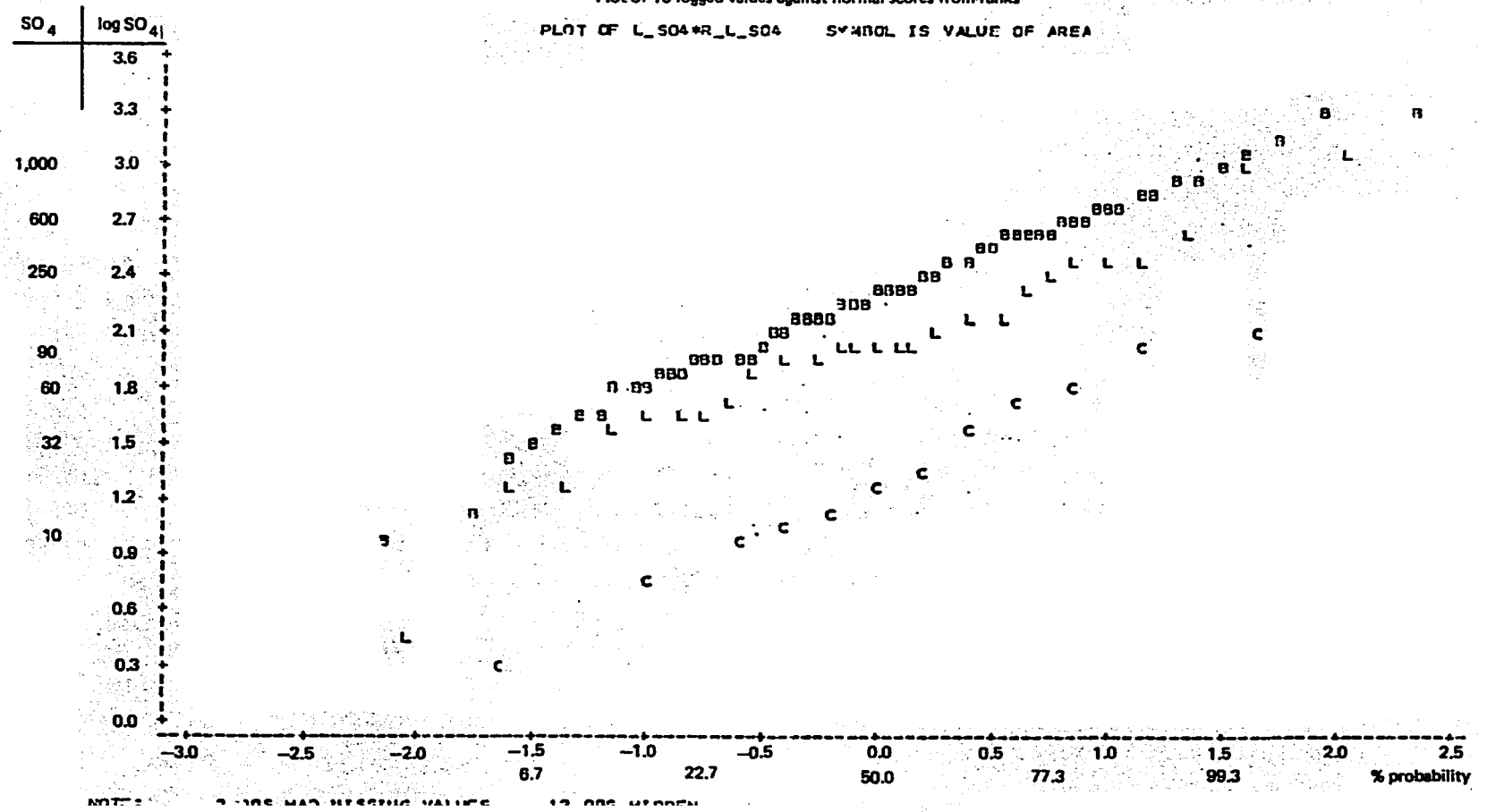
Figure A.5.9



Water quality of Somali wells

Plot of 10 logged values against normal scores from ranks

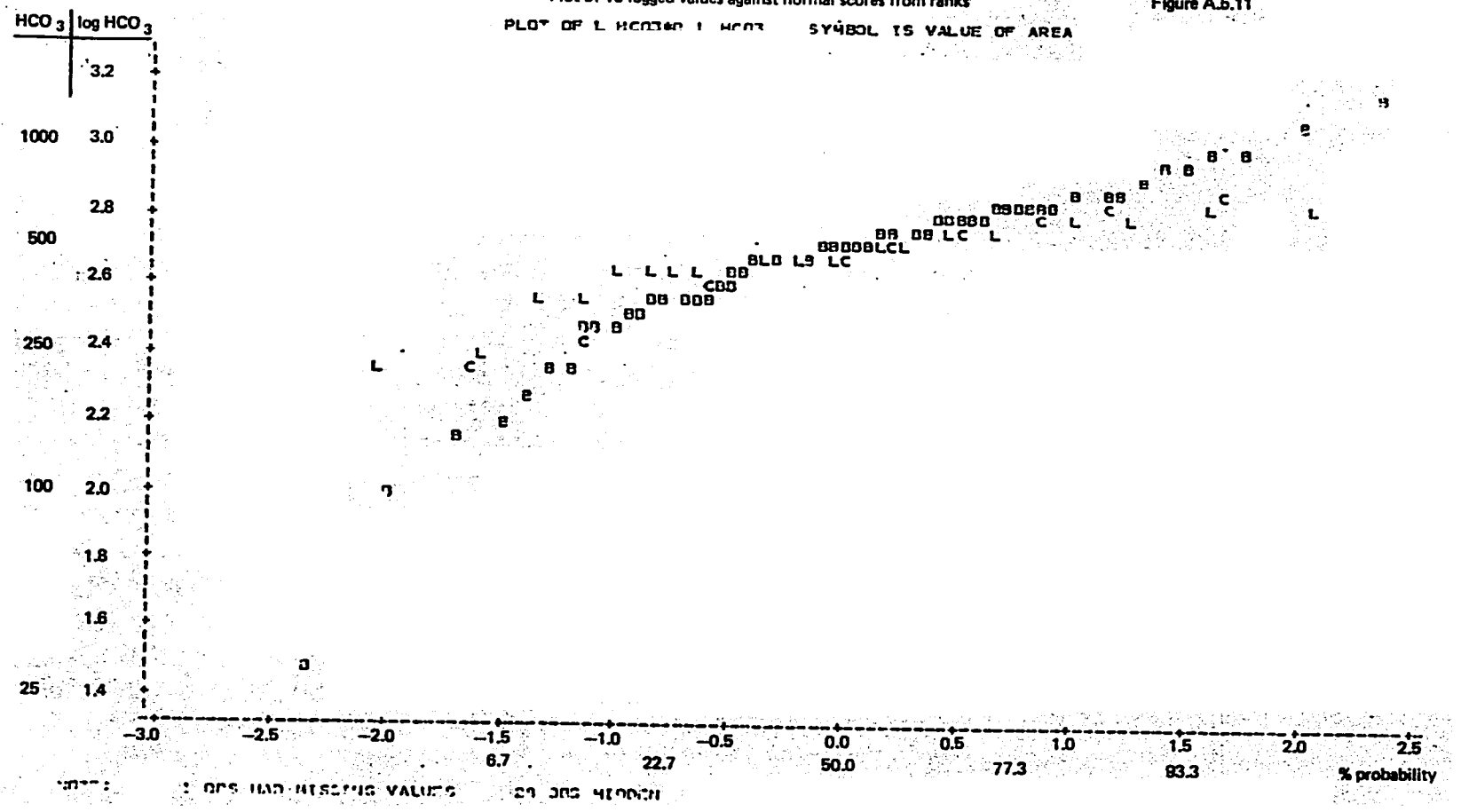
Figure A.5.10



Water quality of Somali wells

Plot of 10 logged values against normal scores from ranks

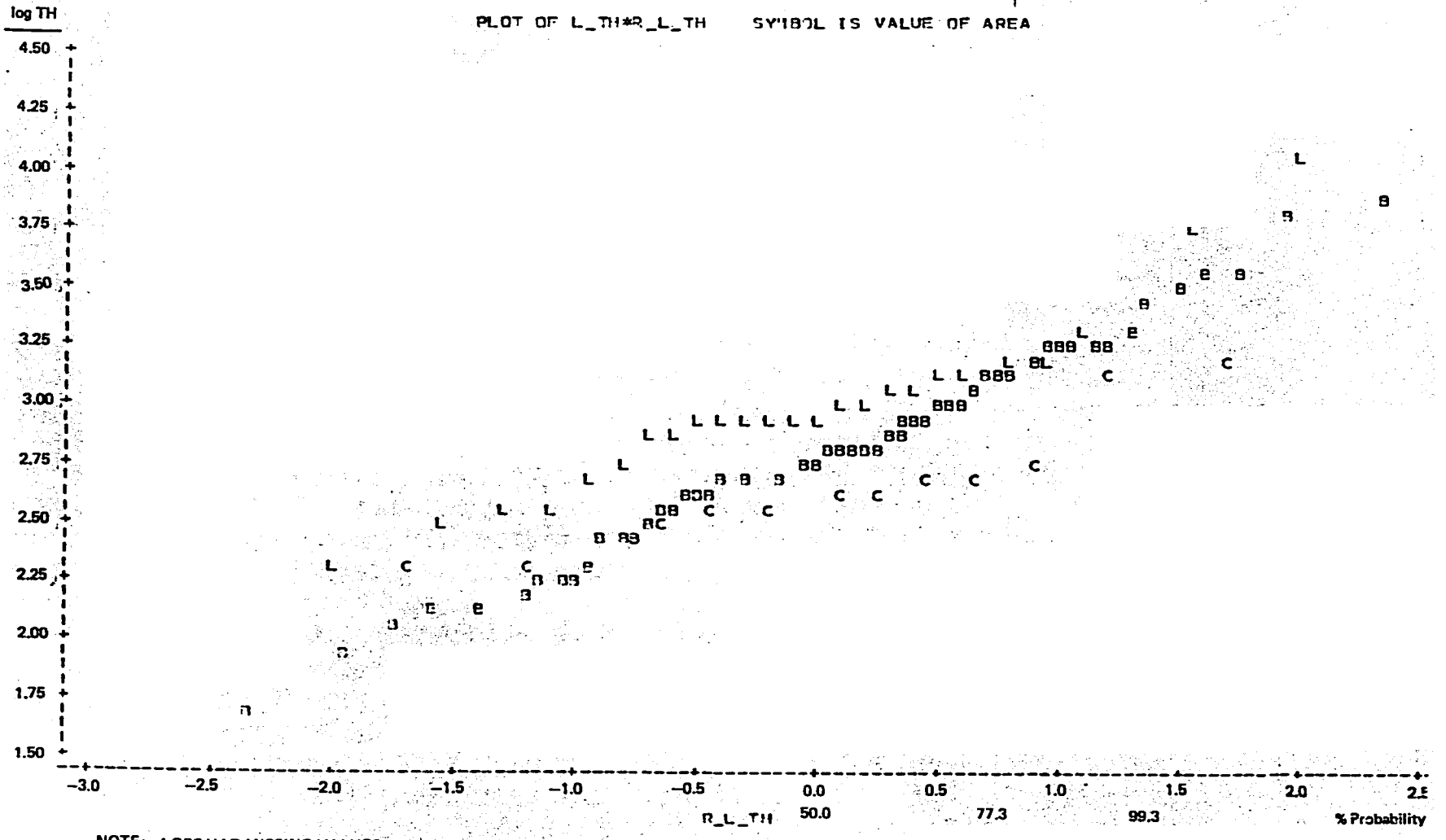
Figure A.5.11



Water quality of Somali wells

Plot of 10 logged values against normal scores from ranks

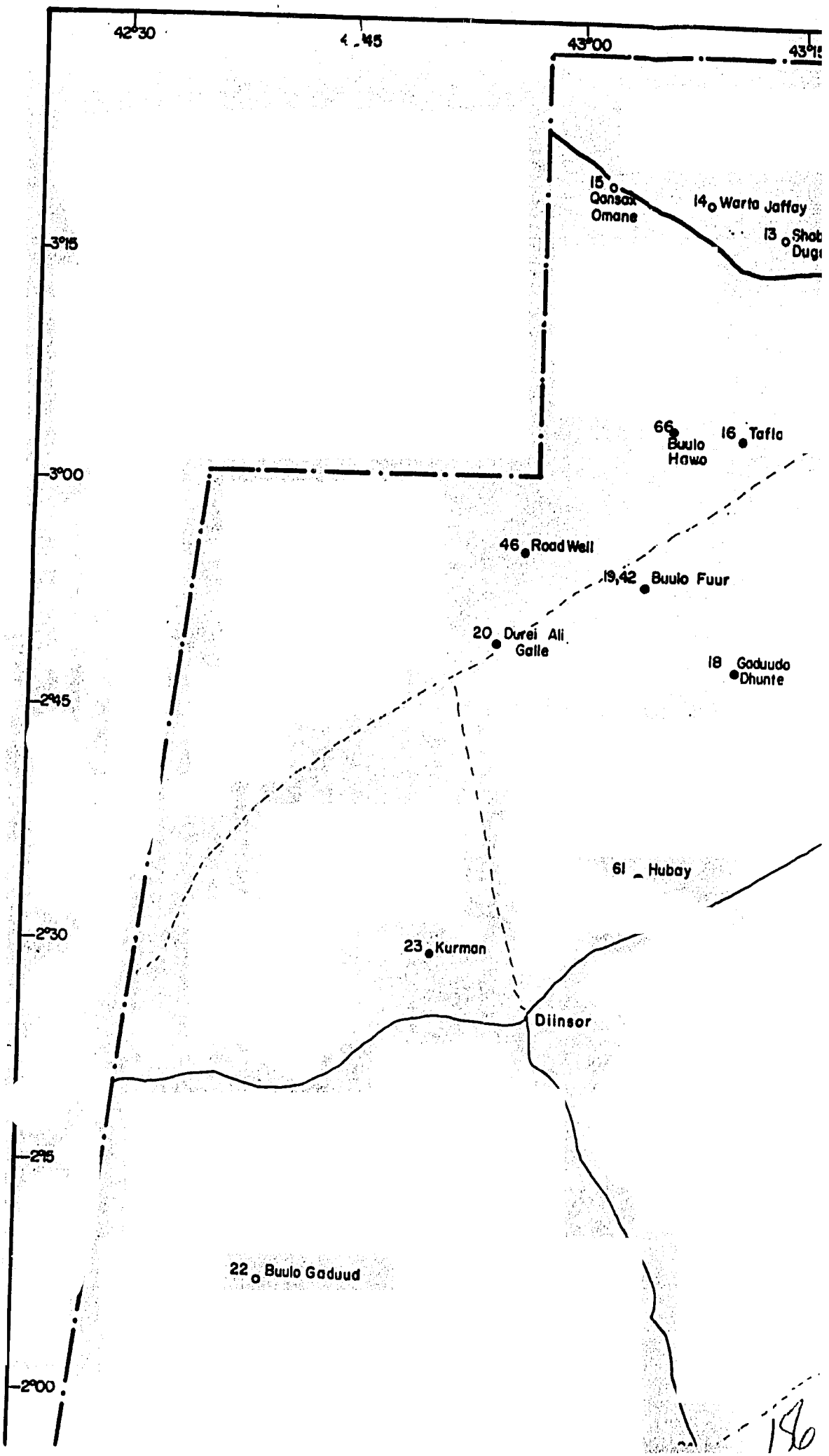
Figure A.5.12



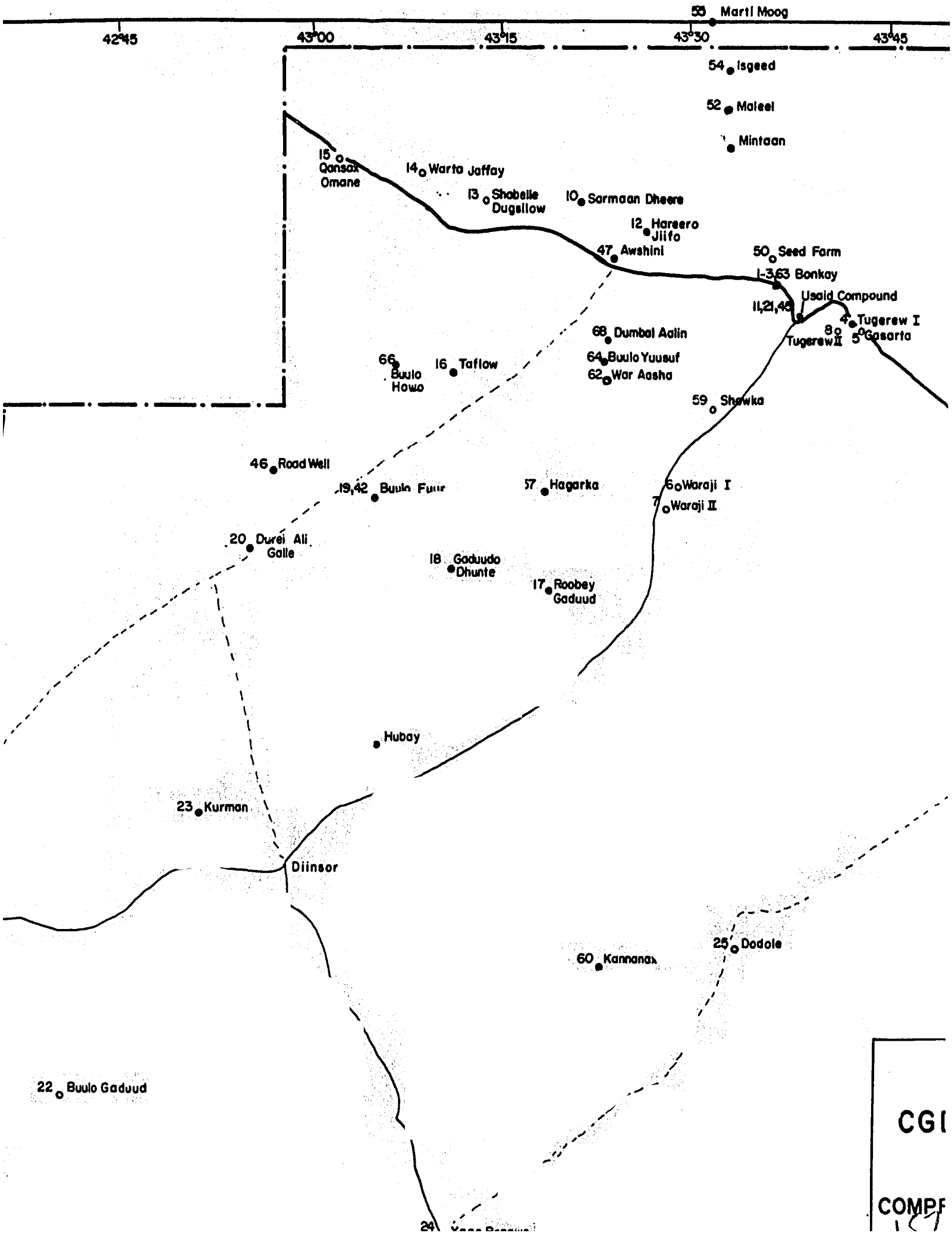
NOTE: 4 OBS HAD MISSING VALUES 16 OBS HIDDEN

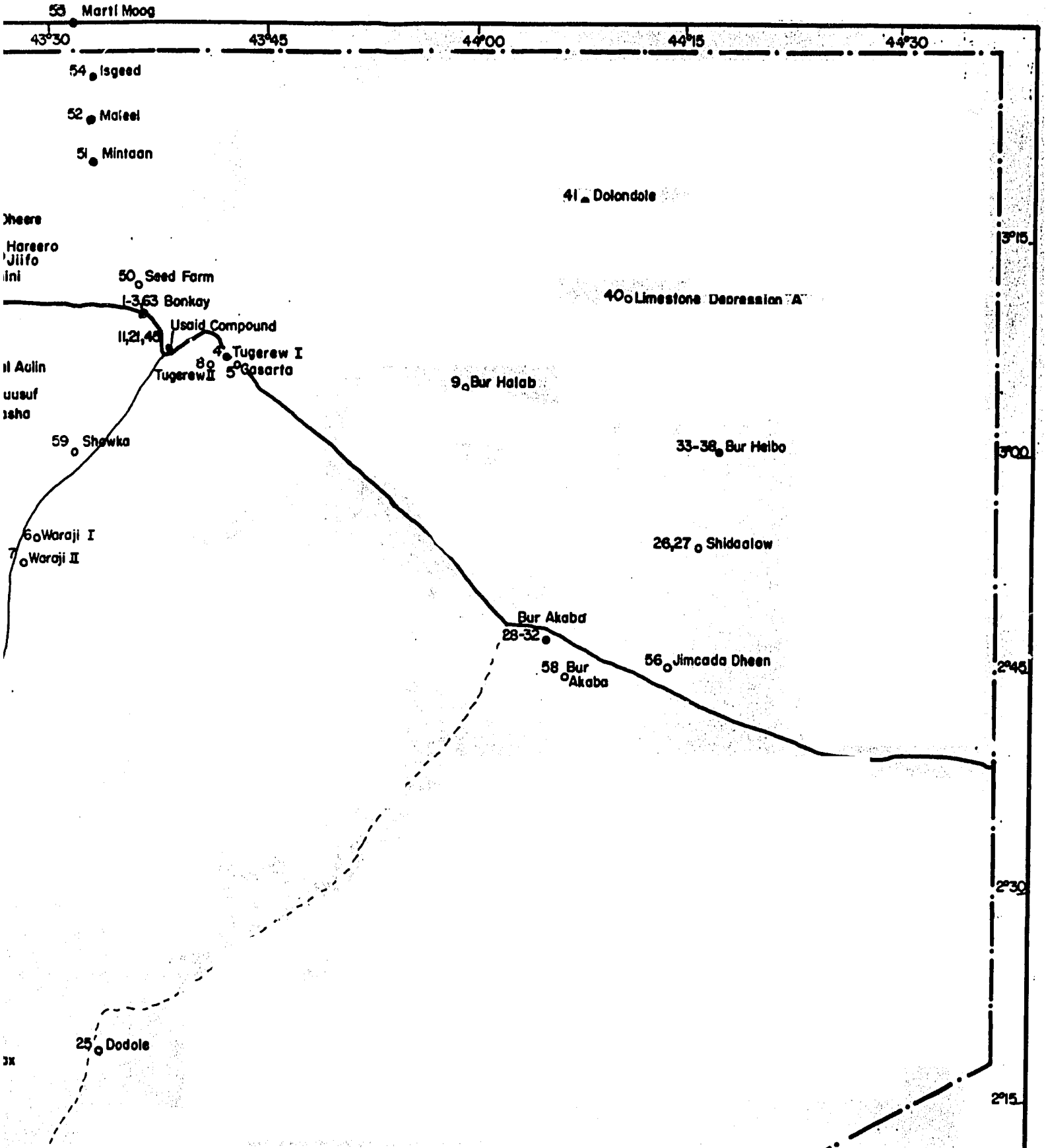
A5A Maps (PLATES INSERTED IN JACKET POCKETS)

155


42°30
43°00
3°15
3°00
2°45
2°30
2°15
2°00
15 Qansax Omane
14 Warta Jaffay
13 Shab Duga
66 Buulo Hawo
16 Tafla
46 Road Well
19,42 Buulo Fuur
20 Durei Ali Galle
18 Gaduudo Dhunte
61 Hubay
23 Kurman
Diinsor
22 Buulo Gaduud

186

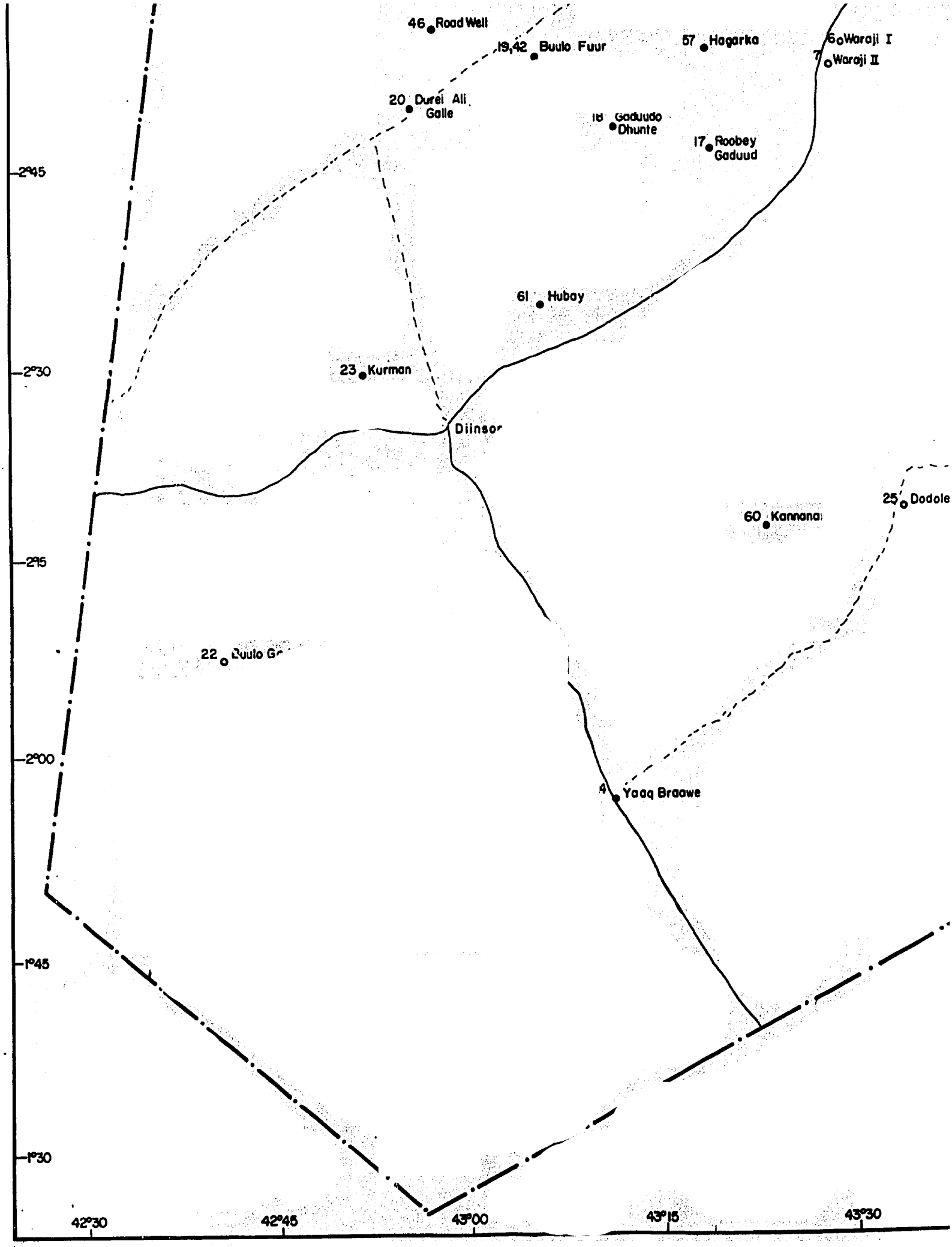

42°45
43°00
43°15
43°30
43°45
55 Martl Moog
54 Isgeed
52 Maleel
Mintaan
15 Qansax Omane
14 Warta Jaffay
13 Shabelle Dugsiiow
10 Sarmaan Dheere
12 Hareero Jiifo
47 Awshini
50 Seed Farm
1-3,63 Bonkay
Usaid Compound
11,21,45
4 Tugerew I
8
Tugerew II
5 Gasarta
68 Dumbal Aalin
64 Buulo Yuusuf
62 War Aasha
66 Buulo Howo
16 Taflow
59 Shawka
46 Road Well
19,42 Buulo Fuur
57 Hagarka
6 Waraji I
7 Waraji II
20 Durei Ali Galle
18 Gaduudo Dhunte
17 Roobey Gaduud
Hubay
23 Kurman
Diinsor
25 Dodole
60 Kannanax
22 Buulo Gaduud
24

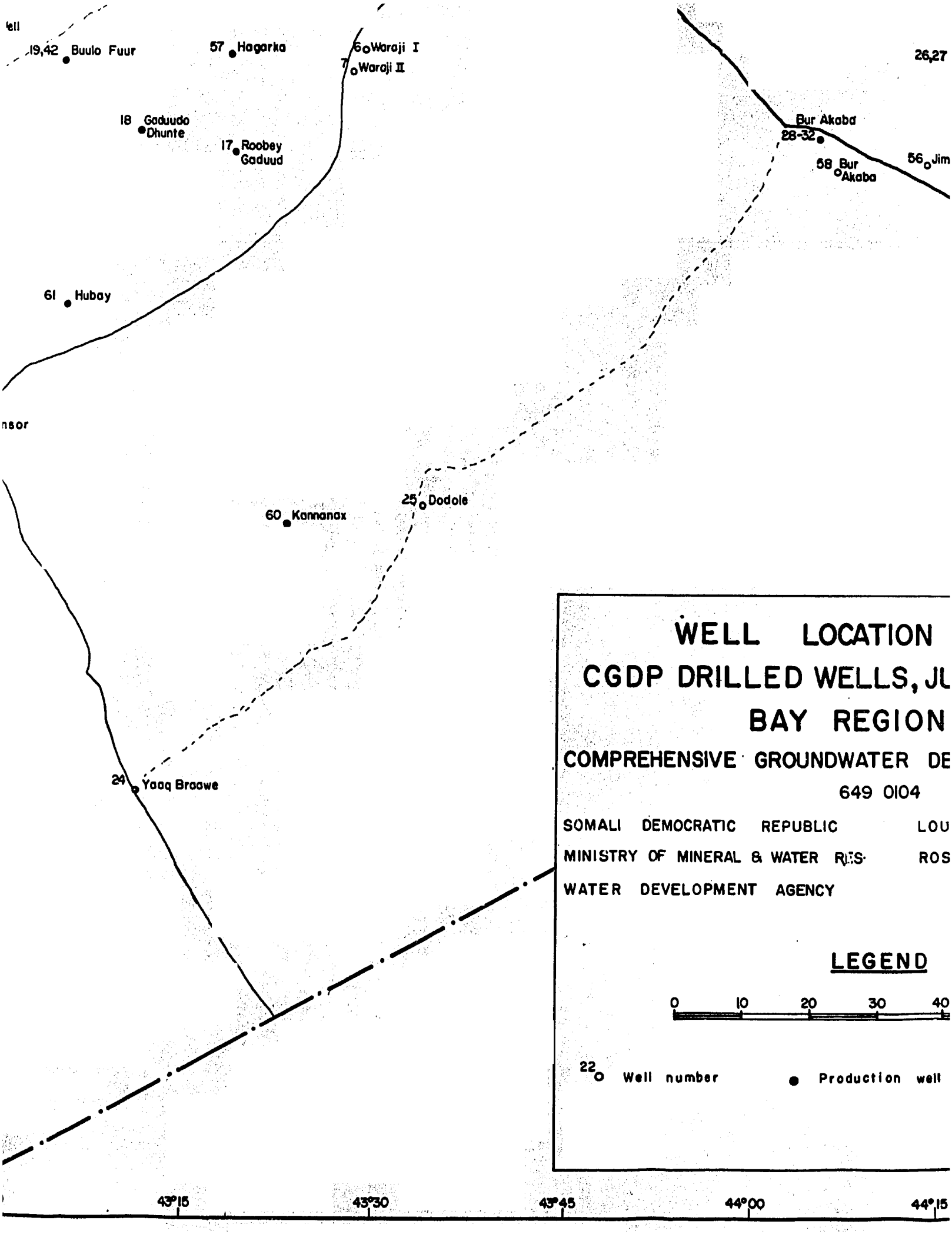


WELL LOCATION MAP

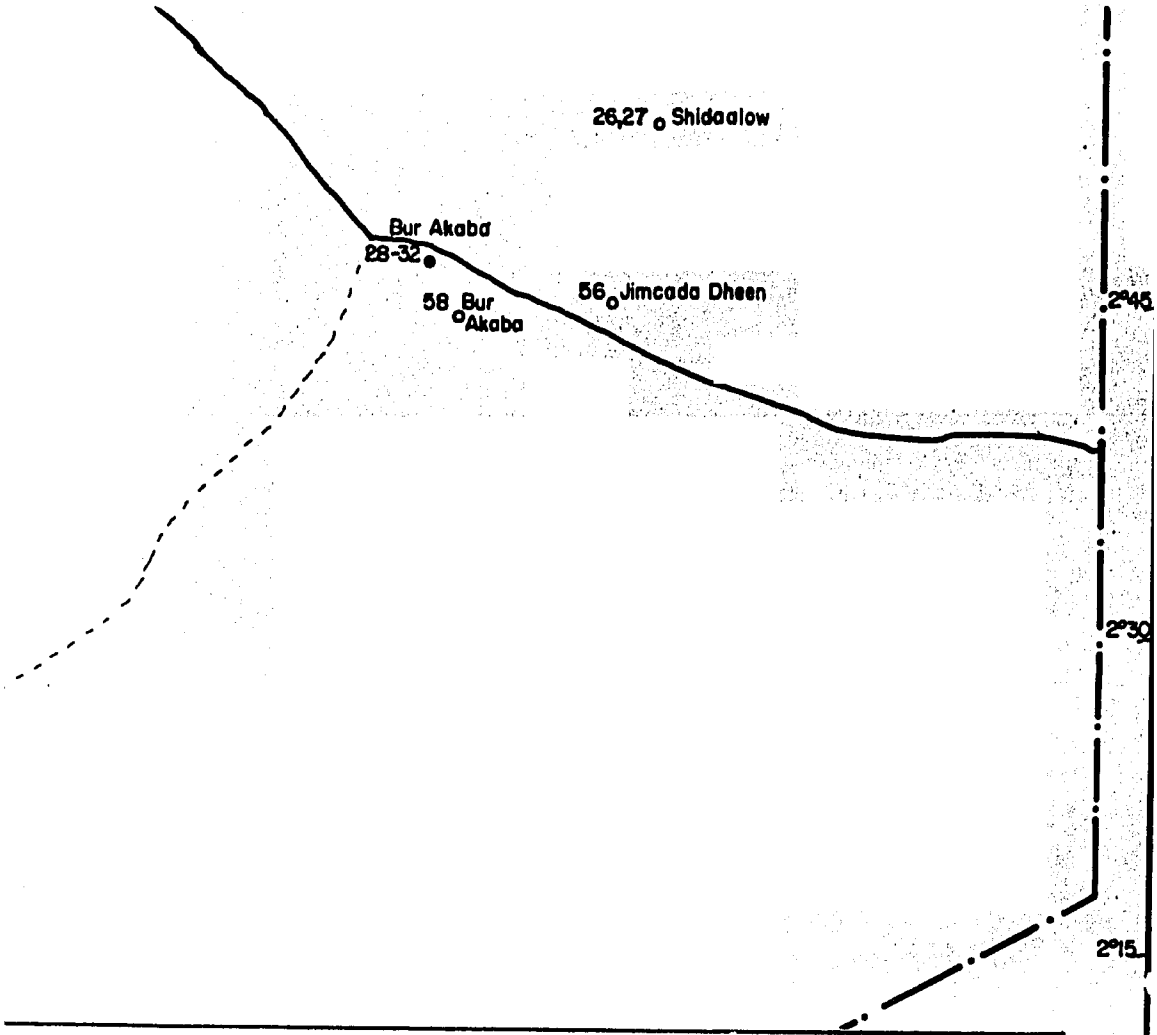
CGDP DRILLED WELLS, JULY 1981-JUNE 1984, BAY REGION

COMPREHENSIVE GROUNDWATER DEVELOPMENT PROJECT


46 Road Well
19,42 Buulo Fuur
57 Hagarka
6 Waraji I
7 Waraji II
20 Durei Ali Galle
18 Gaduudo Dhunte
17 Roobey Gaduud
61 Hubay
23 Kurman
Diinsor
25 Dodole
60 Kannana
22 Buulo G
4 Yaaq Braawe
2°45
2°30
2°15
2°00
1°45
1°30
42°30
42°45
43°00
43°15
43°30


19,42 Buulo Fuur
57 Hagarka
6 Waraji I
7 Waraji II
26,27
18 Gaduudo Dhunte
17 Roobey Gaduud
Bur Akaba
28-32
58 Bur Akaba
56 Jim
61 Hubay
nsor
25 Dodole
60 Kannanax
24 Yaaq Braawe
WELL LOCATION
CGDP DRILLED WELLS, JU
BAY REGION
COMPREHENSIVE GROUNDWATER DE
649 0104
SOMALI DEMOCRATIC REPUBLIC
LOU
MINISTRY OF MINERAL & WATER RES.
ROS
WATER DEVELOPMENT AGENCY
LEGEND
0 10 20 30 40
22 Well number
Production well
43°15
43°30
43°45
44°00
44°15

160



WELL LOCATION MAP
CGDP DRILLED WELLS, JULY 1981-JUNE 1984, BAY REGION

OMPREHENSIVE GROUNDWATER DEVELOPMENT PROJECT

649 0104

OMALI DEMOCRATIC REPUBLIC
INISTRY OF MINERAL & WATER RES
ATER DEVELOPMENT AGENCY

LOUIS BERGER INT'L INC
ROSCOE MOSS CO

2°00

1°45

LEGEND

0 10 20 30 40 50 60km

N

22 o Well number ● Production well o Test well

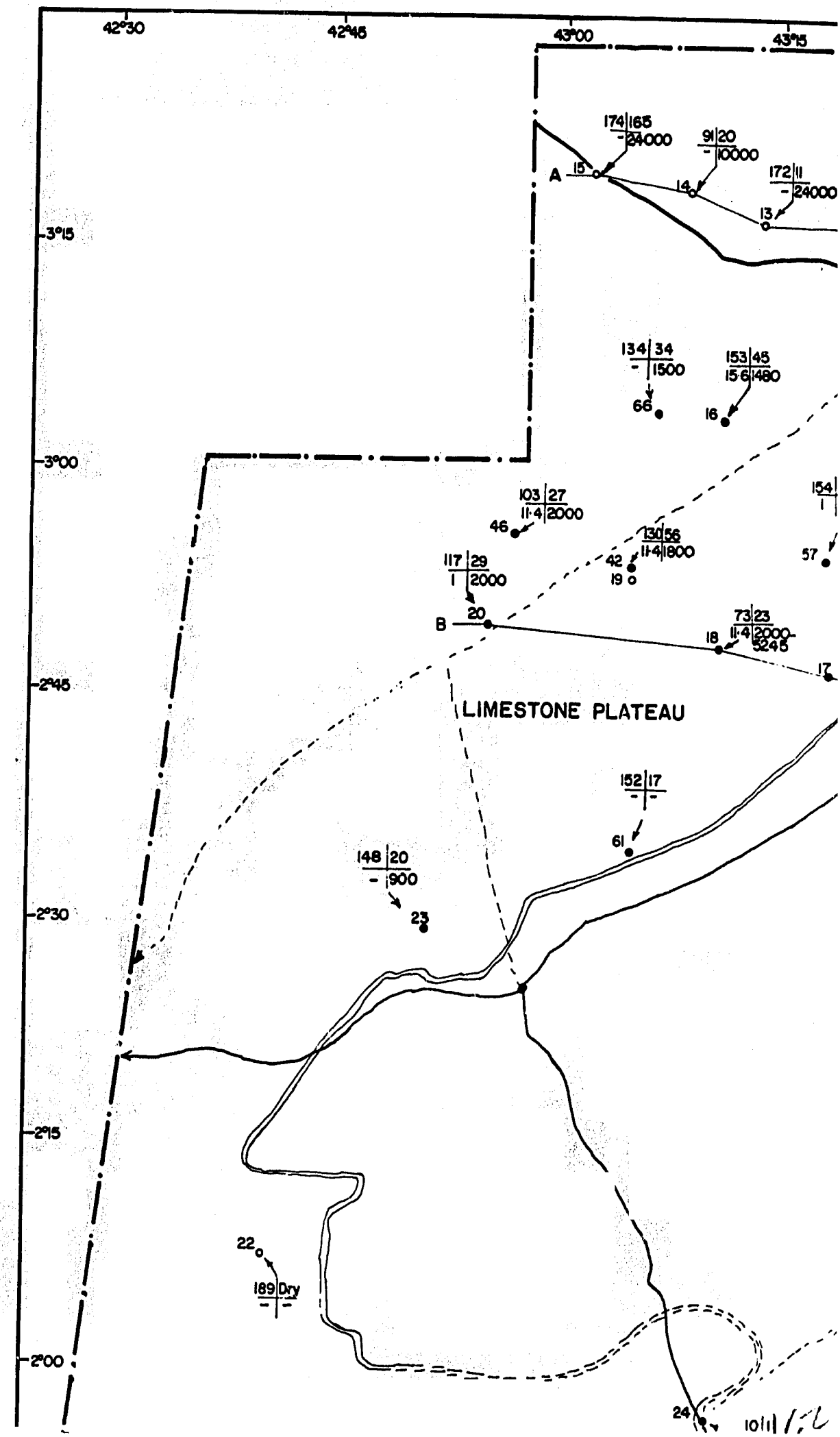
1°30

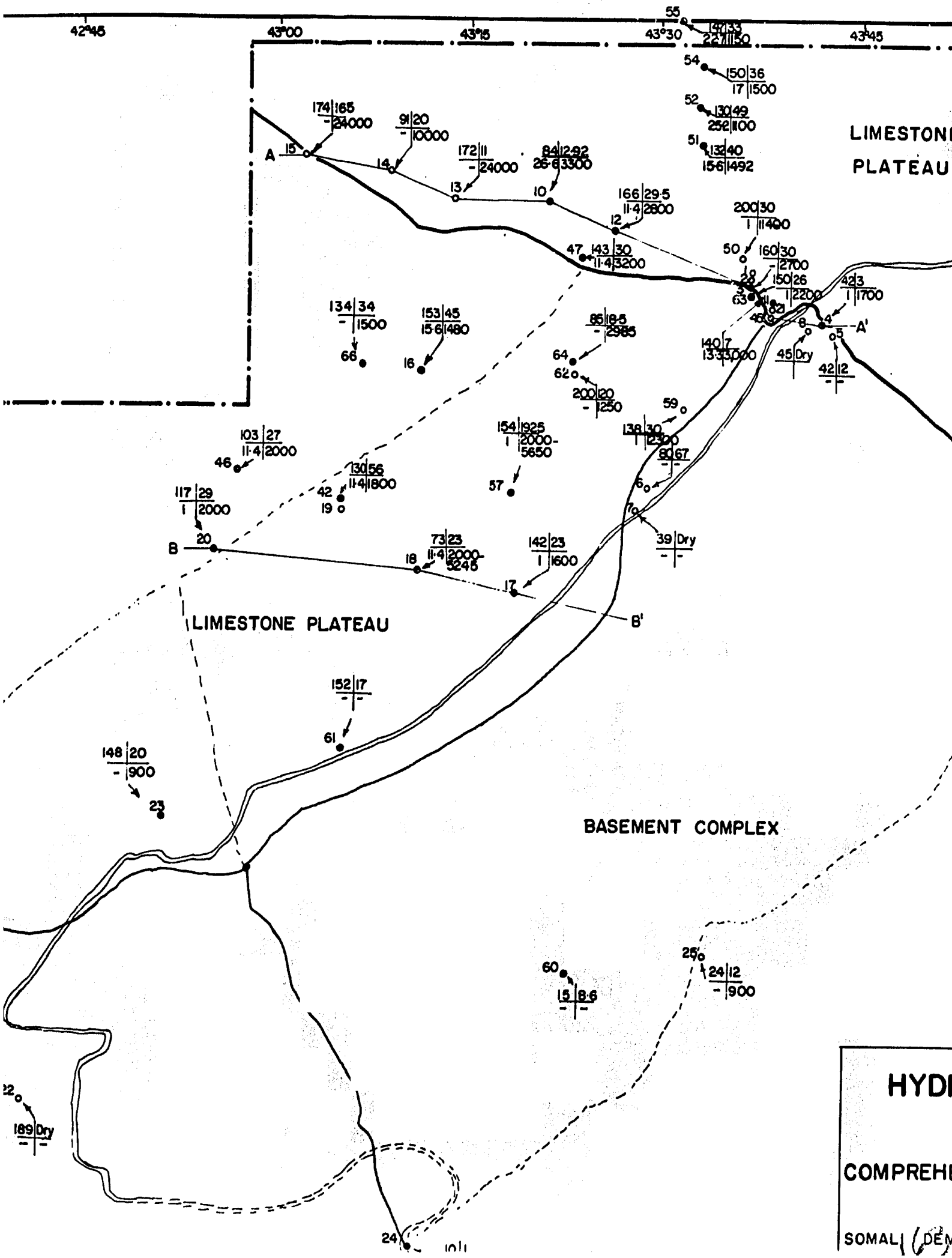
LB11/RM

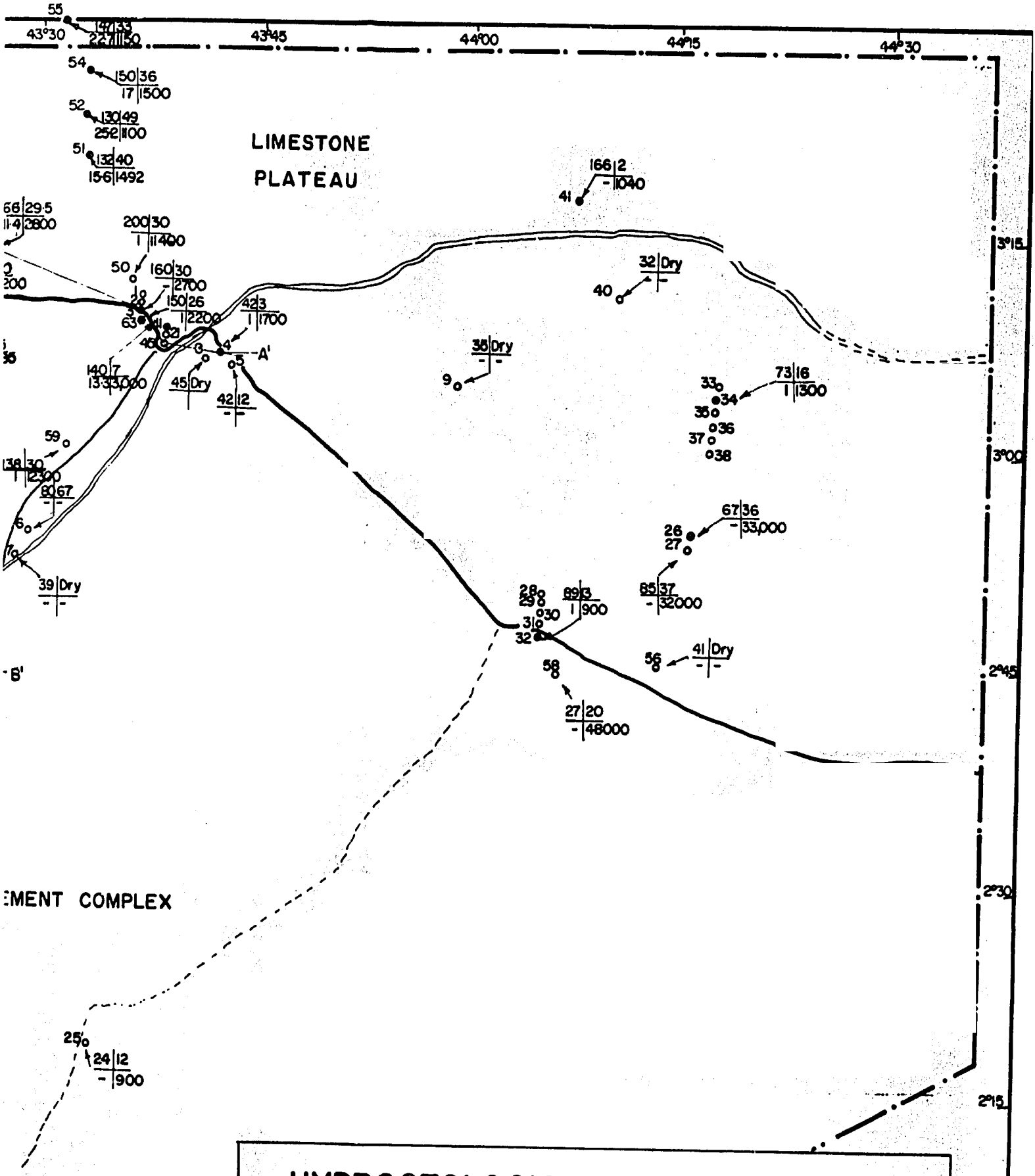
44°00 44°15 44°30

Plate I

161


42°30
42°45
43°00
43°15
3°15
3°00
2°45
2°30
2°15
2°00
174|165
- 24000
91|20
- 10000
172|11
- 24000
A
15
14
13
134|34
- 1500
66
153|45
15·6|480
16
103|27
11·4|2000
46
130|56
11·4|1800
42
19
154
1
57
117|29
1 2000
B
20
73|23
11·4|2000
5248
18
17
LIMESTONE PLATEAU
152|17
- -
61
148|20
- 900
23
22
189 Dry
- -
24
10|11


42°45
43°00
43°15
43°30
43°45
LIMESTONE PLATEAU
LIMESTONE PLATEAU
BASEMENT COMPLEX
A
A'
B
B'
174|165
- |24000
91|20
- |10000
172|11
- |24000
84|12.92
26.6|3300
166|29.5
11.4|2800
143|30
11.4|3200
200|30
1|11400
160|30
- |2700
150|26
1|2200
42|3
1|1700
134|34
- |1500
153|45
15.6|480
85|18.5
- |2985
140|7
13.3|3000
45 Dry
42|12
- |-
200|20
- |1250
154|19.25
1|2000-5650
138|30
1|2300
80|67
- |-
103|27
11.4|2000
130|56
11.4|1800
117|29
1|2000
73|23
11.4|2000-5245
142|23
1|1600
39 Dry
- |-
152|17
- |-
148|20
- |900
60
15|8.6
- |-
24|12
- |900
189 Dry
- |-
HYDF
COMPREHE
SOMALI (DEM



HYDROGEOLOGIC MAP FOR THE BAY REGION

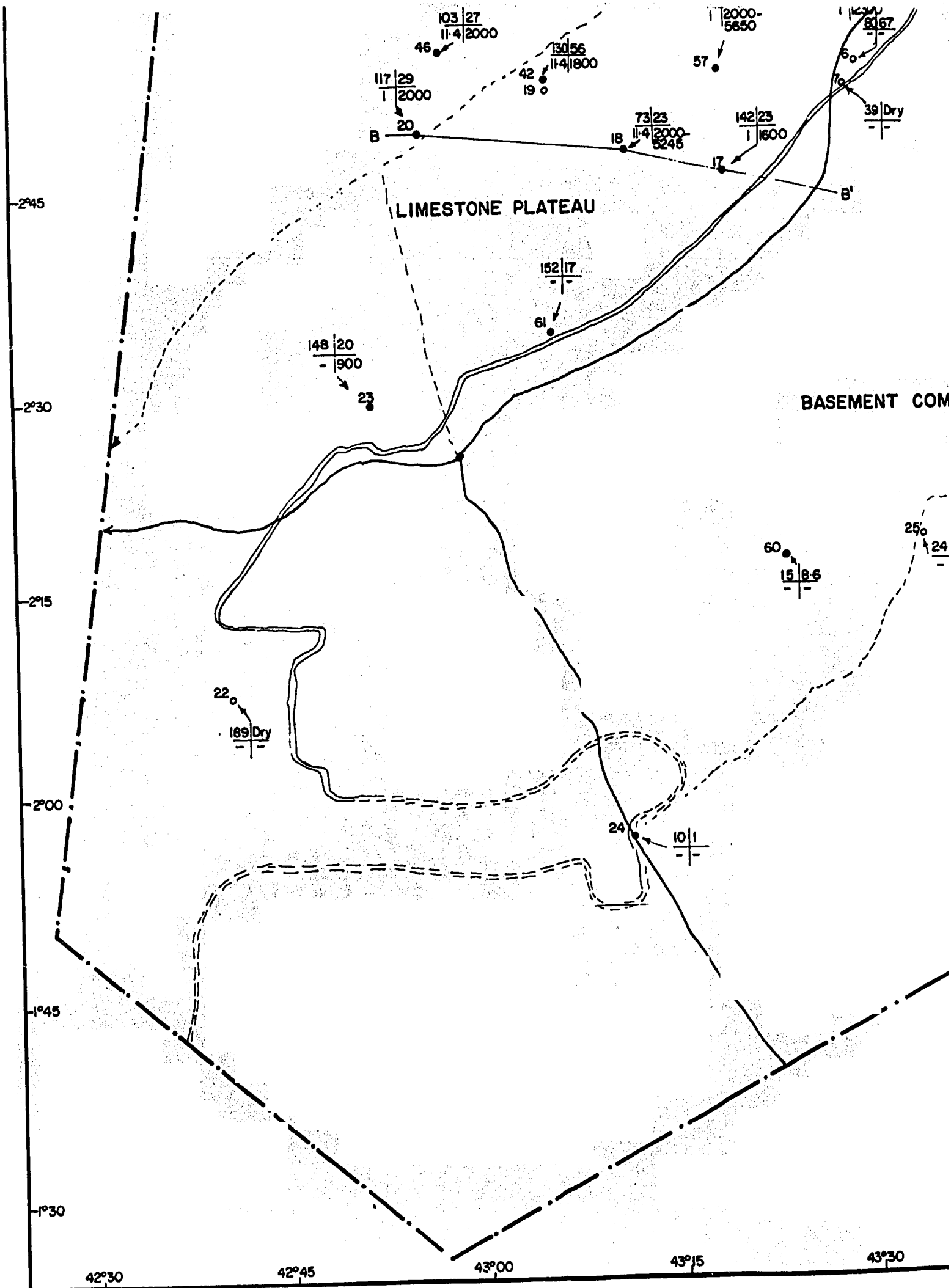
COMPREHENSIVE GROUNDWATER DEVELOPMENT PROJECT

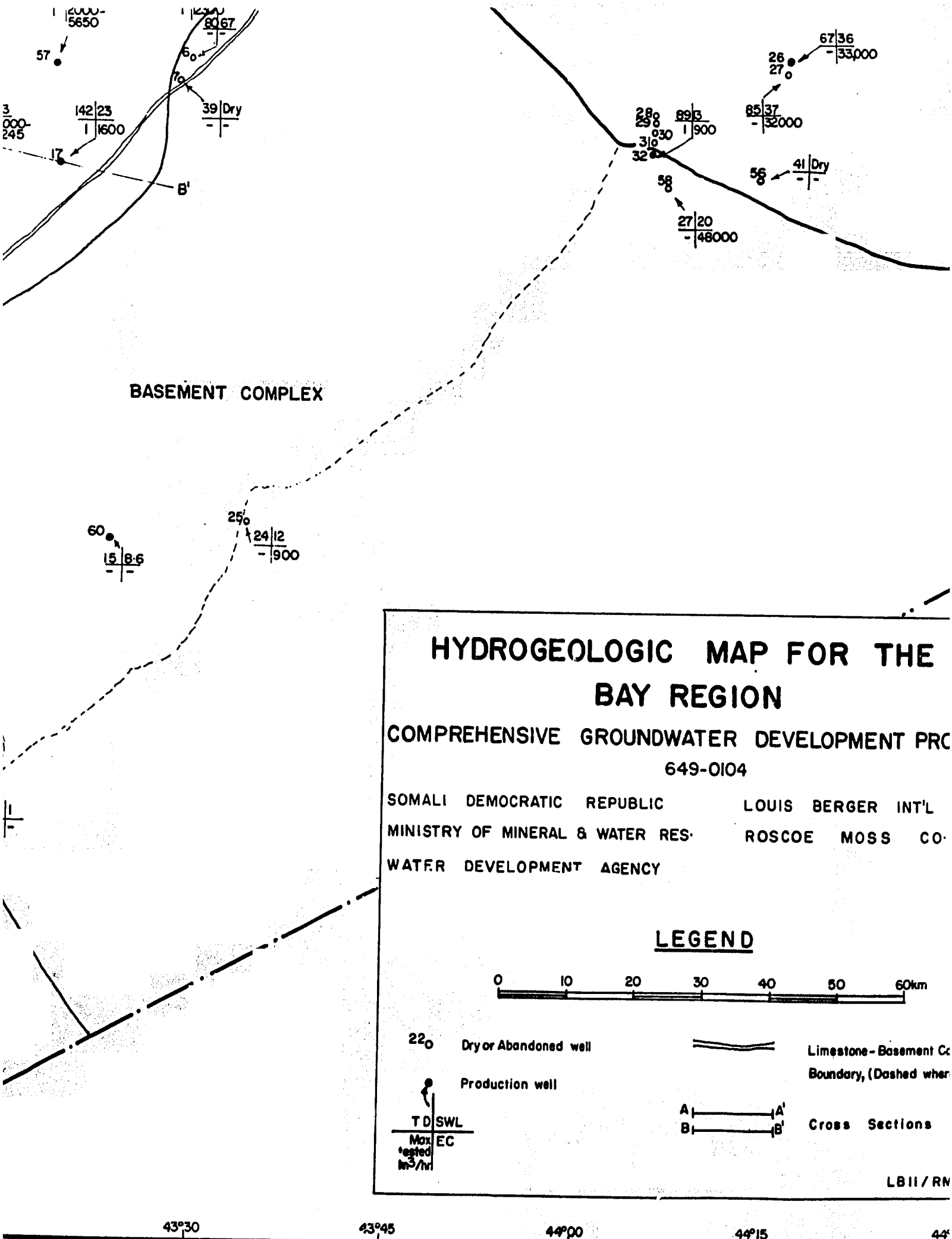
649-0104

SOMALI DEMOCRATIC REPUBLIC

LOUIS BERGER INT'L INC

164


LIMESTONE PLATEAU
BASEMENT COM
B
B'
103 | 27
11·4 | 2000
46
130 | 56
11·4 | 1800
42
19
1 | 2000-
5650
57
117 | 29
1 | 2000
20
73 | 23
11·4 | 2000-
5245
18
142 | 23
1 | 1600
17
80 | 67
6
7
39 | Dry
152 | 17
61
148 | 20
- | 900
23
60
15 | 8·6
25
24
22
189 | Dry
24
10 | 1
2°45
2°30
2°15
2°00
1°45
1°30
42°30
42°45
43°00
43°15
43°30


BASEMENT COMPLEX
HYDROGEOLOGIC MAP FOR THE
BAY REGION
COMPREHENSIVE GROUNDWATER DEVELOPMENT PRC
649-0104
SOMALI DEMOCRATIC REPUBLIC
MINISTRY OF MINERAL & WATER RES·
WATER DEVELOPMENT AGENCY
LOUIS BERGER INT'L
ROSCOE MOSS CO·
LEGEND
0 10 20 30 40 50 60km
Dry or Abandoned well
Production well
T D SWL
Max EC
Limestone-Basement Co
Boundary, (Dashed wher
Cross Sections
LB11/RN
43°30
43°45
44°00
44°15
44°

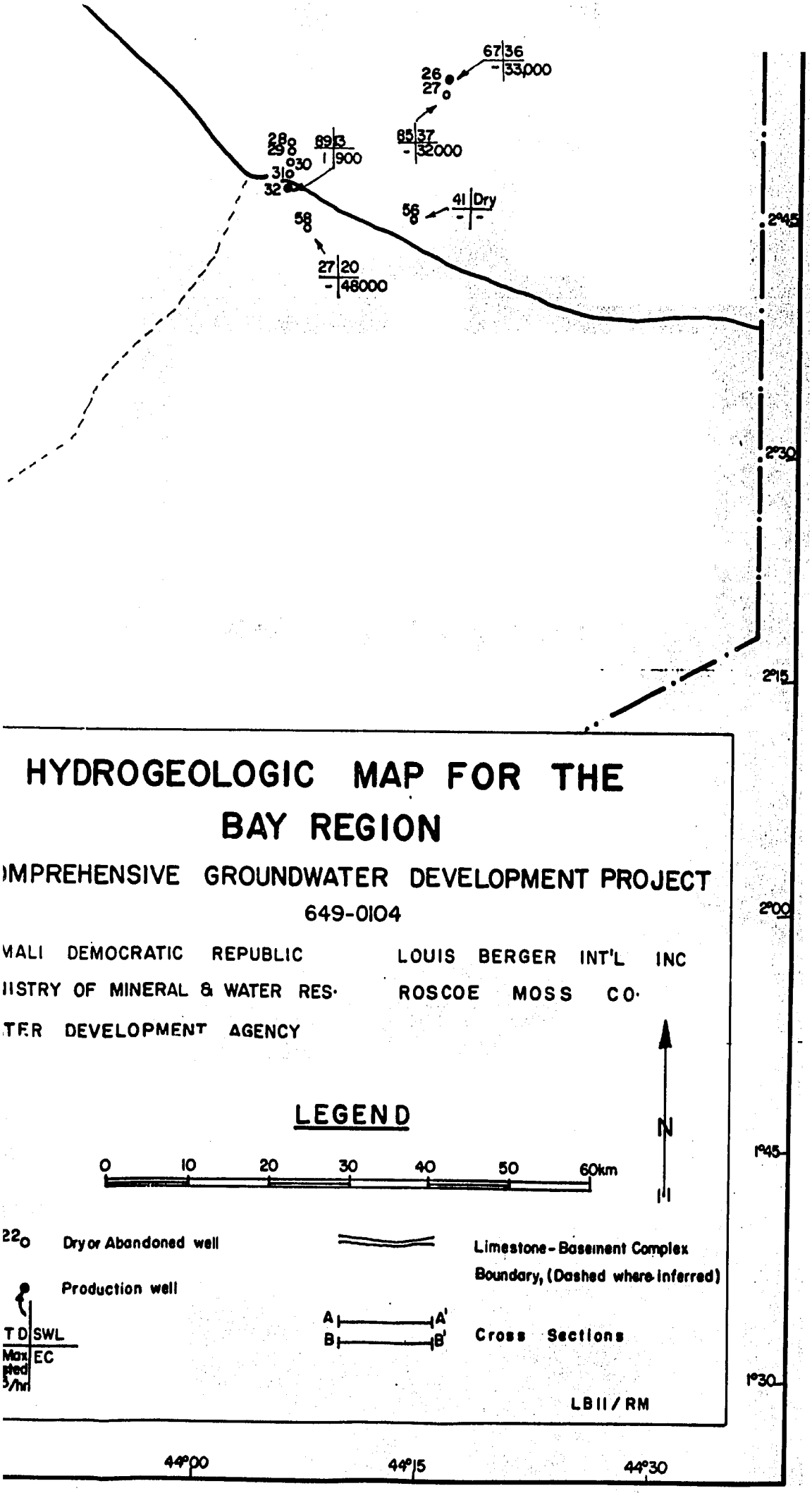
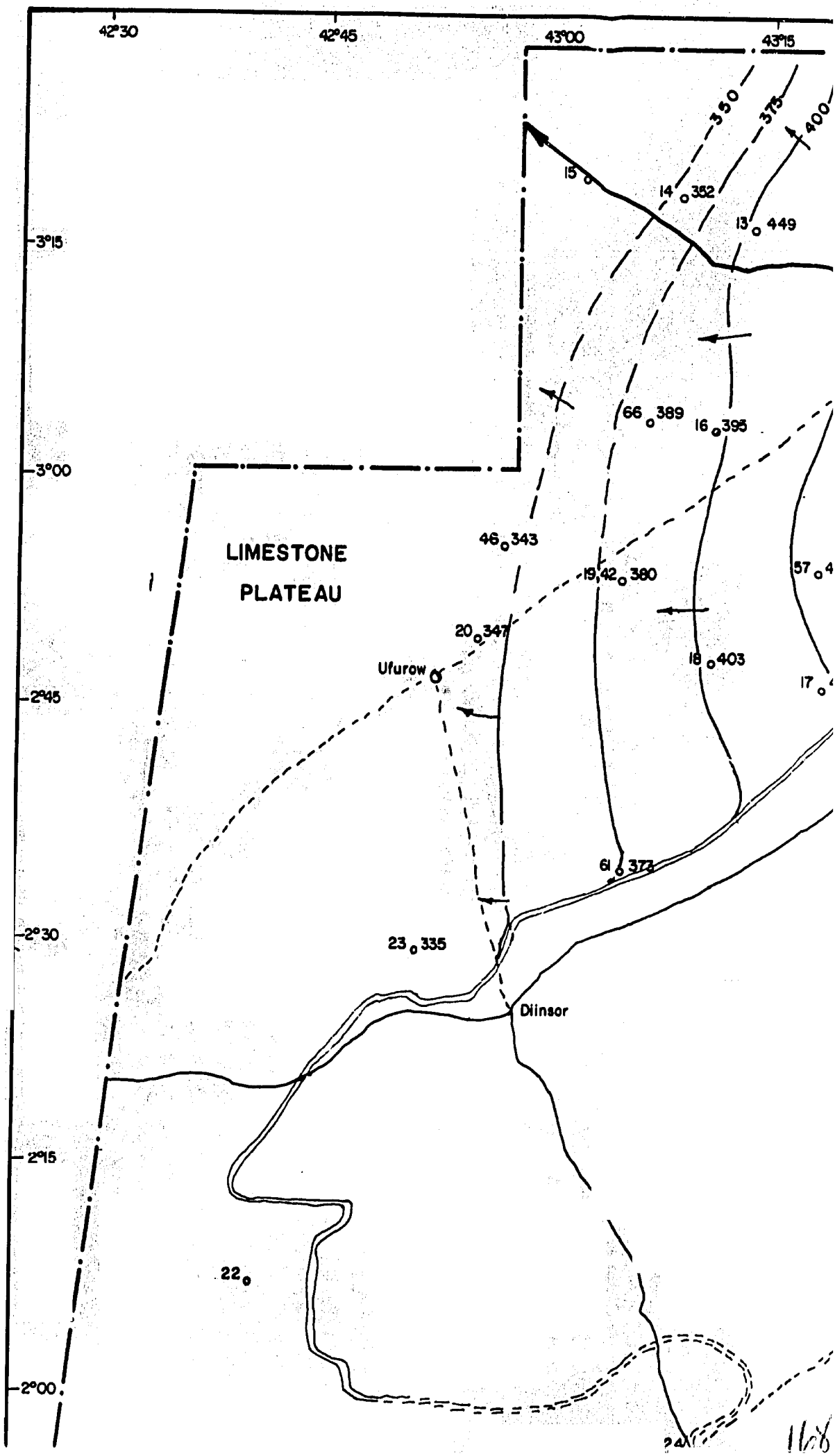
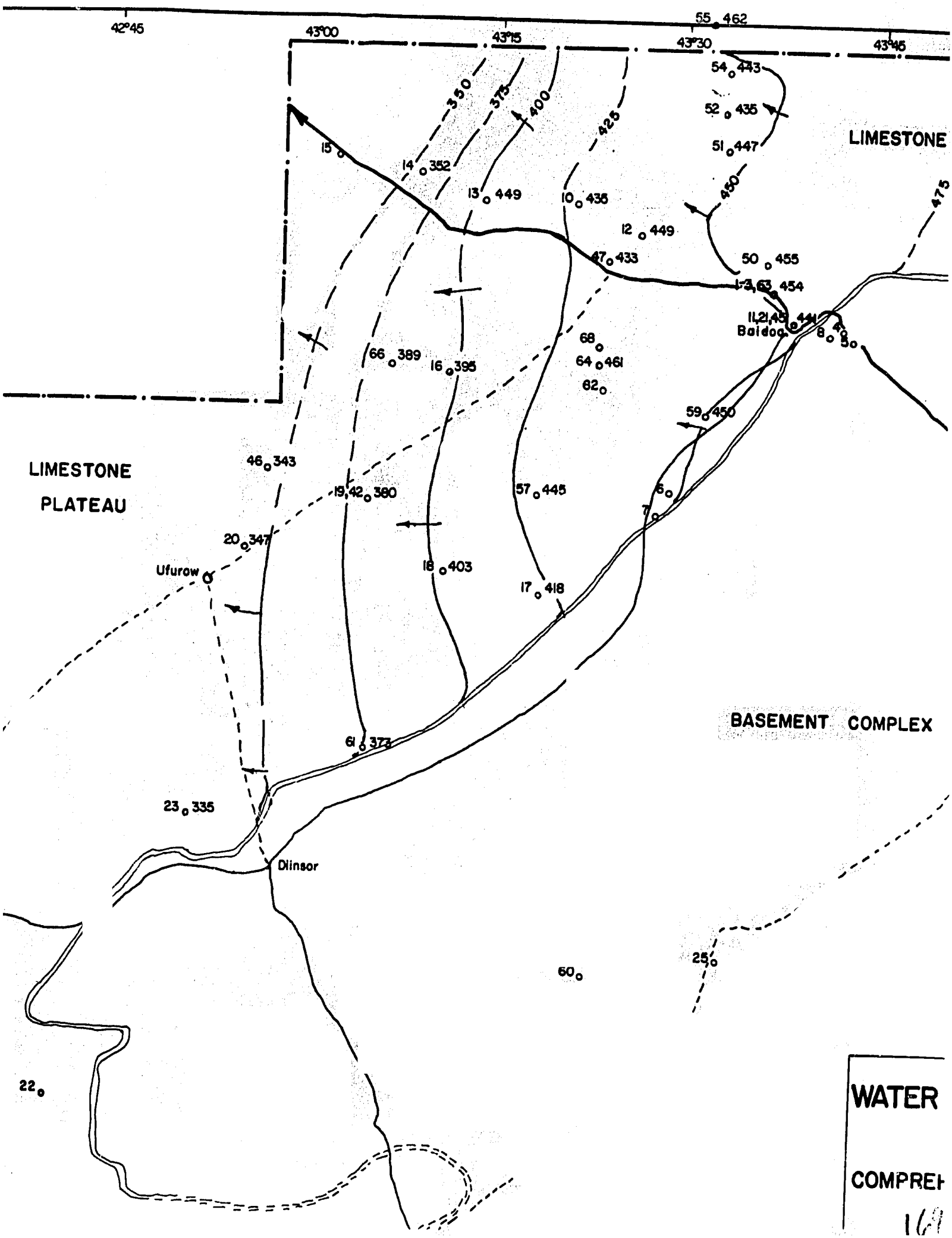
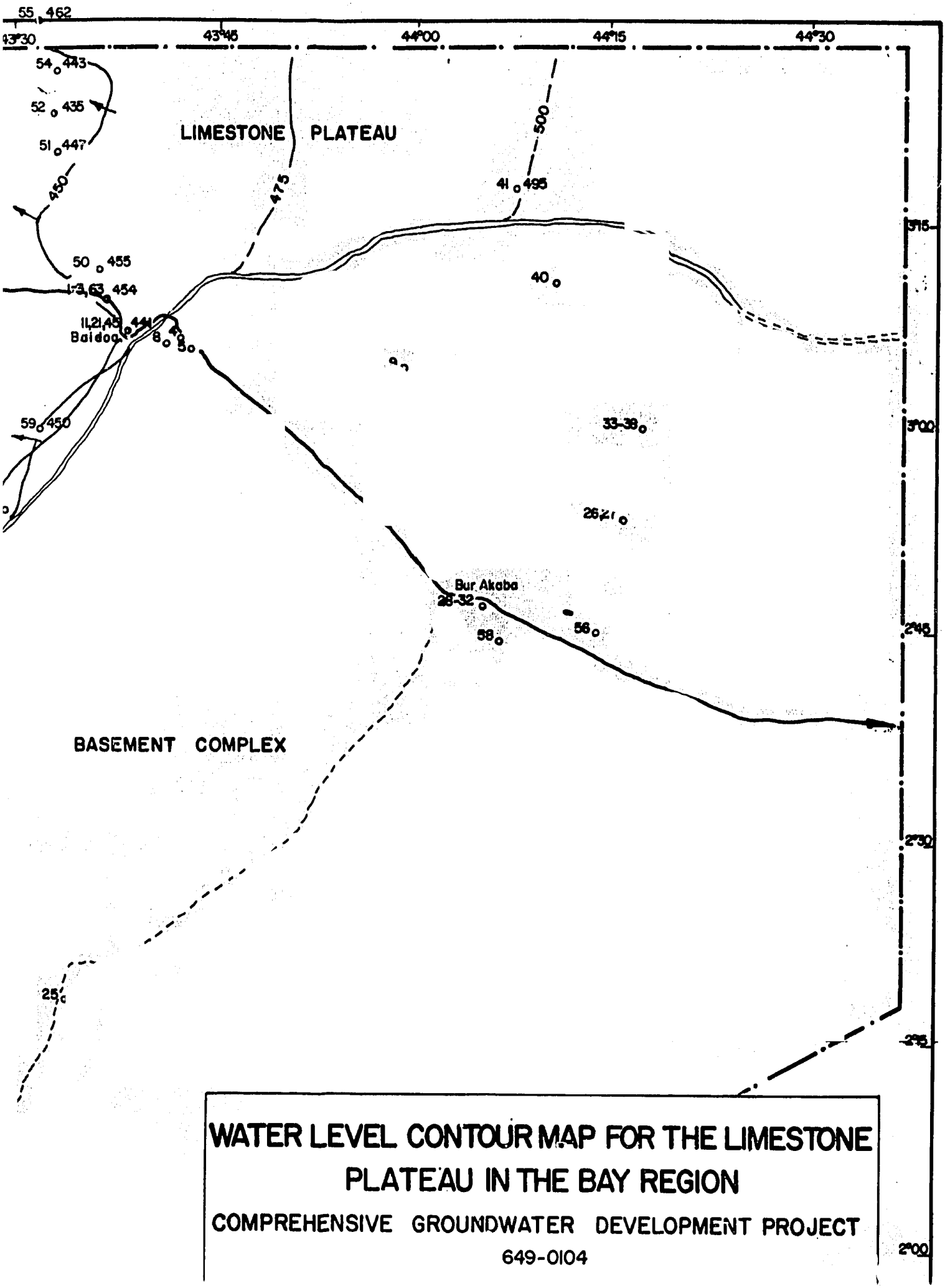

67|36
- |33,000
26
27
85|37
- |32000
28
29
89|3
1|900
30
31
32
41|Dry
- | -
56
58
27|20
- |48000
2°45
2°30
2°15
2°00
1°45
1°30
44°00
44°15
44°30
HYDROGEOLOGIC MAP FOR THE
BAY REGION
)MPREHENSIVE GROUNDWATER DEVELOPMENT PROJECT
649-0104
MALI DEMOCRATIC REPUBLIC
IISTRY OF MINERAL & WATER RES·
TER DEVELOPMENT AGENCY
LOUIS BERGER INT'L INC
ROSCOE MOSS CO·
LEGEND
0 10 20 30 40 50 60km
N
22 Dry or Abandoned well
Production well
T D SWL
Max EC
ted
3/hr
Limestone-Basement Complex
Boundary, (Dashed where inferred)
A A'
B B'
Cross Sections
LB11/RM

Plate 2

167


42°30
42°45
43°00
43°15
3°15
3°00
2°45
2°30
2°15
2°00
LIMESTONE
PLATEAU
Ufurow
Diinsor
15
14 352
13 449
350
375
400
66 389
16 395
46 343
19,42 380
20 347
18 403
17
61 373
23 335
22


42°45
43°00
43°15
43°30
43°45
55 462
54 443
52 435
51 447
LIMESTONE
350
375
400
425
450
475
15
14 352
13 449
10 436
12 449
47 433
50 455
1-3,63 454
11,21,45 441
Baidoo
8
5
68
64 461
62
66 389
16 395
59 450
LIMESTONE
PLATEAU
46 343
19,42 380
57 445
6
7
20 347
Ufurow
18 403
17 418
BASEMENT COMPLEX
61 373
23 335
Dlinsor
25
60
22
WATER
COMPREH
169



WATER LEVEL CONTOUR MAP FOR THE LIMESTONE PLATEAU IN THE BAY REGION

COMPREHENSIVE GROUNDWATER DEVELOPMENT PROJECT

649-0104

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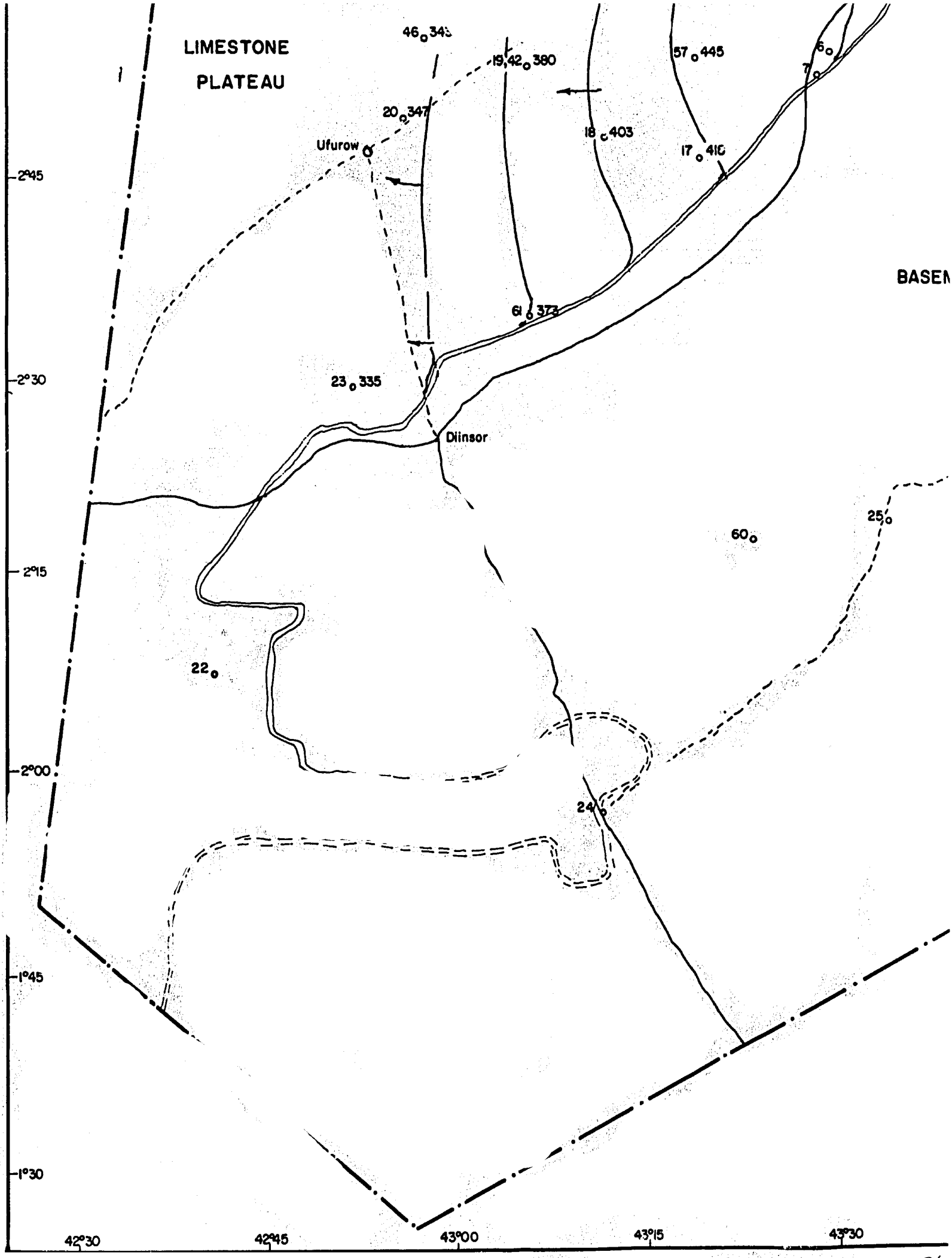
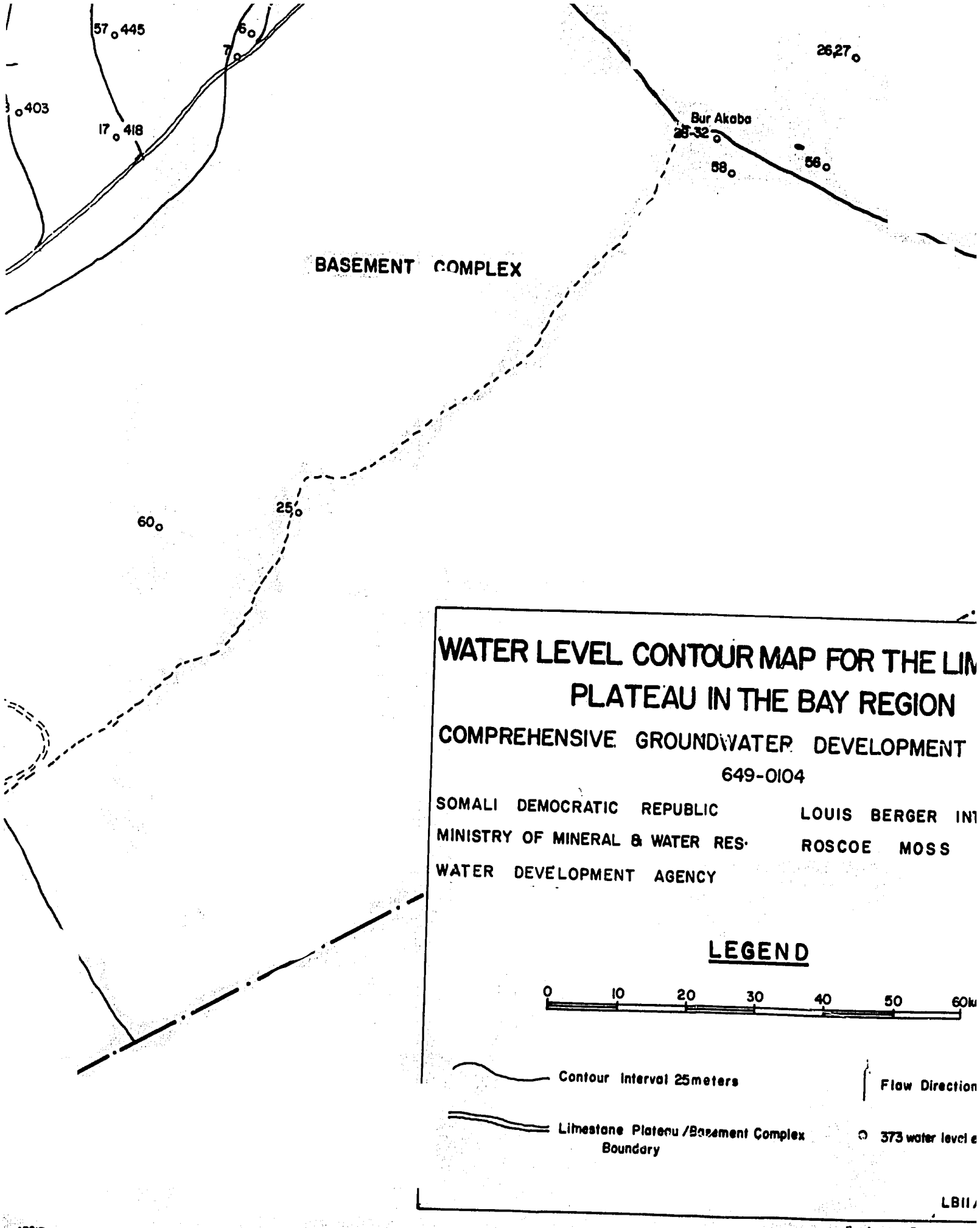

LIMESTONE
PLATEAU
46 o 343
19 42 o 380
57 o 445
6 o
7 o
20 o 347
18 o 403
17 o 416
Ufurow
BASEM
61 o 373
23 o 335
Diinsor
25 o
60 o
22 o
24 o
2°45
2°30
2°15
2°00
1°45
1°30
42°30
42°45
43°00
43°15
43°30


57 445
403
17 418
26,27
Bur Akaba
28-32
58
56
BASEMENT COMPLEX
60
25
WATER LEVEL CONTOUR MAP FOR THE LIM
PLATEAU IN THE BAY REGION
COMPREHENSIVE GROUNDWATER DEVELOPMENT
649-0104
SOMALI DEMOCRATIC REPUBLIC
MINISTRY OF MINERAL & WATER RES.
WATER DEVELOPMENT AGENCY
LOUIS BERGER INT
ROSCOE MOSS
LEGEND
0 10 20 30 40 50 60ku
Contour Interval 25meters
Flow Direction
Limestone Plateau /Basement Complex Boundary
373 water level
LBII
43°15
43°30
43°45
44°00
44°15

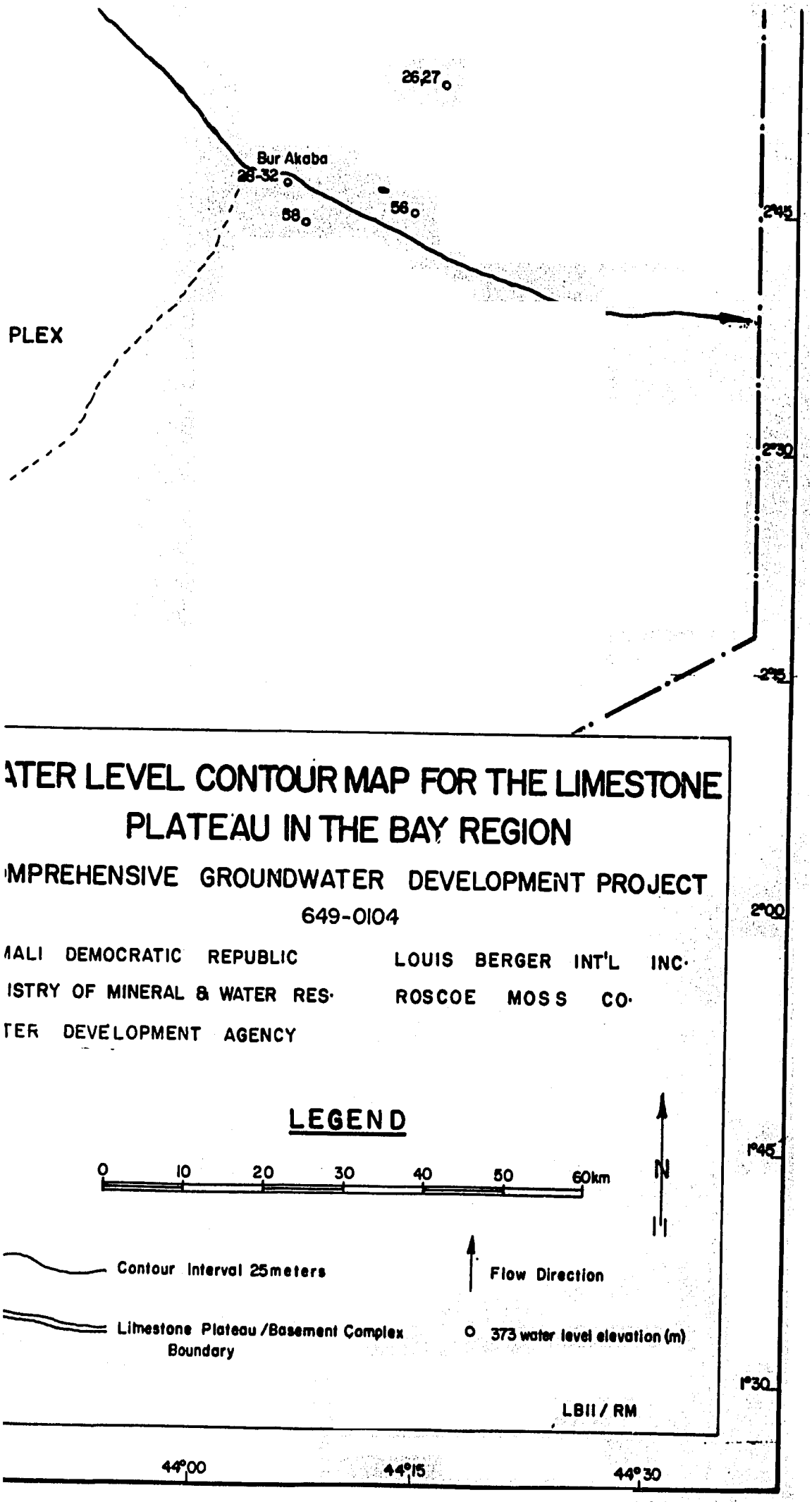
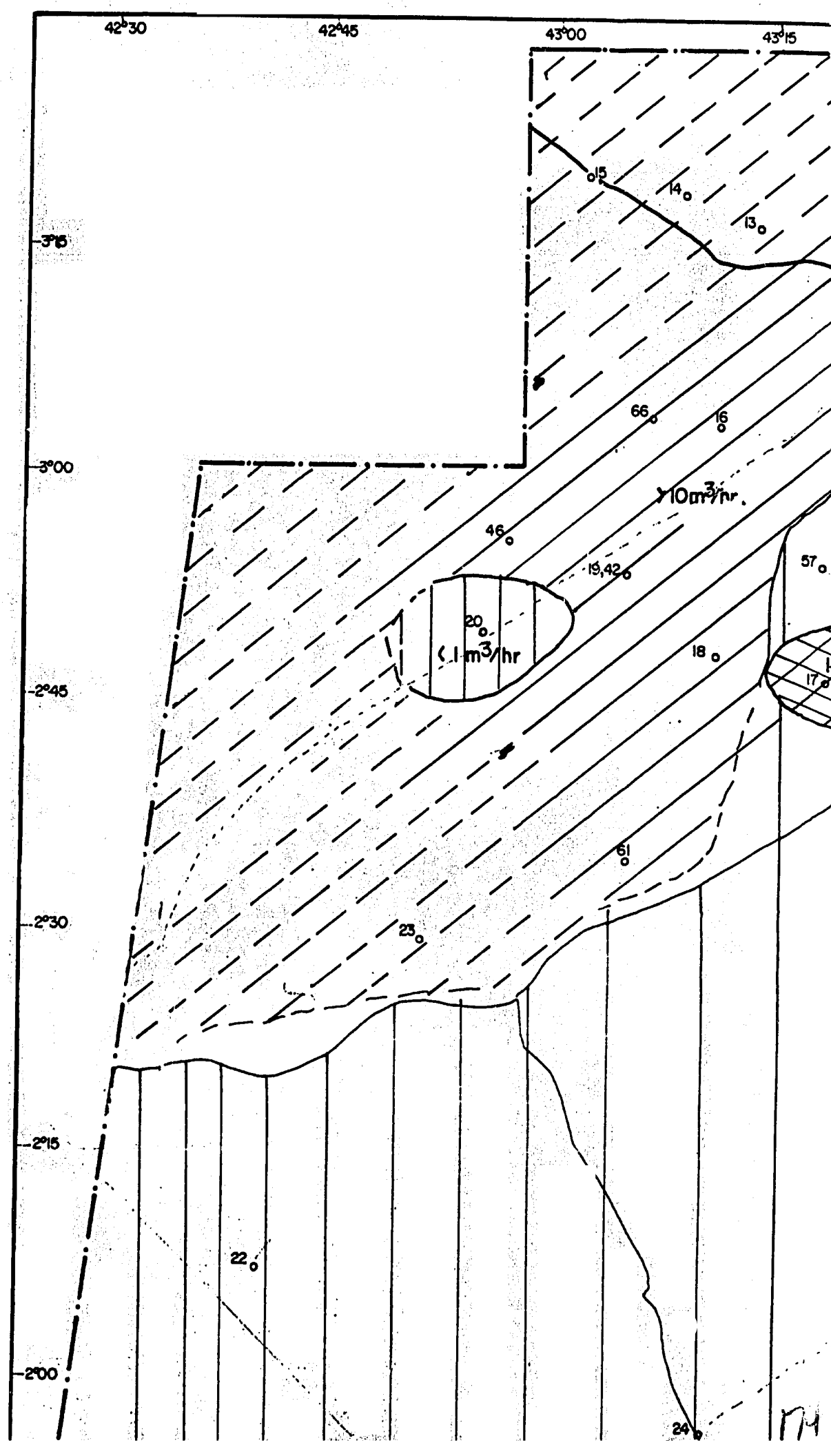
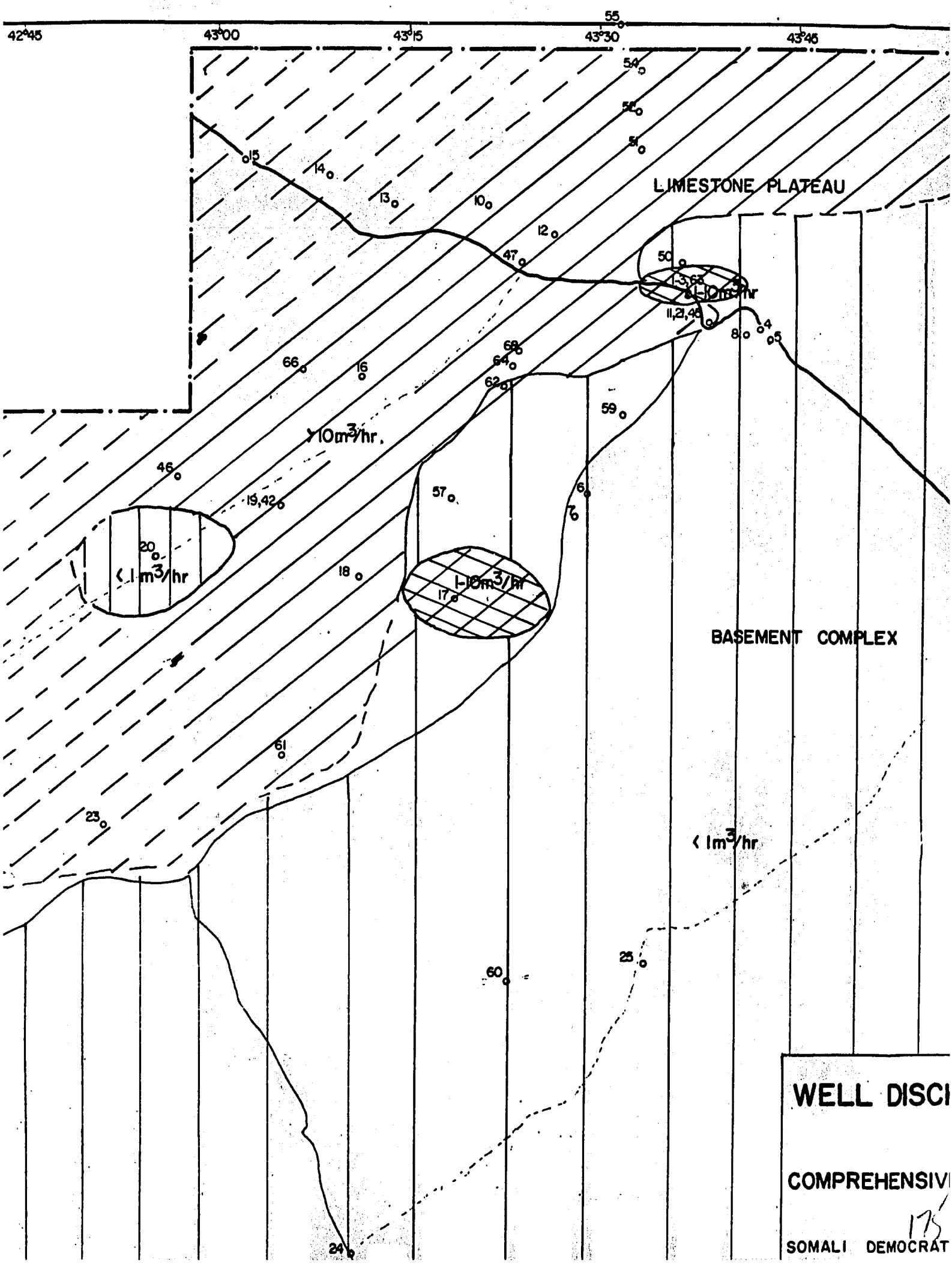
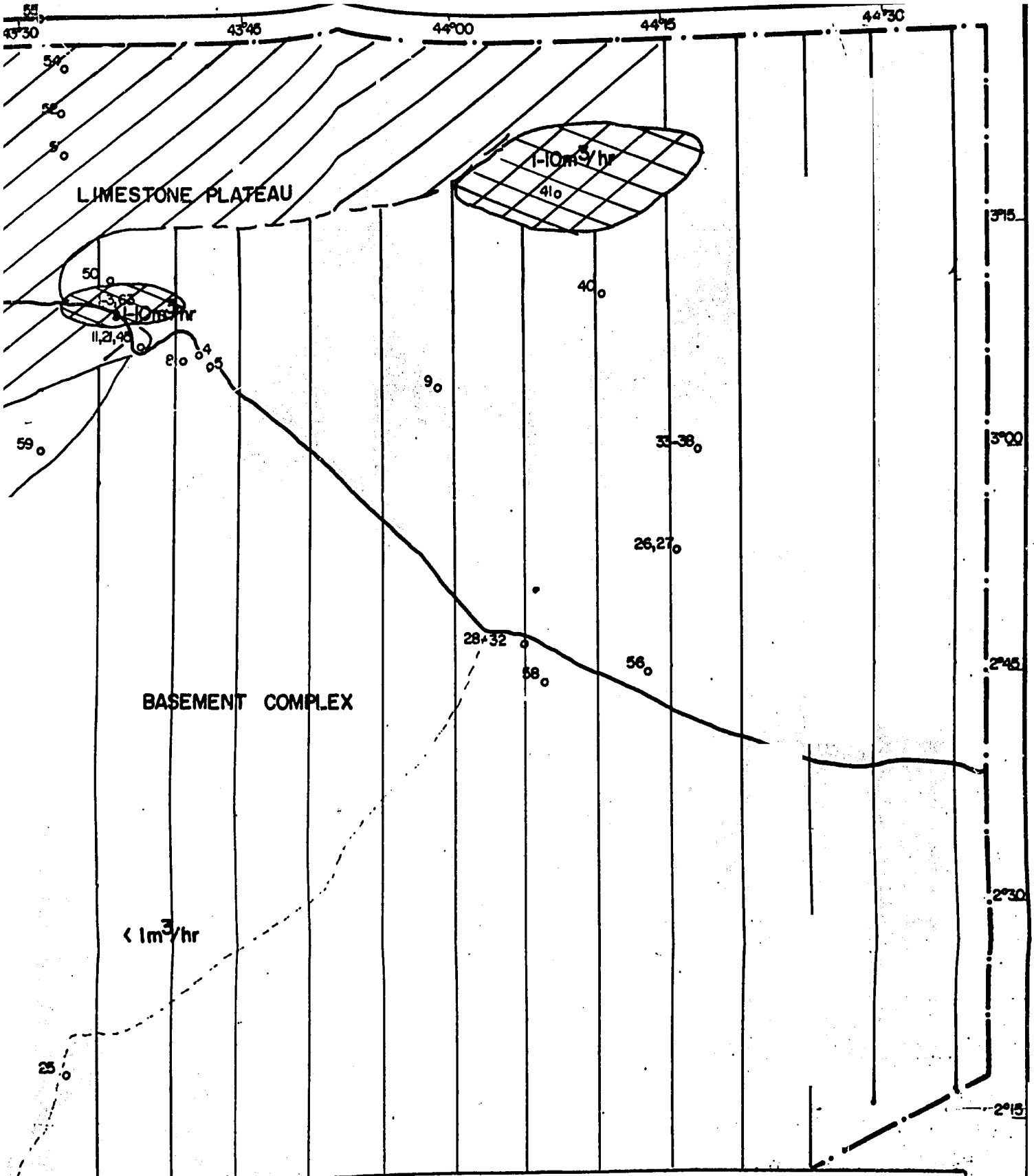

26,27
Bur Akaba
28-32
58
56
PLEX
2°45
2°30
2°15
2°00
1°45
1°30
44°00
44°15
44°30
ATER LEVEL CONTOUR MAP FOR THE LIMESTONE PLATEAU IN THE BAY REGION
MPREHENSIVE GROUNDWATER DEVELOPMENT PROJECT
649-0104
MALI DEMOCRATIC REPUBLIC
ISTRY OF MINERAL & WATER RES.
TER DEVELOPMENT AGENCY
LOUIS BERGER INT'L INC.
ROSCOE MOSS CO.
LEGEND
0 10 20 30 40 50 60km
N
Contour Interval 25meters
Flow Direction
Limestone Plateau /Basement Complex Boundary
373 water level elevation (m)
LBII / RM

Plate 3


42°30
42°45
43°00
43°15
3°15
3°00
2°45
2°30
2°15
2°00
15
14
13
66
16
>10m³/hr.
46
19,42
57
20
<1 m³/hr
18
17
61
23
22
24


42°45
43°00
43°15
43°30
43°45
LIMESTONE PLATEAU
>10m³/hr.
<1m³/hr
1-10m³/hr
1-10m³/hr
BASEMENT COMPLEX
<1m³/hr
WELL DISCI
COMPREHENSIVI
SOMALI DEMOCRAT

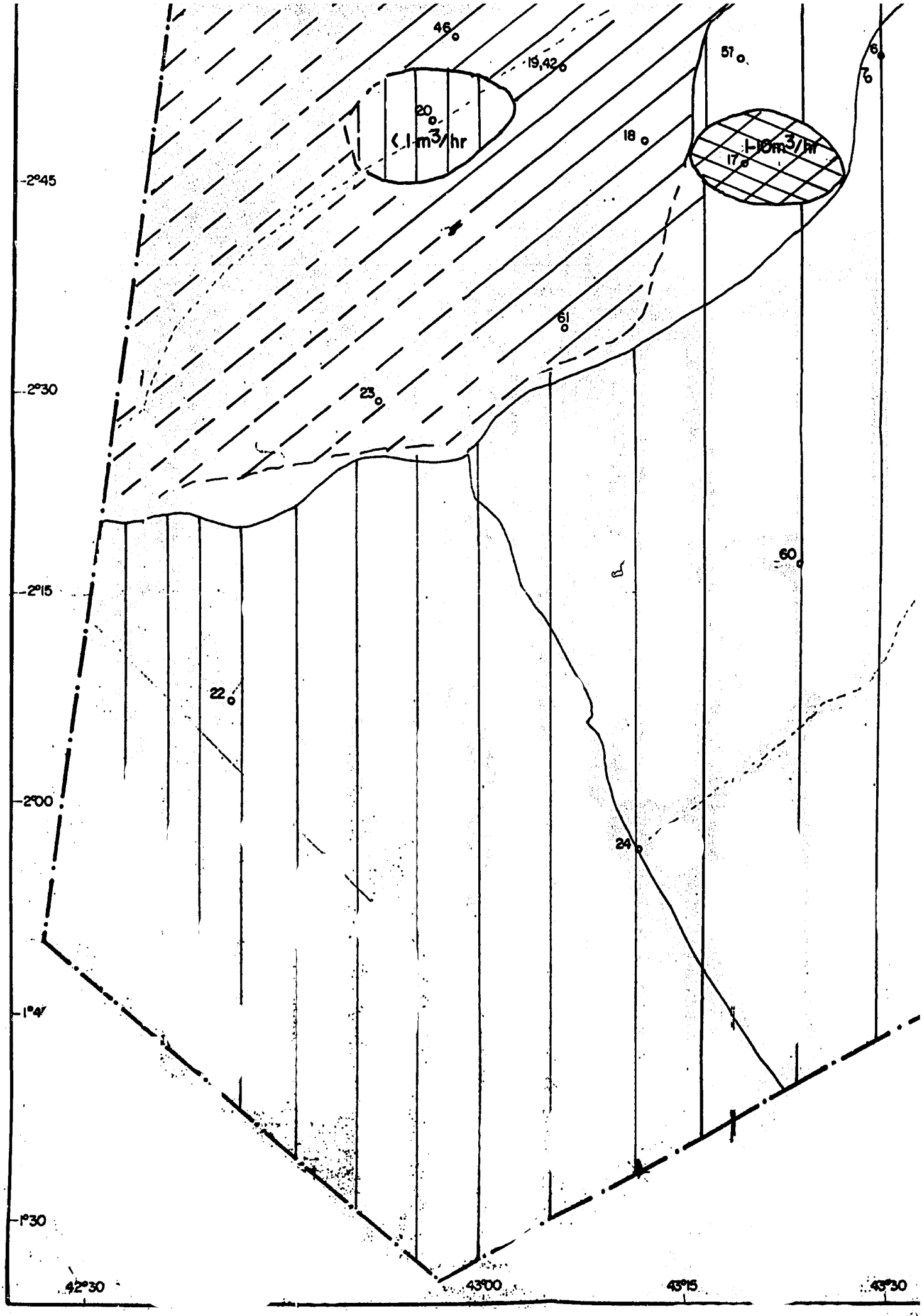


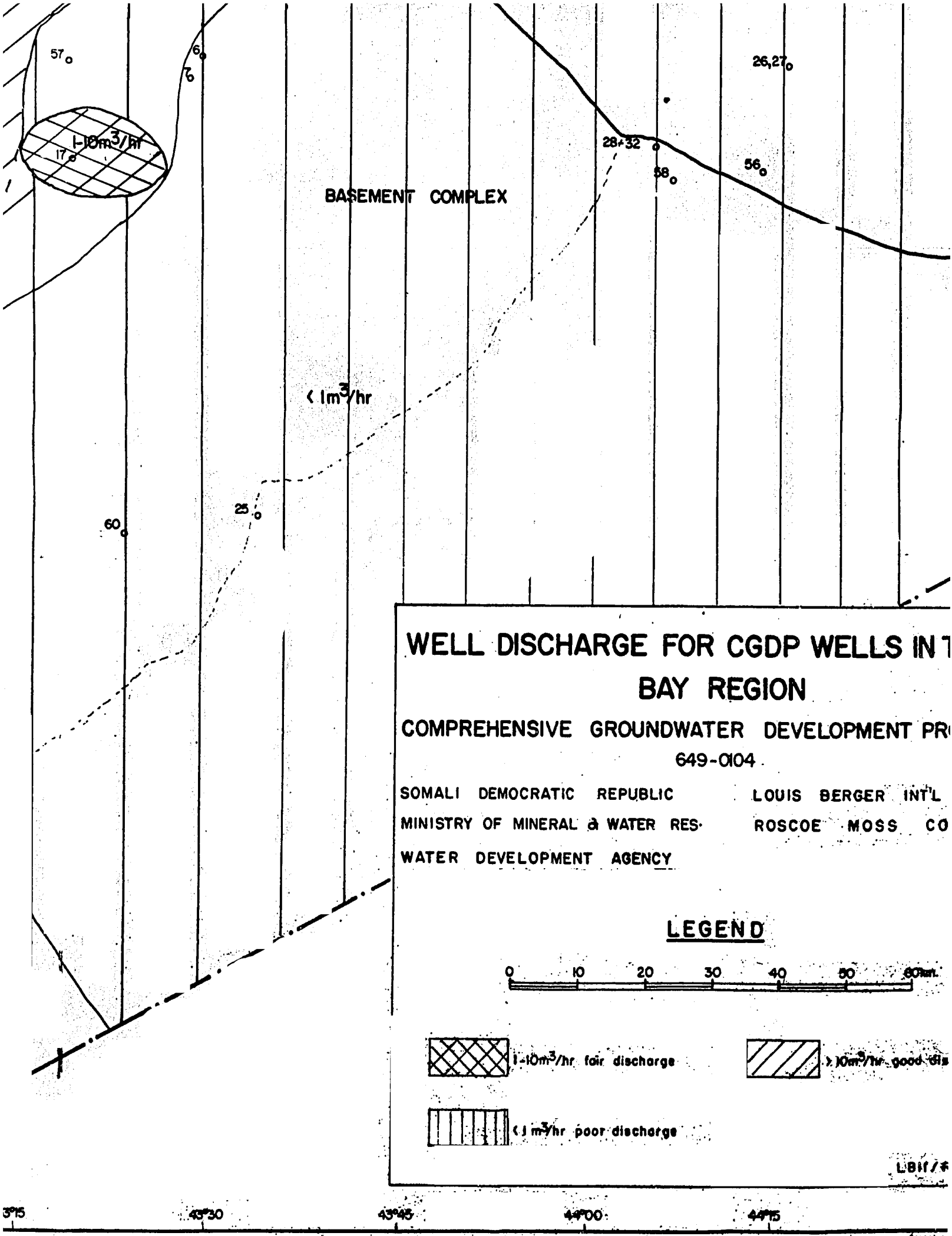
WELL DISCHARGE FOR CGDP WELLS IN THE BAY REGION

COMPREHENSIVE GROUNDWATER DEVELOPMENT PROJECT

649-0104

SOMALI DEMOCRATIC REPUBLIC LOUIS BERGER INT'L INC


46
19,42
57
6
20
<.1 m3/hr
18
1-10m3/hr
17
61
23
60
22
24
-2°45
-2°30
-2°15
-2°00
-1°4'
-1°30
42°30
43°00
43°15
43°30


57
6
7
1-10m3/hr
17
BASEMENT COMPLEX
26,27
28-32
38
56
< 1m3/hr
25
60
WELL DISCHARGE FOR CGDP WELLS IN T
BAY REGION
COMPREHENSIVE GROUNDWATER DEVELOPMENT PR
649-0104
SOMALI DEMOCRATIC REPUBLIC
MINISTRY OF MINERAL & WATER RES.
WATER DEVELOPMENT AGENCY
LOUIS BERGER INT'L
ROSCOE MOSS CO
LEGEND
0 10 20 30 40 50 60km.
1-10m3/hr fair discharge
> 10m3/hr good dis
< 1 m3/hr poor discharge
LBII/*
43°15
43°30
43°45
44°00
44°15

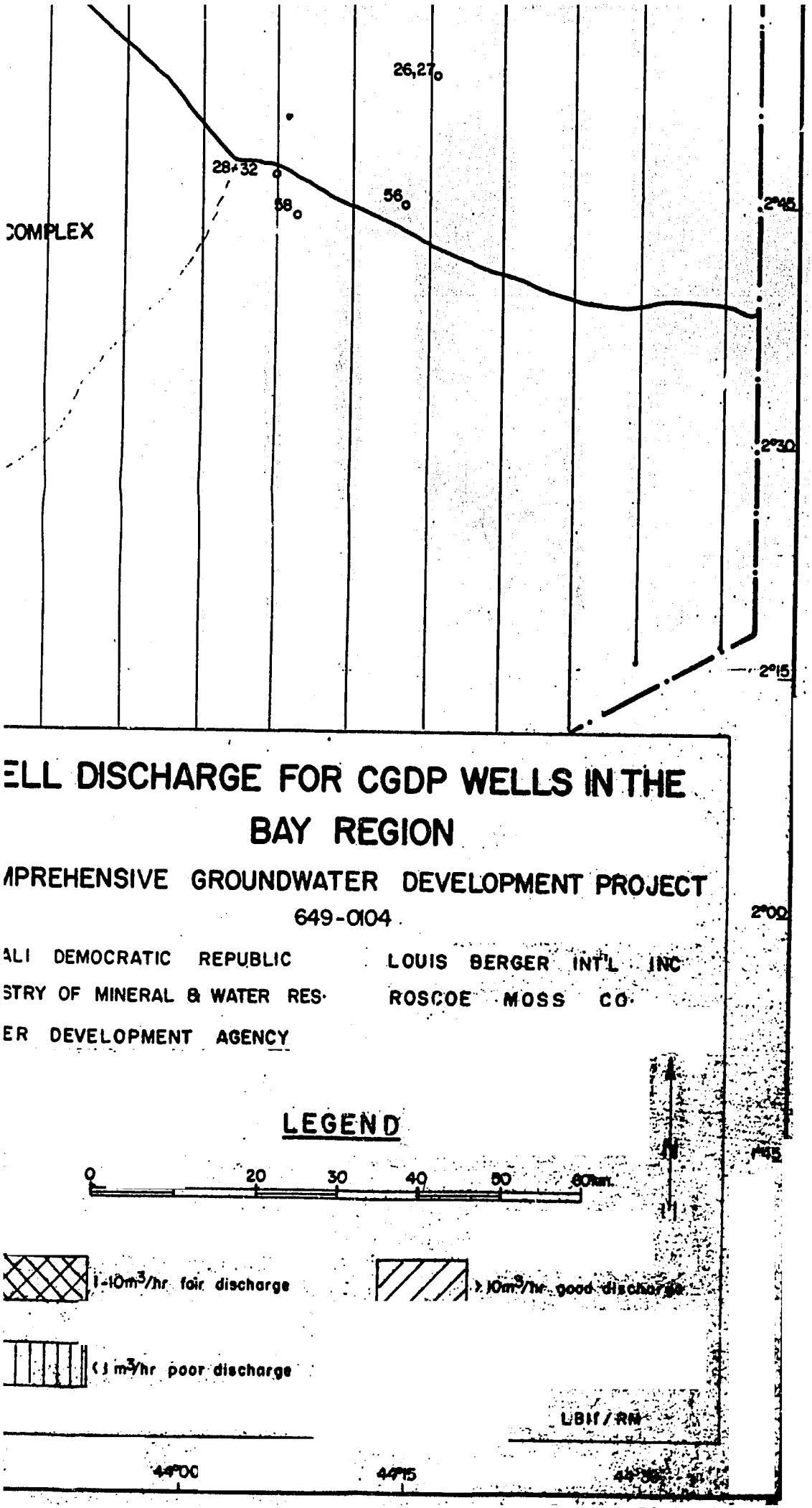
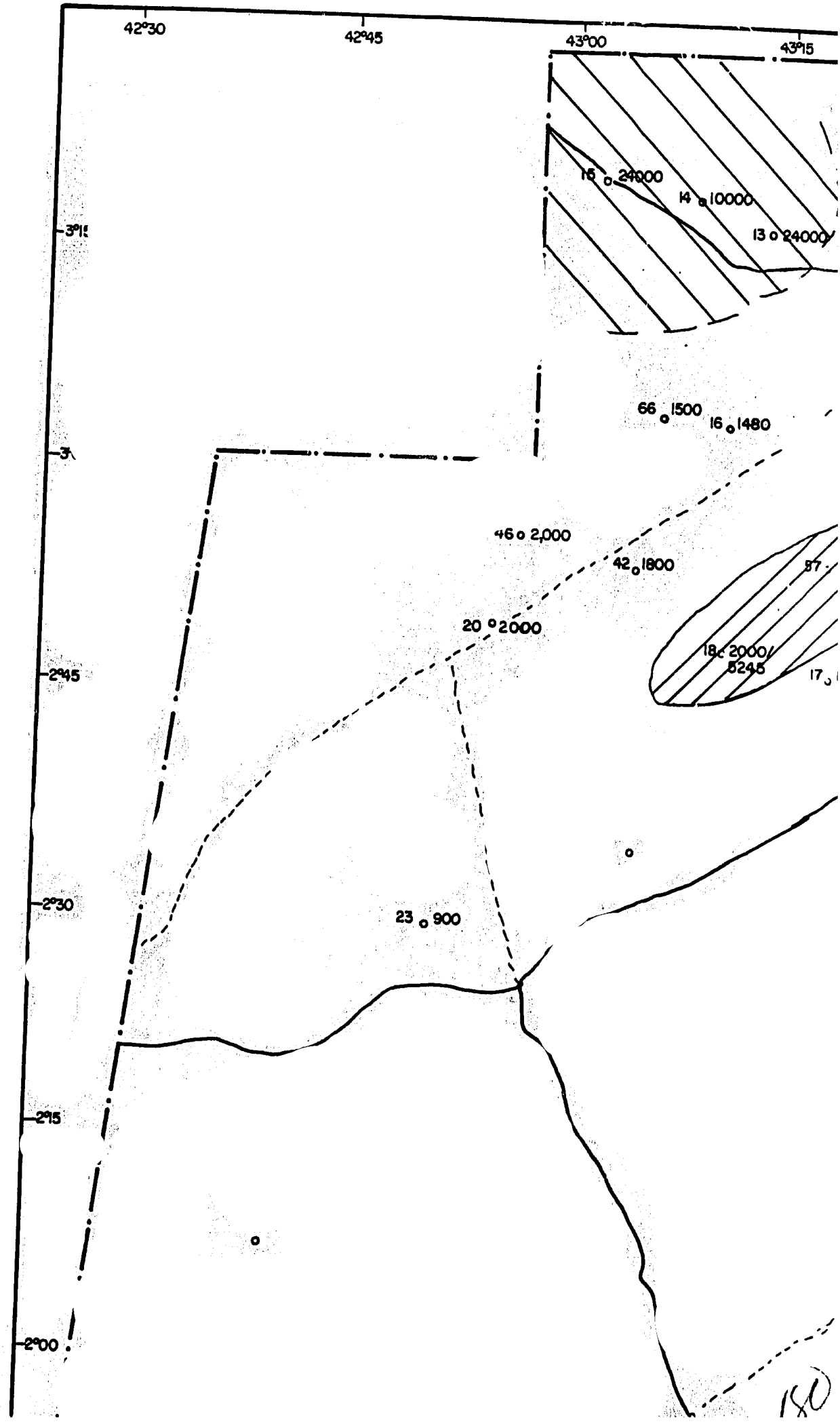
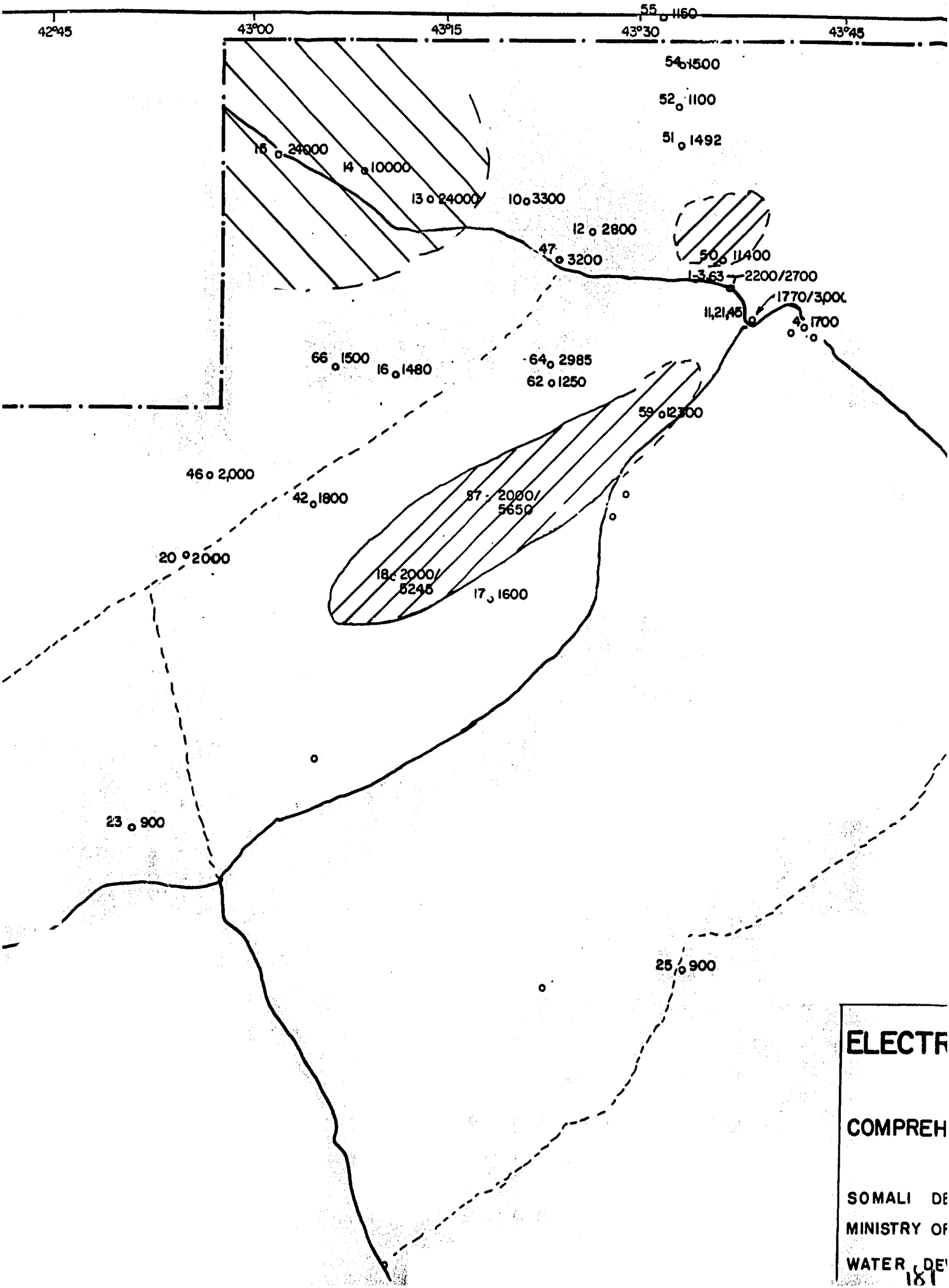

26,27
28,32
58
56
COMPLEX
2°45
2°30
2°15
2°00
ELL DISCHARGE FOR CGDP WELLS IN THE
BAY REGION
MPREHENSIVE GROUNDWATER DEVELOPMENT PROJECT
649-0104
ALI DEMOCRATIC REPUBLIC
STRY OF MINERAL & WATER RES.
ER DEVELOPMENT AGENCY
LOUIS BERGER INT'L INC
ROSCOE MOSS CO.
LEGEND
0 20 30 40 50 60km
N
1-10m³/hr fair discharge
>10m³/hr good discharge
<1 m³/hr poor discharge
LBII / RM
44°00
44°15

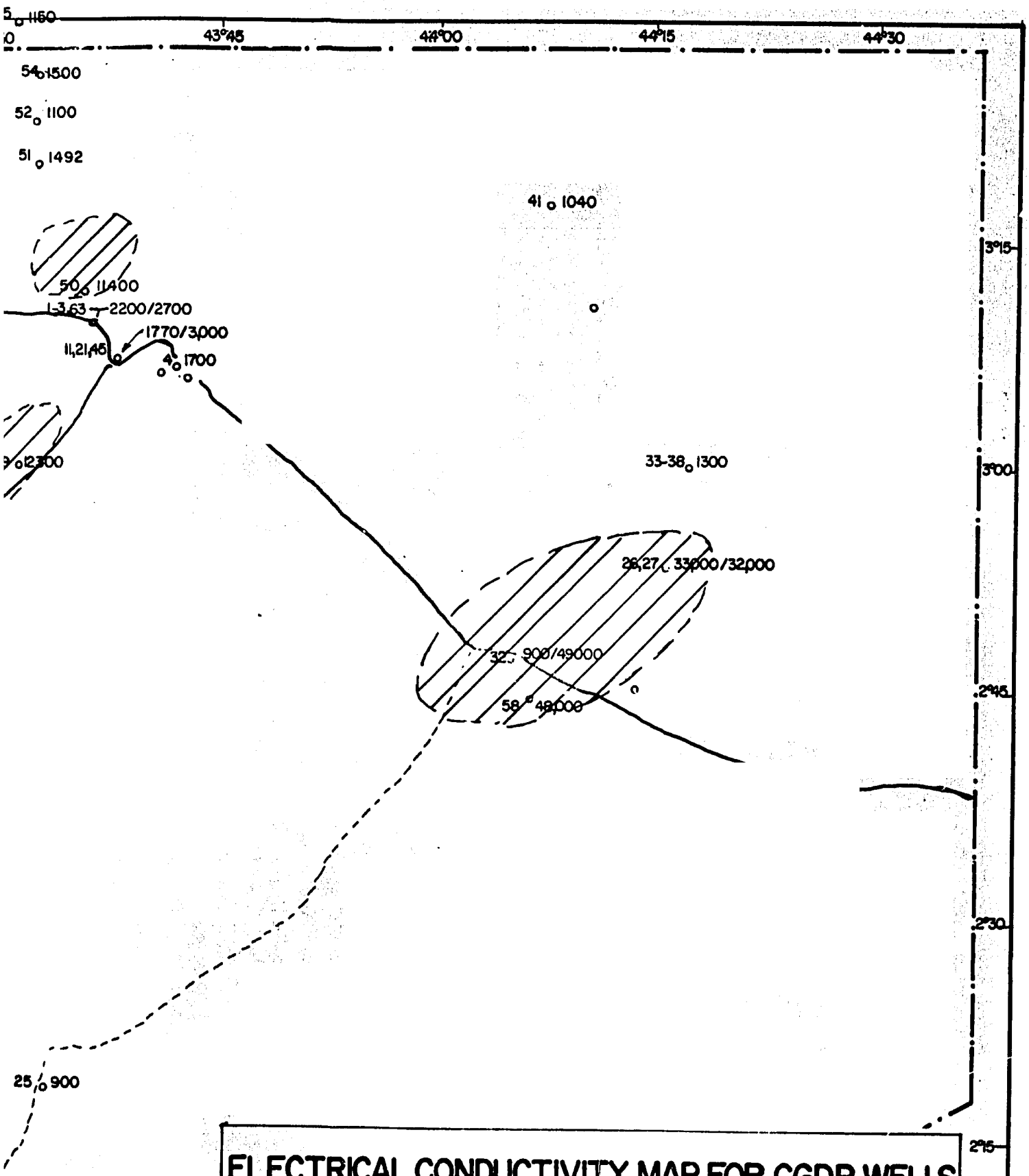
Plate 4

177


42°30
42°45
43°00
43°15
3°15
3
2°45
2°30
2°15
2°00
15 o 24000
14 o 10000
13 o 24000
66 o 1500
16 o 1480
46 o 2,000
42 o 1800
20 o 2000
18 o 2000/
5245
17
23 o 900

180


42°45
43°00
43°15
43°30
43°45
55 1160
54 1500
52 1100
51 1492
15 24000
14 10000
13 24000
10 3300
12 2800
47 3200
50 11400
1-3,63 2200/2700
1770/3000
11,21,45
4 1700
66 1500
16 1480
64 2985
62 1250
59 12300
46 2,000
42 1800
57 2000/5650
20 2000
18 2000/5245
17 1600
23 900
25 900
ELECTR
COMPREH
SOMALI DE
MINISTRY OF
WATER DEV



ELECTRICAL CONDUCTIVITY MAP FOR CGDP WELLS IN THE BAY REGION

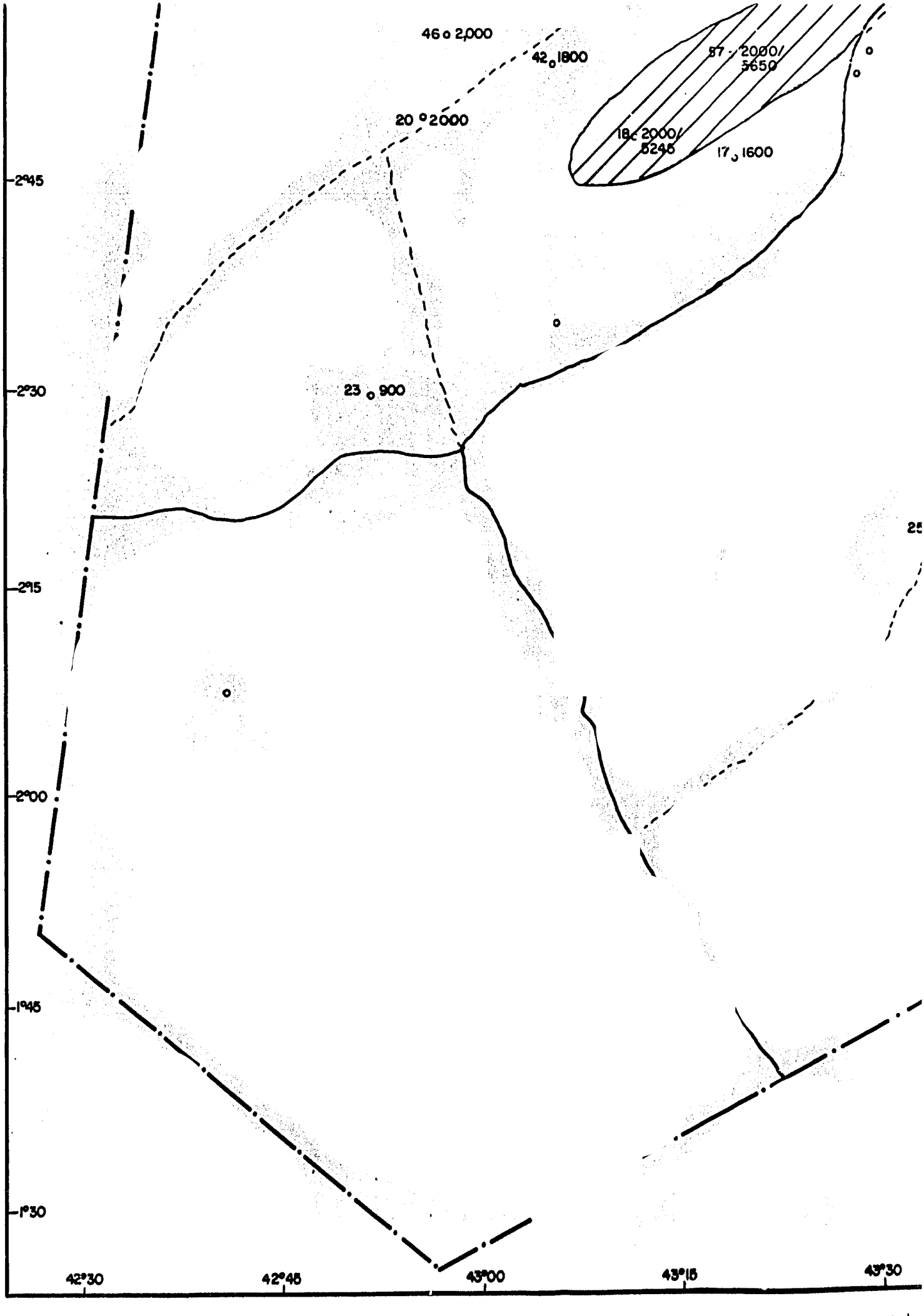
COMPREHENSIVE GROUNDWATER DEVELOPMENT PROJECT

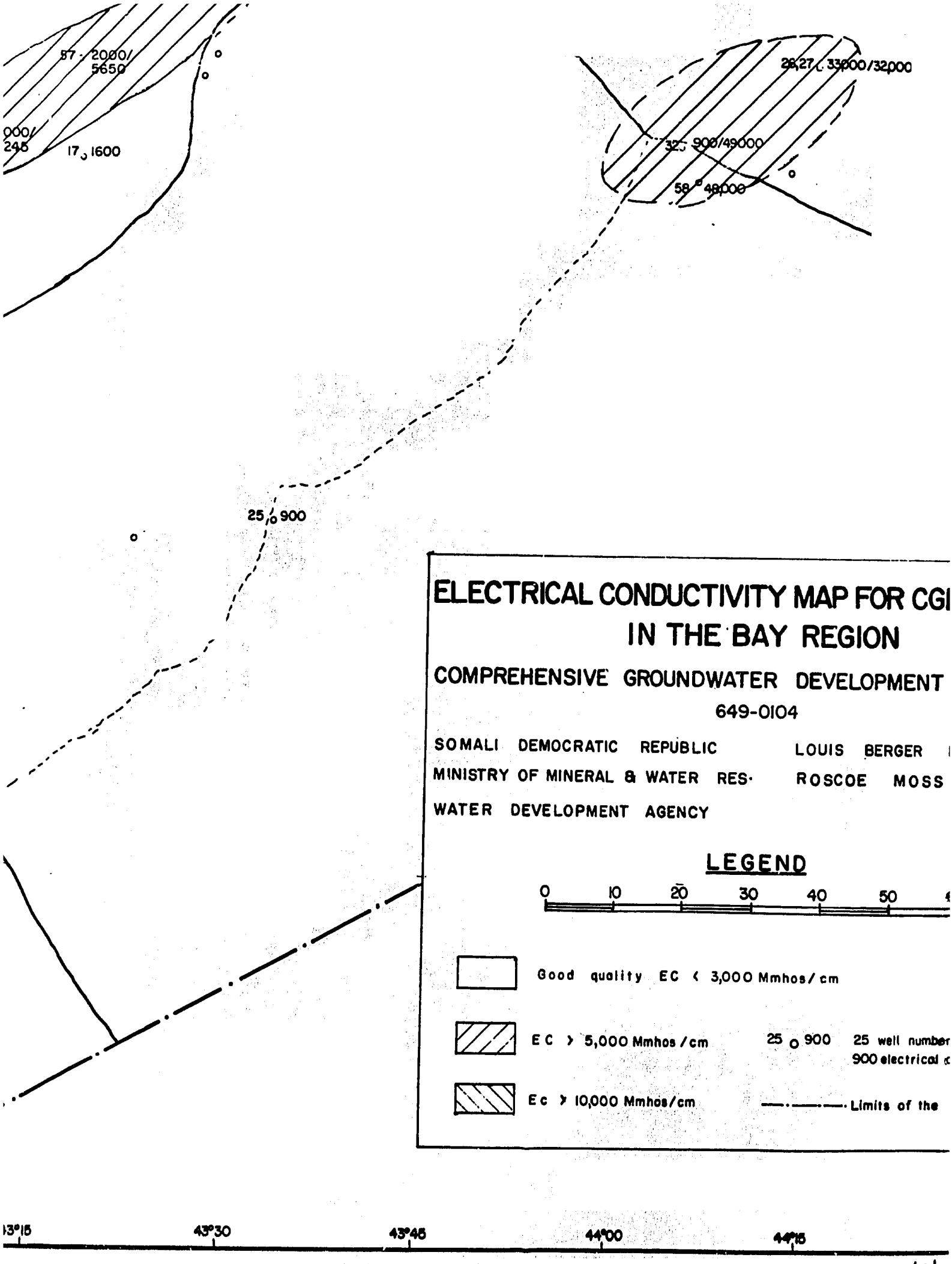
649-0104

SOMALI DEMOCRATIC REPUBLIC
MINISTRY OF MINERAL & WATER RES.

LOUIS BERGER INT'L INC
ROSCOE MOSS CO.

18


46 o 2,000
42 o 1800
20 o 2000
23 o 900
17 o 1600
2°45
2°30
2°15
2°00
1°45
1°30
42°30
42°45
43°00
43°15
43°30


57 · 2000/
5650
000/
246
17 1600
26,27 33000/32000
32 900/49000
58 48000
25 900
ELECTRICAL CONDUCTIVITY MAP FOR CGI
IN THE BAY REGION
COMPREHENSIVE GROUNDWATER DEVELOPMENT
649-0104
SOMALI DEMOCRATIC REPUBLIC
MINISTRY OF MINERAL & WATER RES·
WATER DEVELOPMENT AGENCY
LOUIS BERGER
ROSCOE MOSS
LEGEND
0 10 20 30 40 50
Good quality EC < 3,000 Mmhos/cm
EC > 5,000 Mmhos/cm
25 900
25 well number
900 electrical c
Ec > 10,000 Mmhos/cm
Limits of the
43°30
43°45
44°00
44°15

184

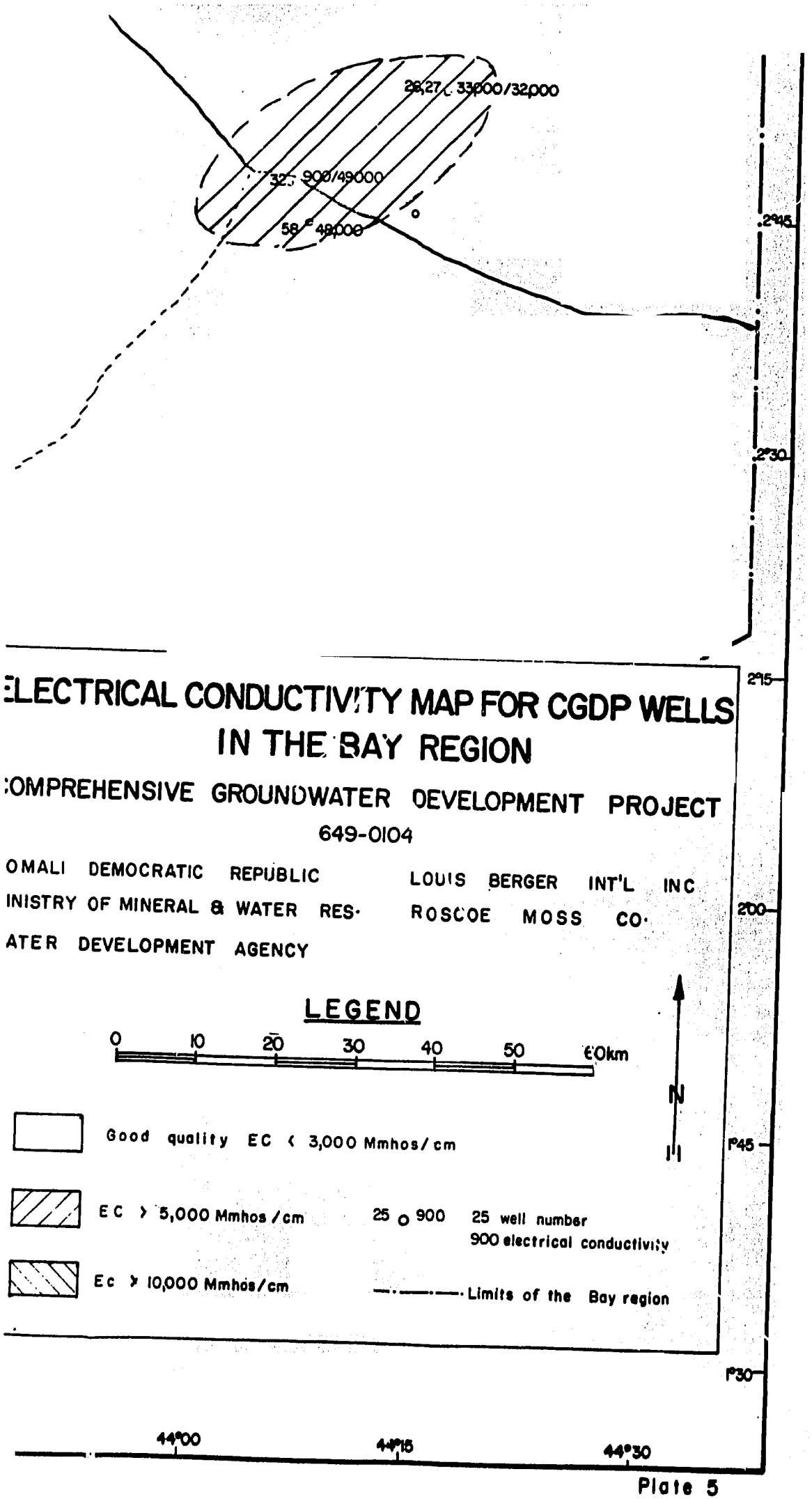
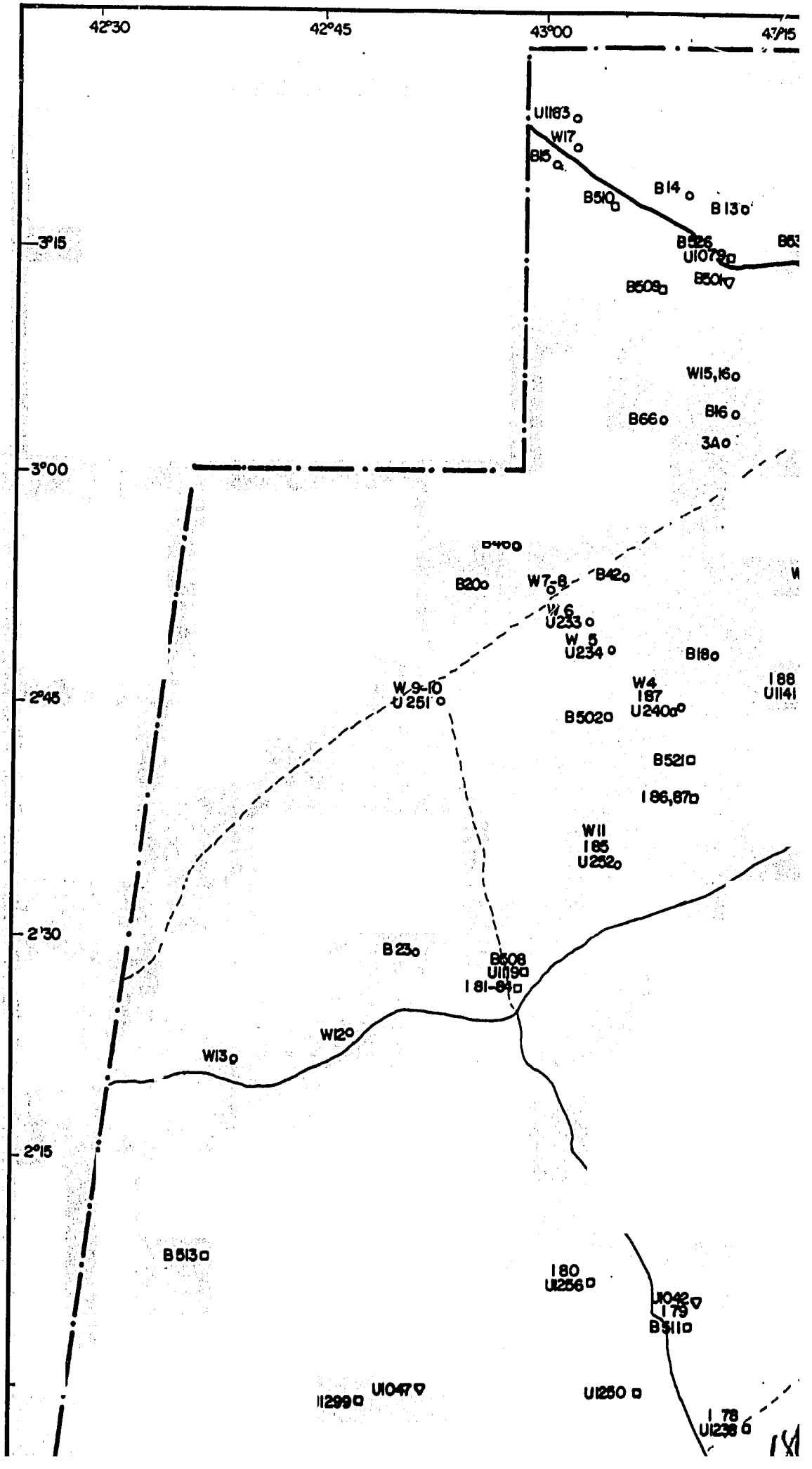
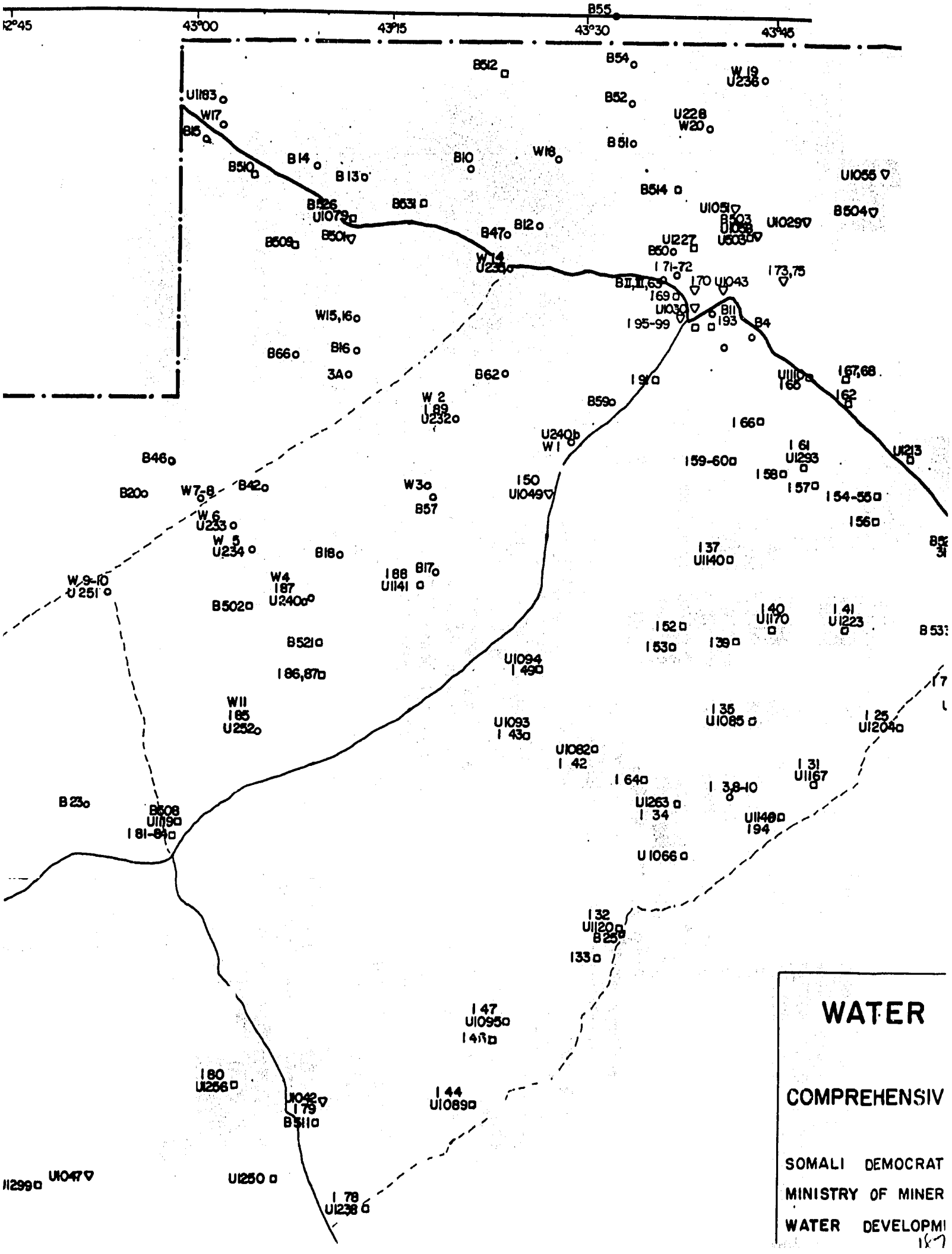
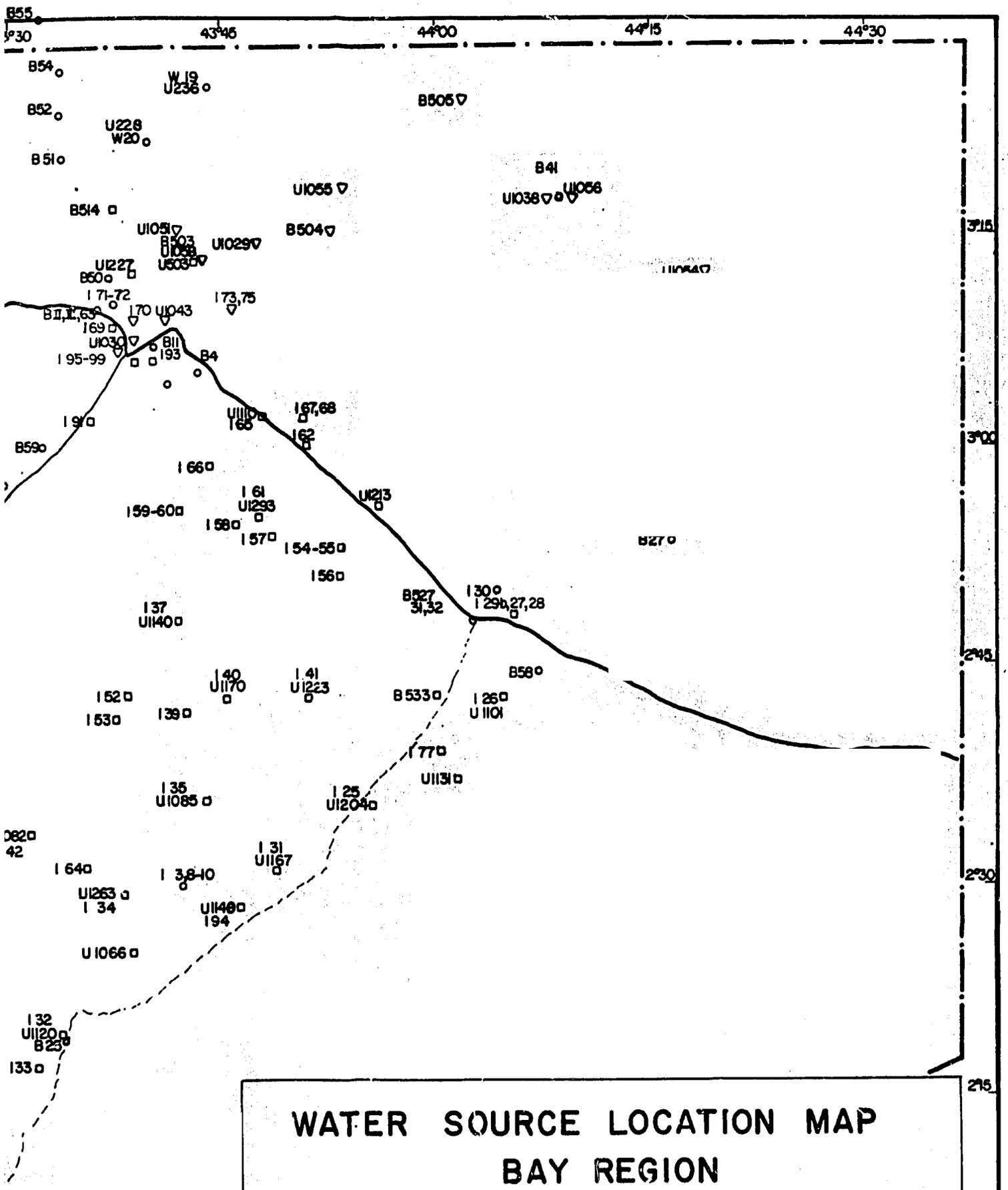

28,27 33,000/32,000
32 900/49000
58 49,000
2°45
2°30
2°15
2°00
1°45
1°30
44°00
44°15
44°30
ELECTRICAL CONDUCTIVITY MAP FOR CGDP WELLS
IN THE BAY REGION
COMPREHENSIVE GROUNDWATER DEVELOPMENT PROJECT
649-0104
OMALI DEMOCRATIC REPUBLIC
INISTRY OF MINERAL & WATER RES.
ATER DEVELOPMENT AGENCY
LOUIS BERGER INT'L INC
ROSCOE MOSS CO.
LEGEND
0 10 20 30 40 50 60km
N
Good quality EC < 3,000 Mmhos/cm
EC > 5,000 Mmhos/cm
25 o 900
25 well number
900 electrical conductivity
Ec > 10,000 Mmhos/cm
Limits of the Bay region

Plate 5


42°30
42°45
43°00
3°15
3°00
2°45
2°30
2°15
U1183
W17
B15
B510
B14
B13
B526
U1079
B509
B501
W15,16
B66
B16
3A
B20
W7-8
B42
W6
U233
W5
U234
B18
W9-10
U251
W4
187
U240
B502
B521
186,87
W11
185
U252
B23
B508
U1119
181-84
W12
W13
B513
180
U1256
U1042
179
B511
U1047
U1250
178
U1238


WATER
COMPREHENSIV
SOMALI DEMOCRAT
MINISTRY OF MINER
WATER DEVELOPMI



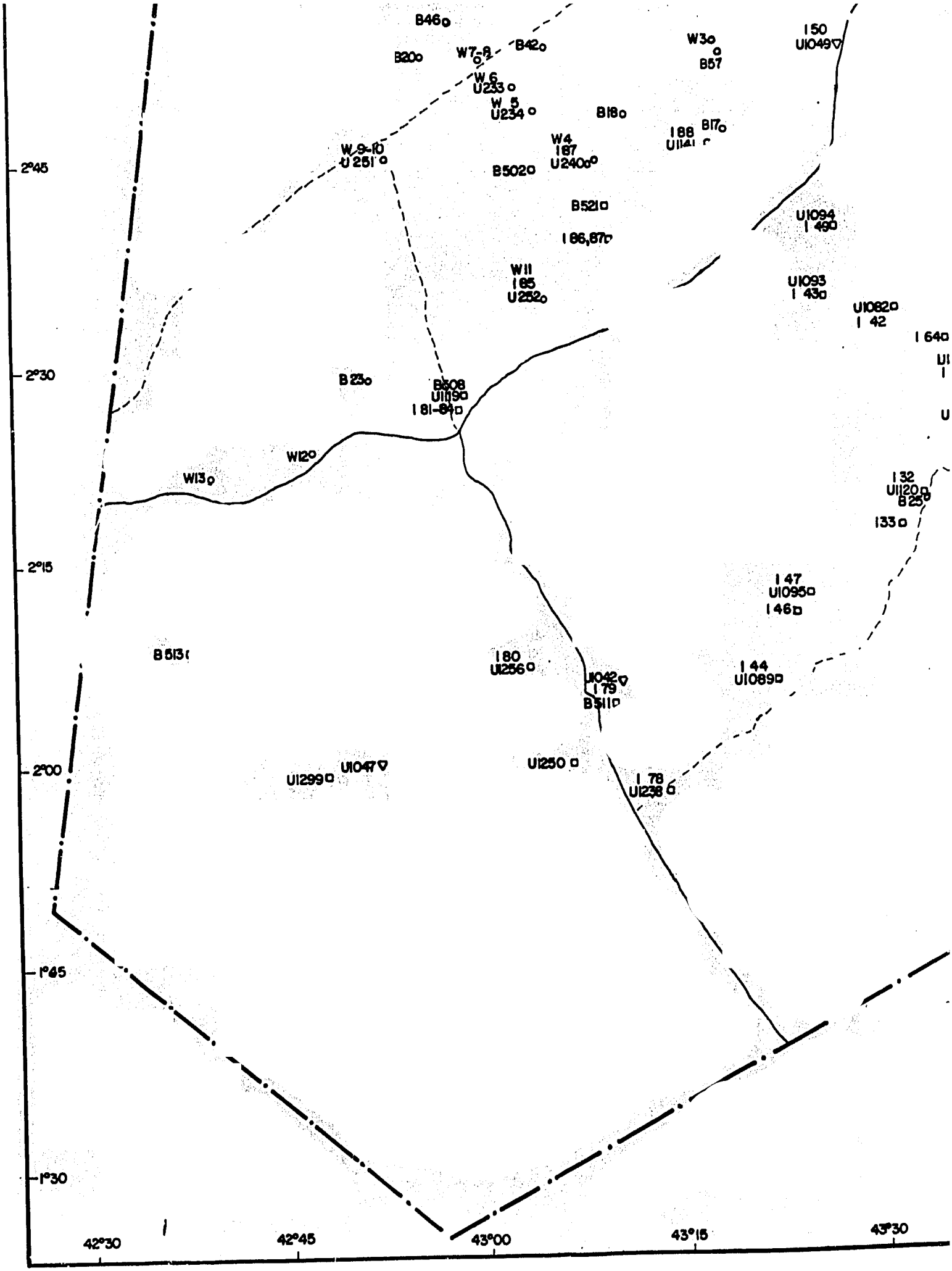
WATER SOURCE LOCATION MAP
BAY REGION

COMPREHENSIVE GROUNDWATER DEVELOPMENT PROJECT

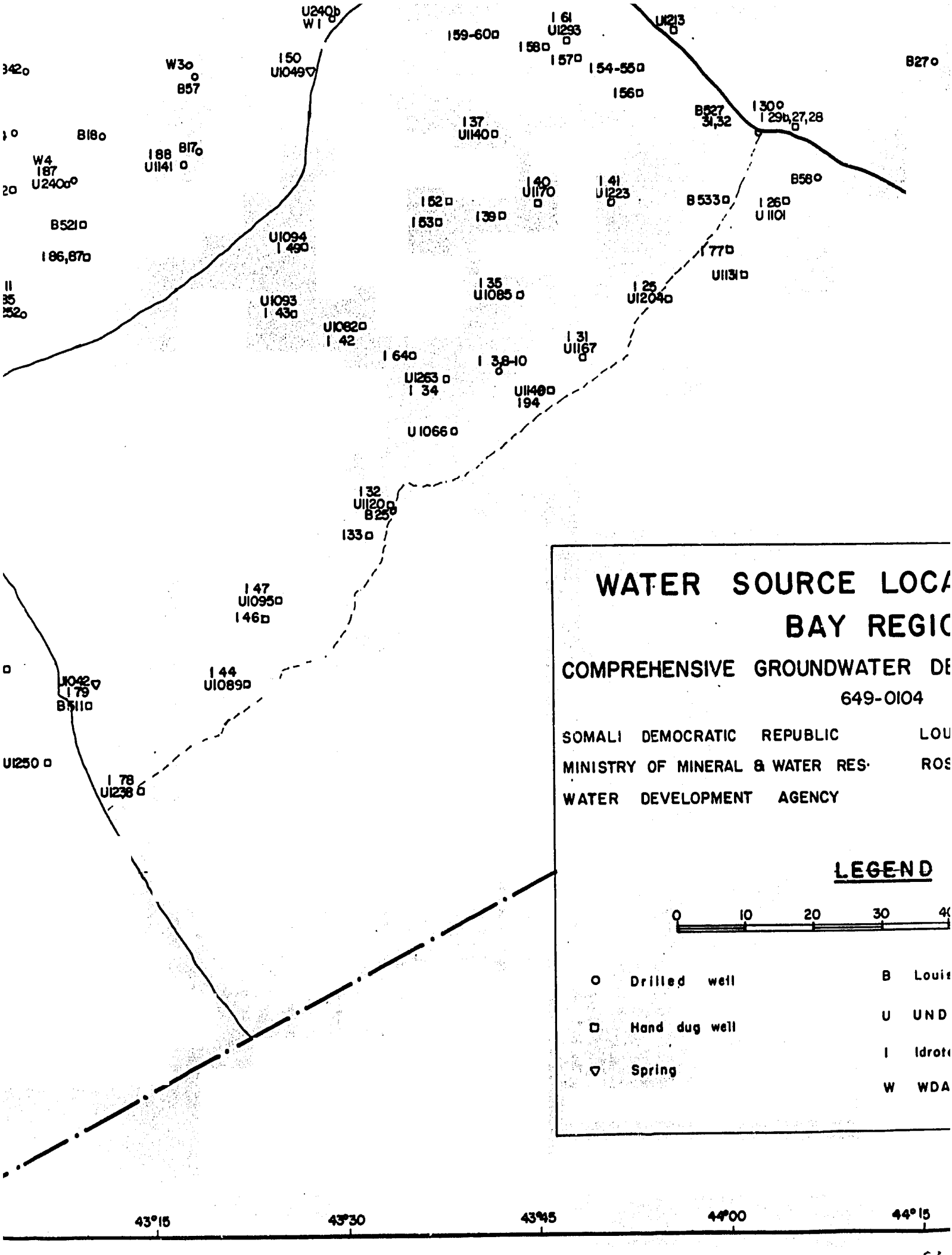
649-0104

SOMALI DEMOCRATIC REPUBLIC
MINISTRY OF MINERAL & WATER RES.
WATER DEVELOPMENT AGENCY

LOUIS BERGER INT'L INC
ROSCOE MOSS CO.


B46
B20
W7-8
B42
W6
U233
W5
U234
B18
W3
B57
150
U1049
188
U1141
B17
W4
187
U240
W9-10
U251
B502
B521
186,87
U1094
149
W11
185
U252
U1093
143
U1082
142
164
B23
B508
U1119
181-84
W12
W13
132
U1120
B25
133
147
U1095
146
B513
180
U1256
U1042
179
B511
144
U1089
U1047
U1299
U1250
178
U1238
2°45
2°30
2°15
2°00
1°45
1°30
42°30
42°45
43°00
43°15
43°30

189


WATER SOURCE LOCA
BAY REGIC
COMPREHENSIVE GROUNDWATER DE
649-0104
SOMALI DEMOCRATIC REPUBLIC
MINISTRY OF MINERAL & WATER RES.
WATER DEVELOPMENT AGENCY
LOU
ROS
LEGEND
0 10 20 30 40
Drilled well
Hand dug well
Spring
B Louis
U UND
I Idrot
W WDA
43°15
43°30
43°45
44°00
44°15

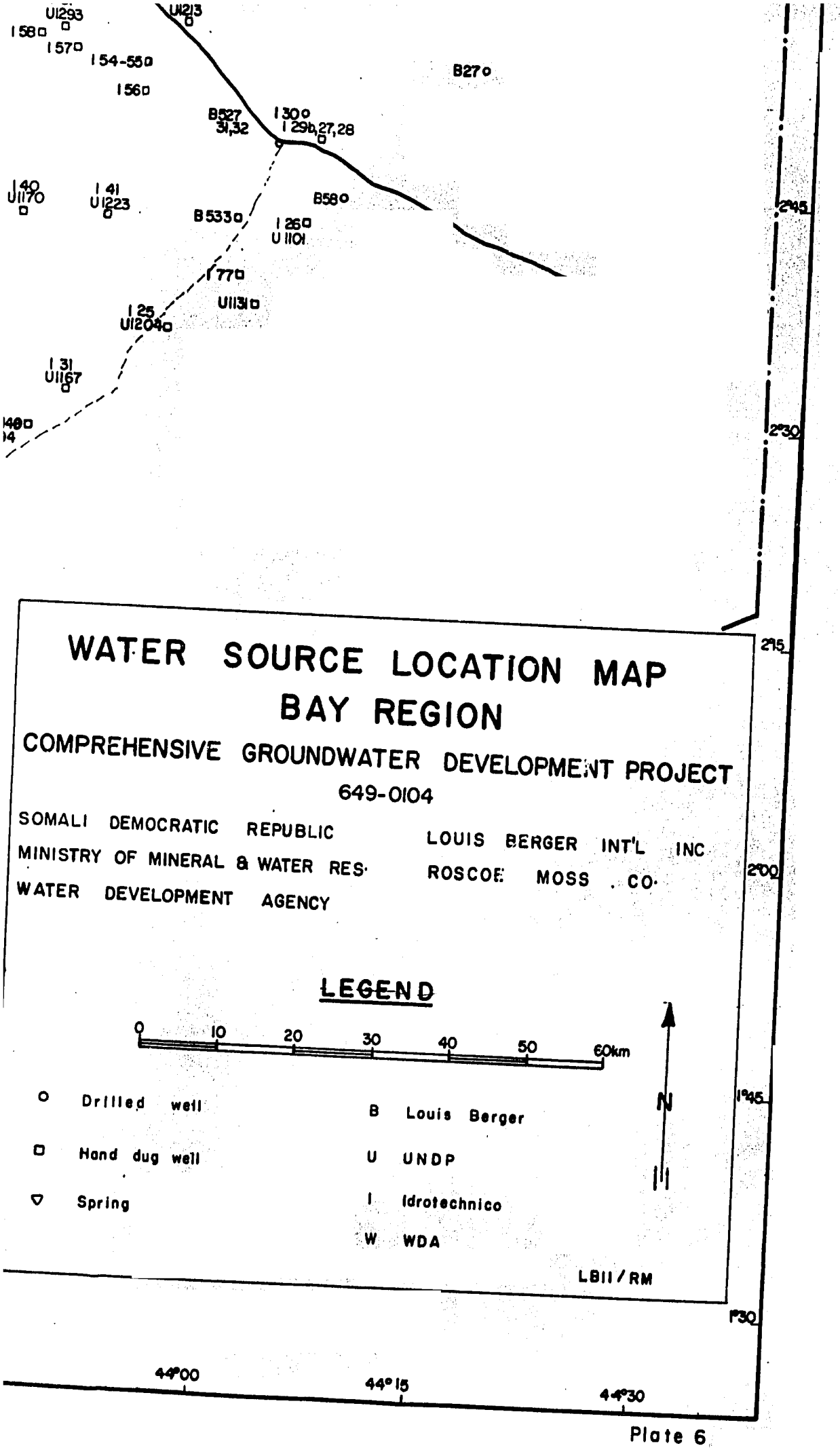
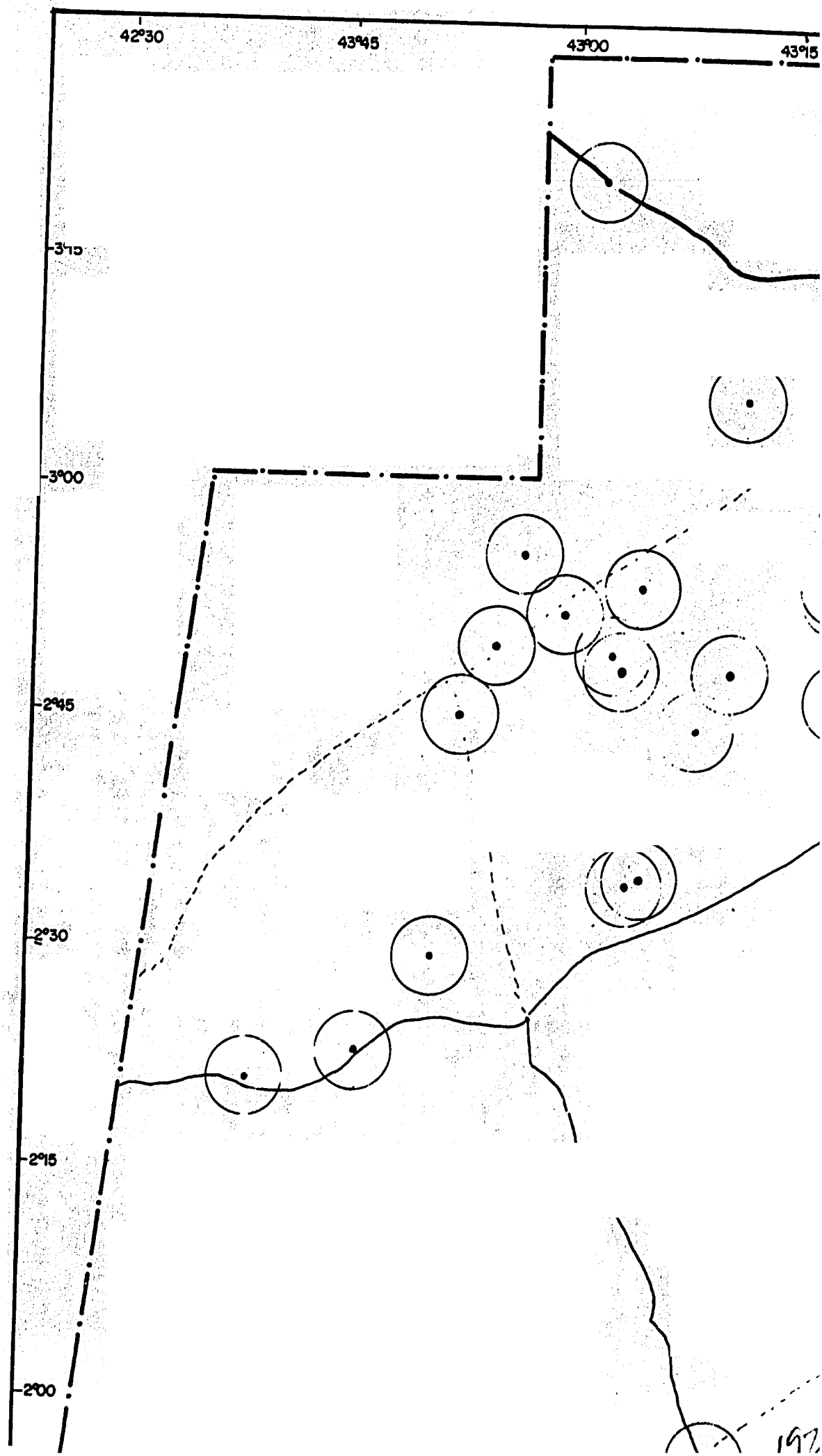
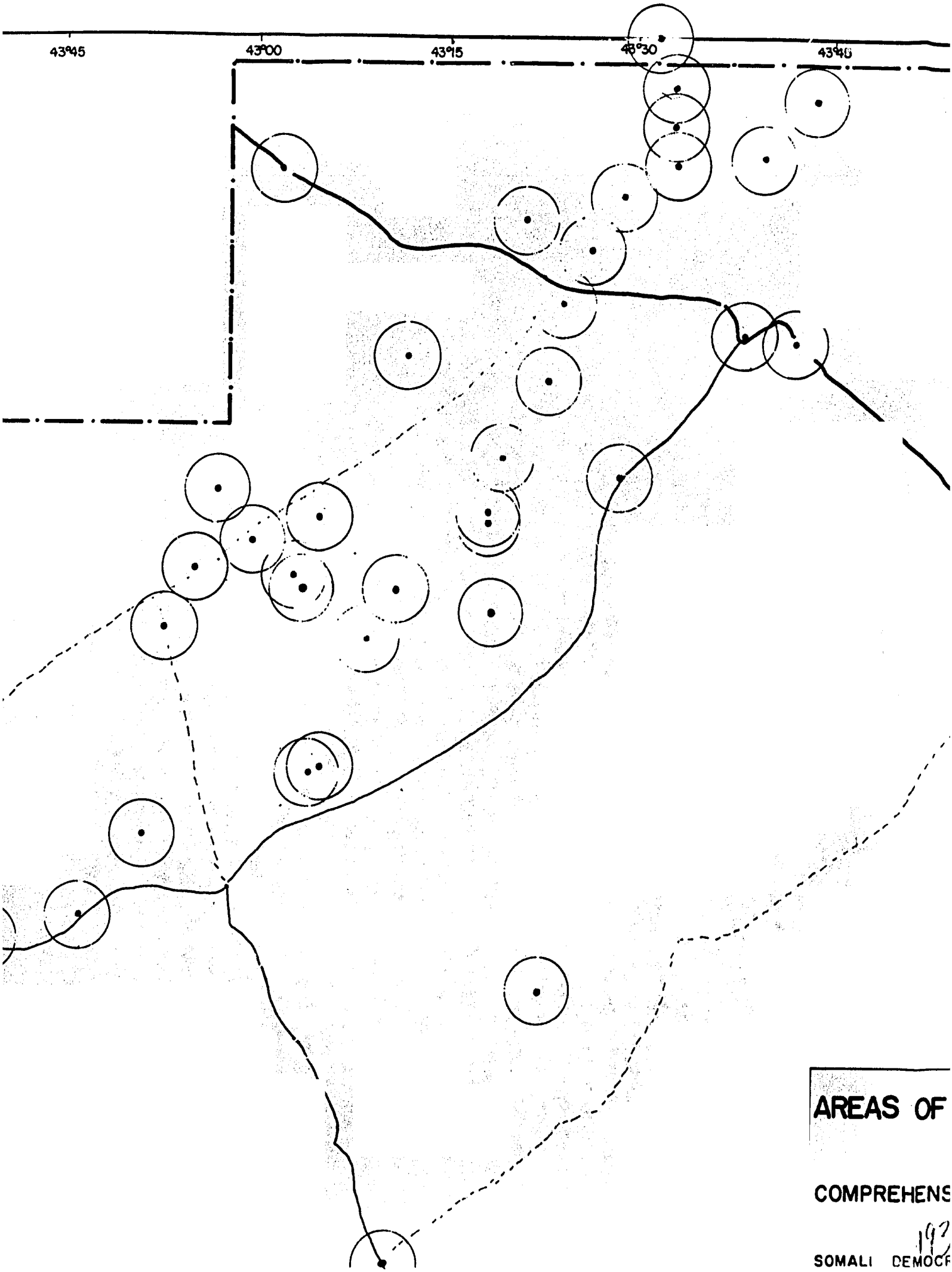

WATER SOURCE LOCATION MAP
BAY REGION
COMPREHENSIVE GROUNDWATER DEVELOPMENT PROJECT
649-0104
SOMALI DEMOCRATIC REPUBLIC
MINISTRY OF MINERAL & WATER RES.
WATER DEVELOPMENT AGENCY
LOUIS BERGER INT'L INC.
ROSCOE MOSS CO.
LEGEND
0 10 20 30 40 50 60km
N
Drilled well
Hand dug well
Spring
B Louis Berger
U UNDP
I Idrotechnico
W WDA
LB11/RM
44°00
44°15
44°30
2°45
2°30
2°15
2°00
1°45
1°30
B270
B527
31,32
1300
1296,27,28
140
U1170
141
U1223
B580
B5330
1260
U1101
1770
U1131
125
U1204
131
U1167
U1293
1580
1570
154-550
1560
U1213

Plate 6

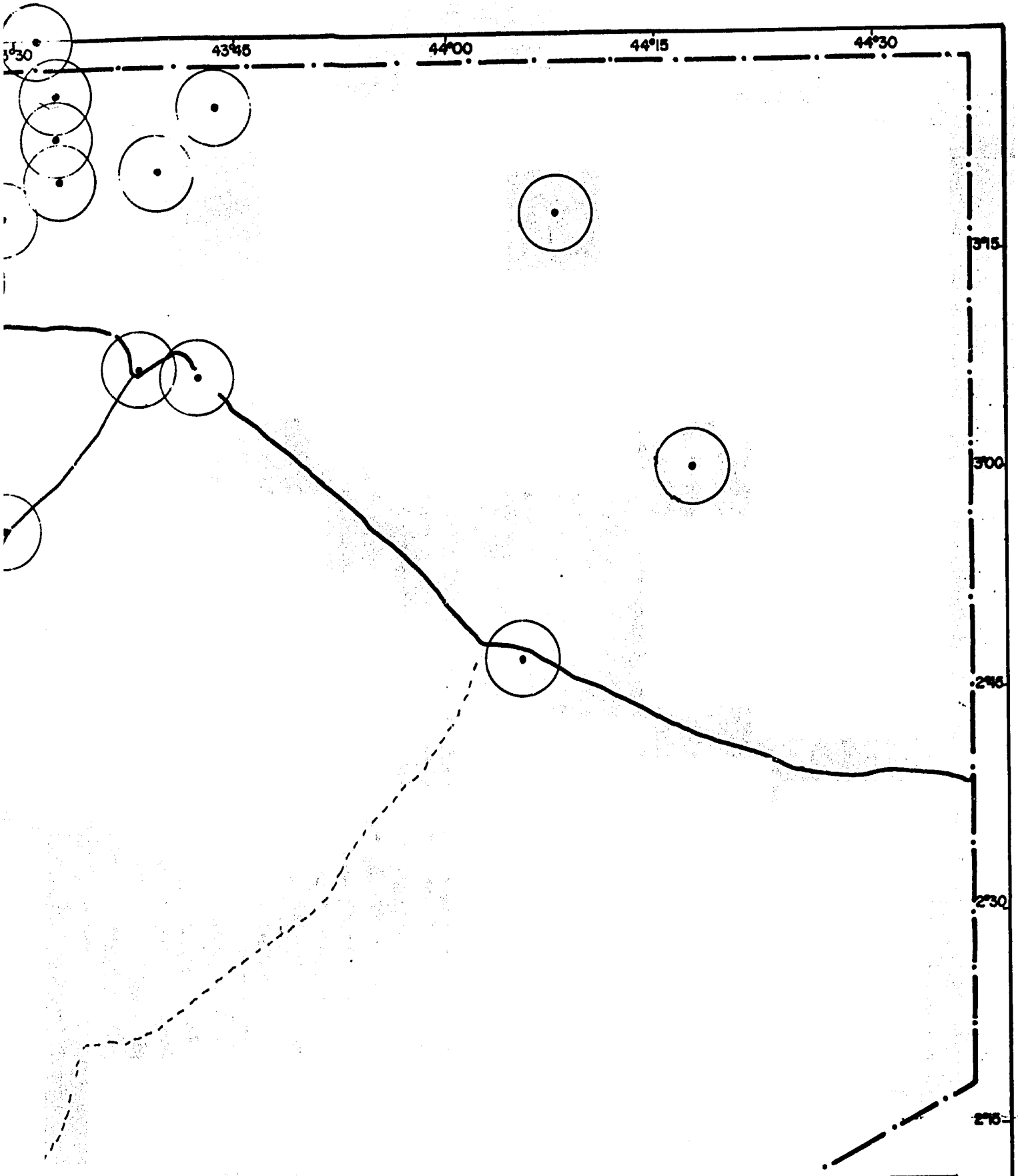

42°30
43°45
43°00
43°15
3°15
3°00
2°45
2°30
2°15
2°00



AREAS OF

COMPREHENS

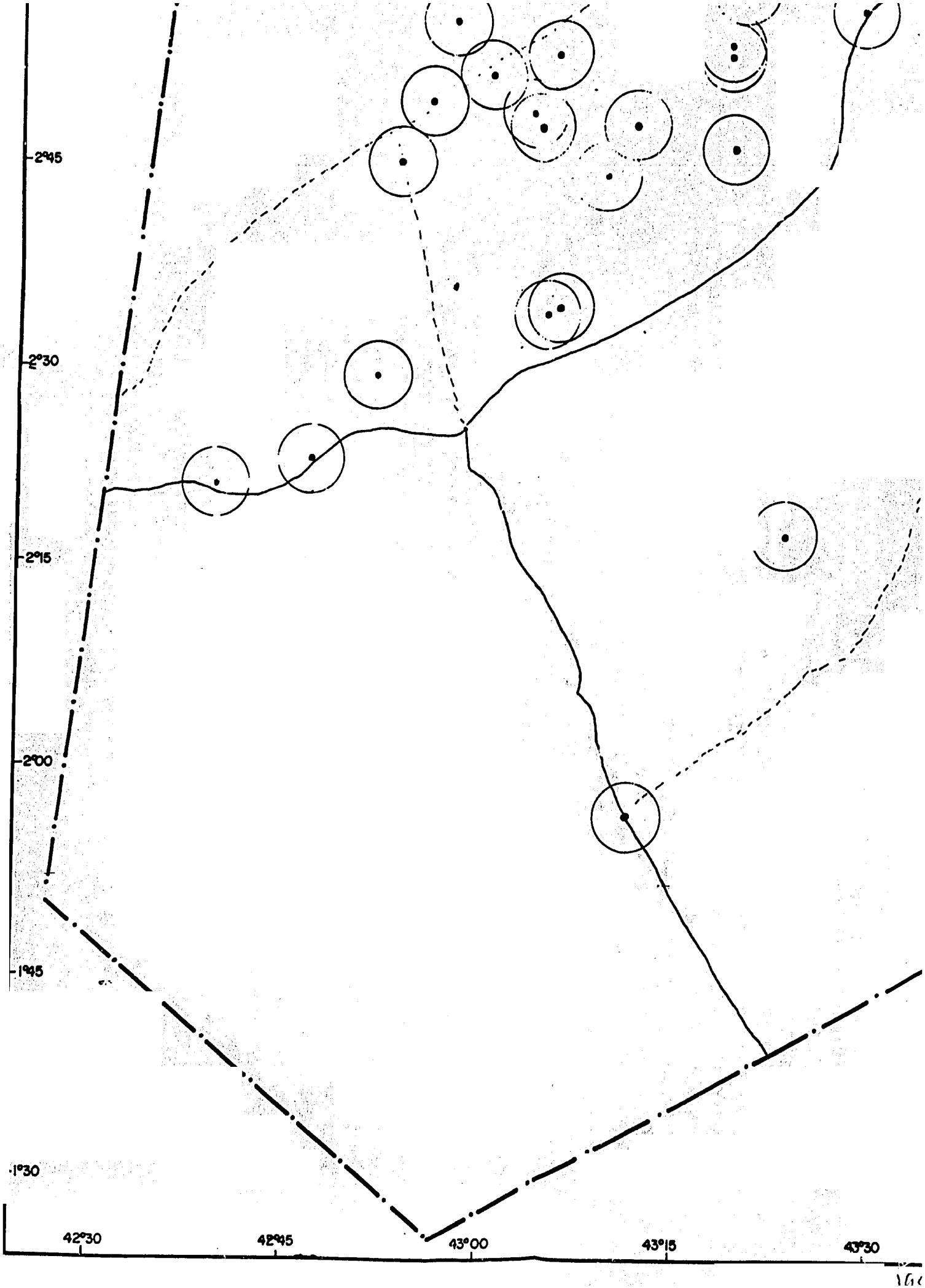
SOMALI DEMOCR

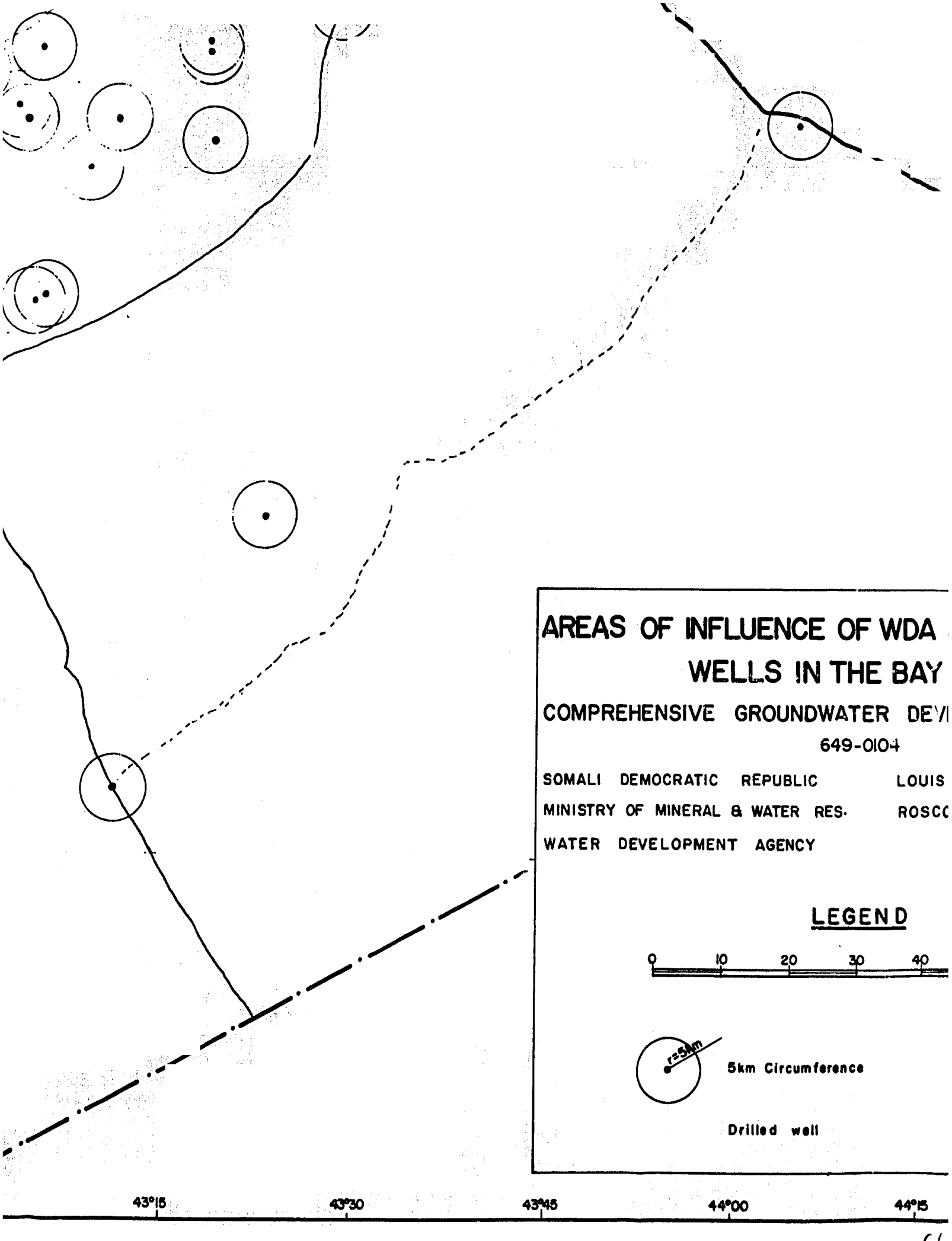


AREAS OF INFLUENCE OF WDA & CGDP DRILLED WELLS IN THE BAY REGION

COMPREHENSIVE GROUNDWATER DEVELOPMENT PROJECT

649-0104


2°45
2°30
2°15
2°00
1°45
1°30
42°30
42°45
43°00
43°15
43°30


AREAS OF INFLUENCE OF WDA
WELLS IN THE BAY
COMPREHENSIVE GROUNDWATER DEV
649-0104
SOMALI DEMOCRATIC REPUBLIC
MINISTRY OF MINERAL & WATER RES.
WATER DEVELOPMENT AGENCY
LOUIS
ROSCC
LEGEND
0
10
20
30
40
r=5km
5km Circumference
Drilled well
43°15
43°30
43°45
44°00
44°15

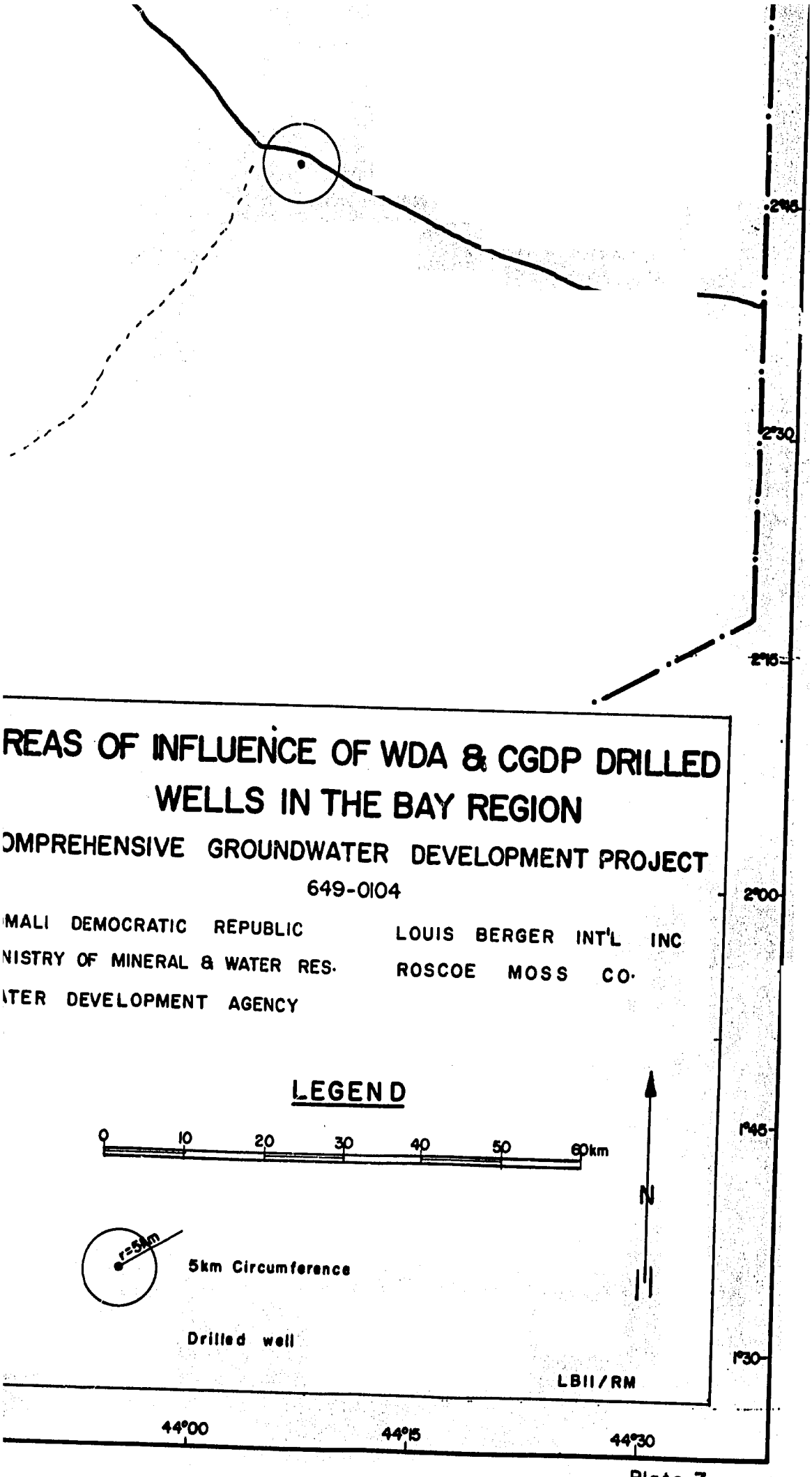
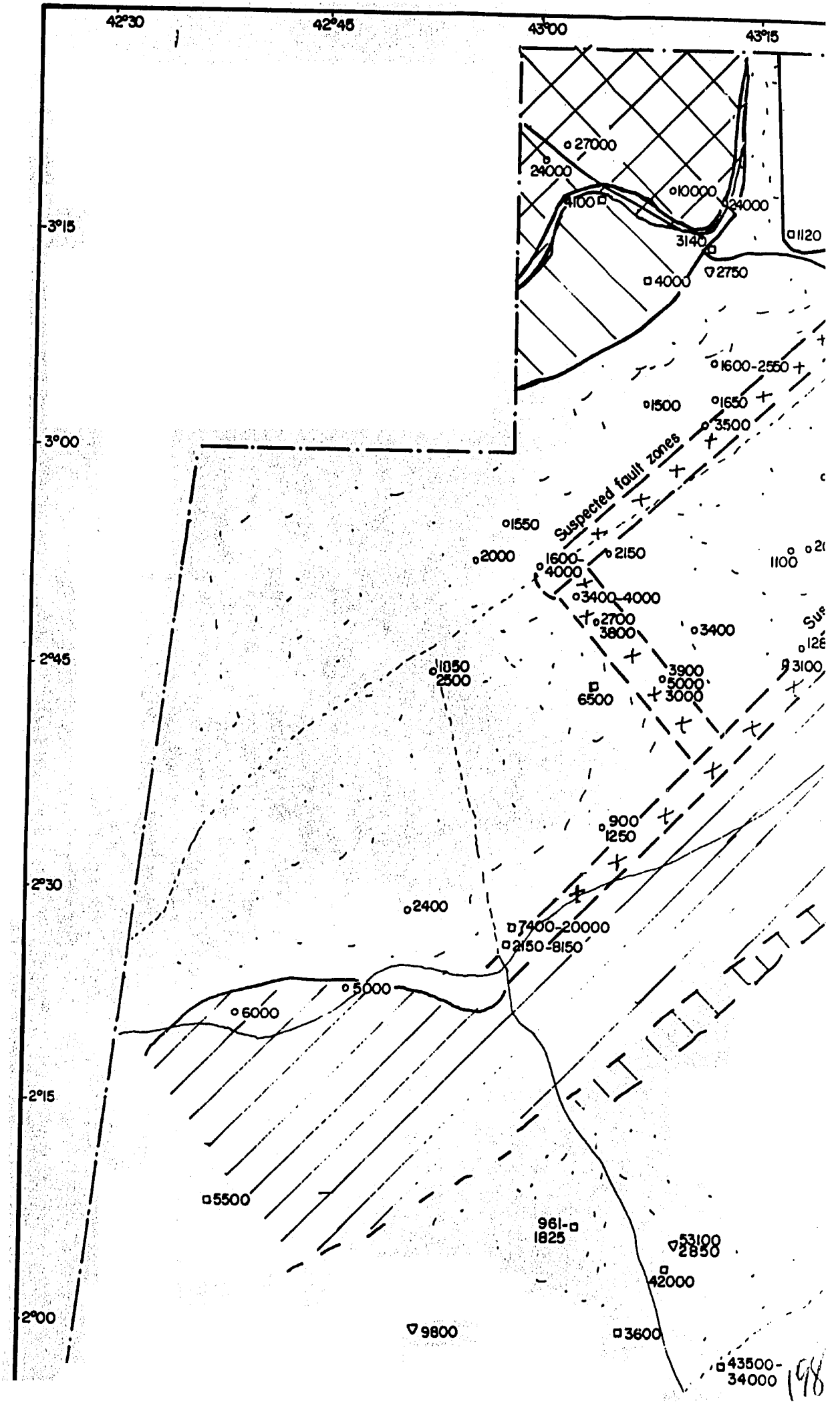

REAS OF INFLUENCE OF WDA & CGDP DRILLED WELLS IN THE BAY REGION
OMPREHENSIVE GROUNDWATER DEVELOPMENT PROJECT
649-0104
MALI DEMOCRATIC REPUBLIC
NISTRY OF MINERAL & WATER RES.
ATER DEVELOPMENT AGENCY
LOUIS BERGER INT'L INC
ROSCOE MOSS CO.
LEGEND
0 10 20 30 40 50 60km
N
r=5km
5km Circumference
Drilled well
LBII/RM
2°45
2°30
2°15
2°00
1°45
1°30
44°00
44°15
44°30

Plate 7

197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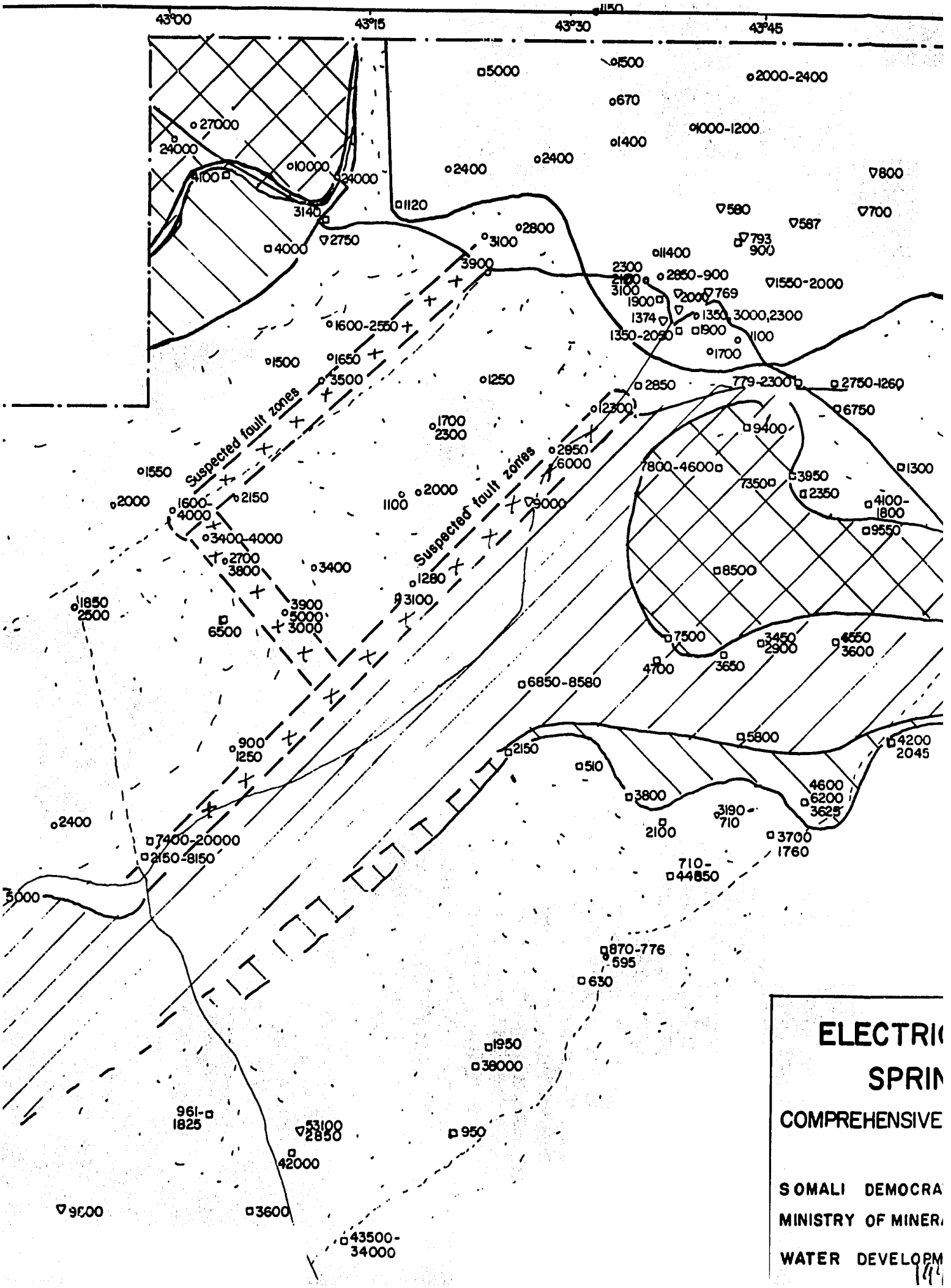
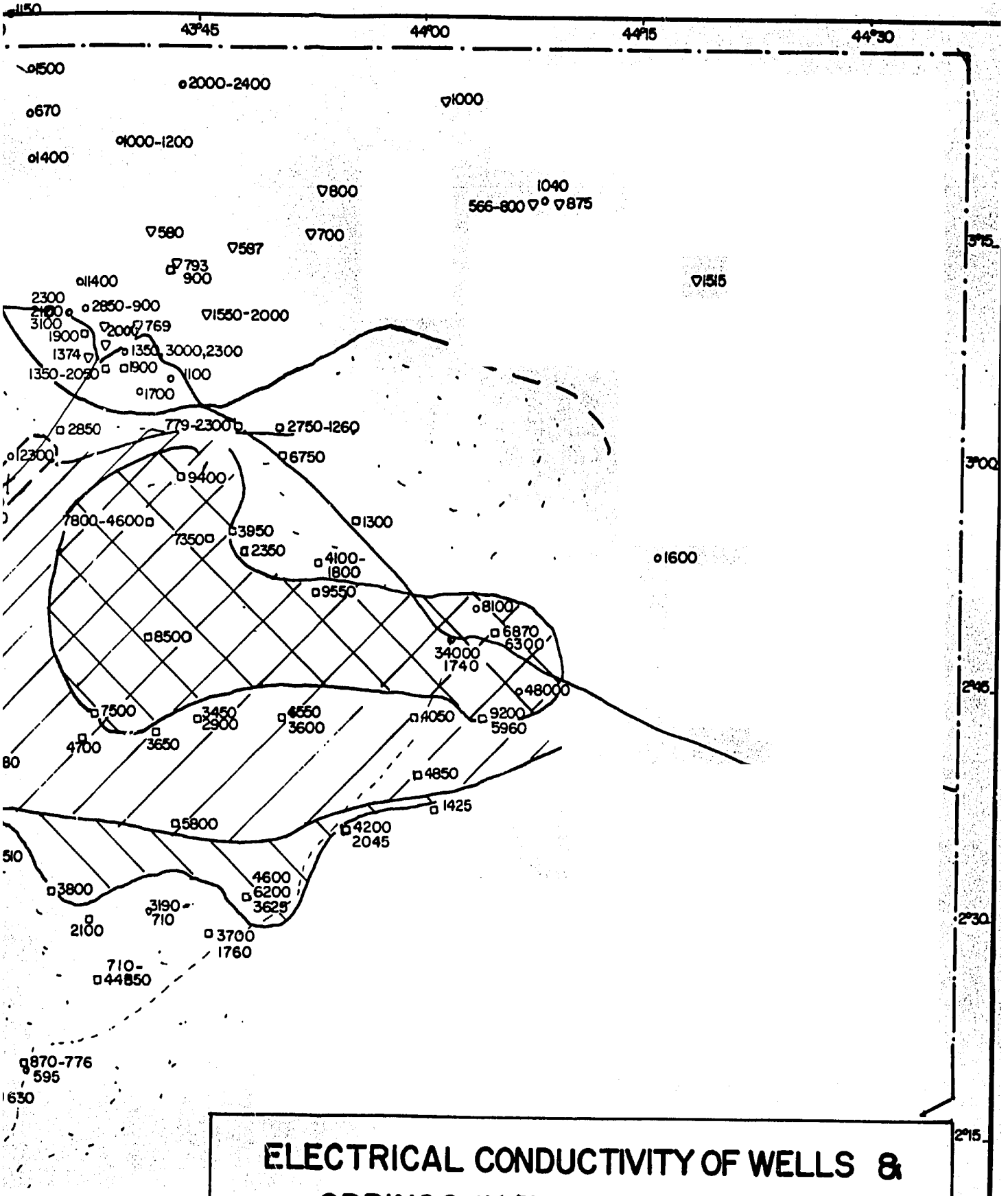
43°00
43°15
3°15
3°00
2°45
2°30
2°15
2°00
27000
24000
10000
24000
4100
3140
1120
2750
4000
1600-2550
1500
1650
3500
Suspected fault zones
1550
2000
1600-
4000
2150
1100
3400-4000
2700
3800
3400
1050
2500
3900
5000
3000
6500
3100
900
1250
2400
7400-20000
2150-8150
5000
6000
5500
961-
1825
53100
2850
42000
9800
3600
43500-
34000

148


43°00
43°15
43°30
43°45
Suspected fault zones
Suspected fault zones
ELECTRIC
SPRIN
COMPREHENSIVE
SOMALI DEMOCRA
MINISTRY OF MINER
WATER DEVELOPM



ELECTRICAL CONDUCTIVITY OF WELLS & SPRINGS IN THE BAY REGION

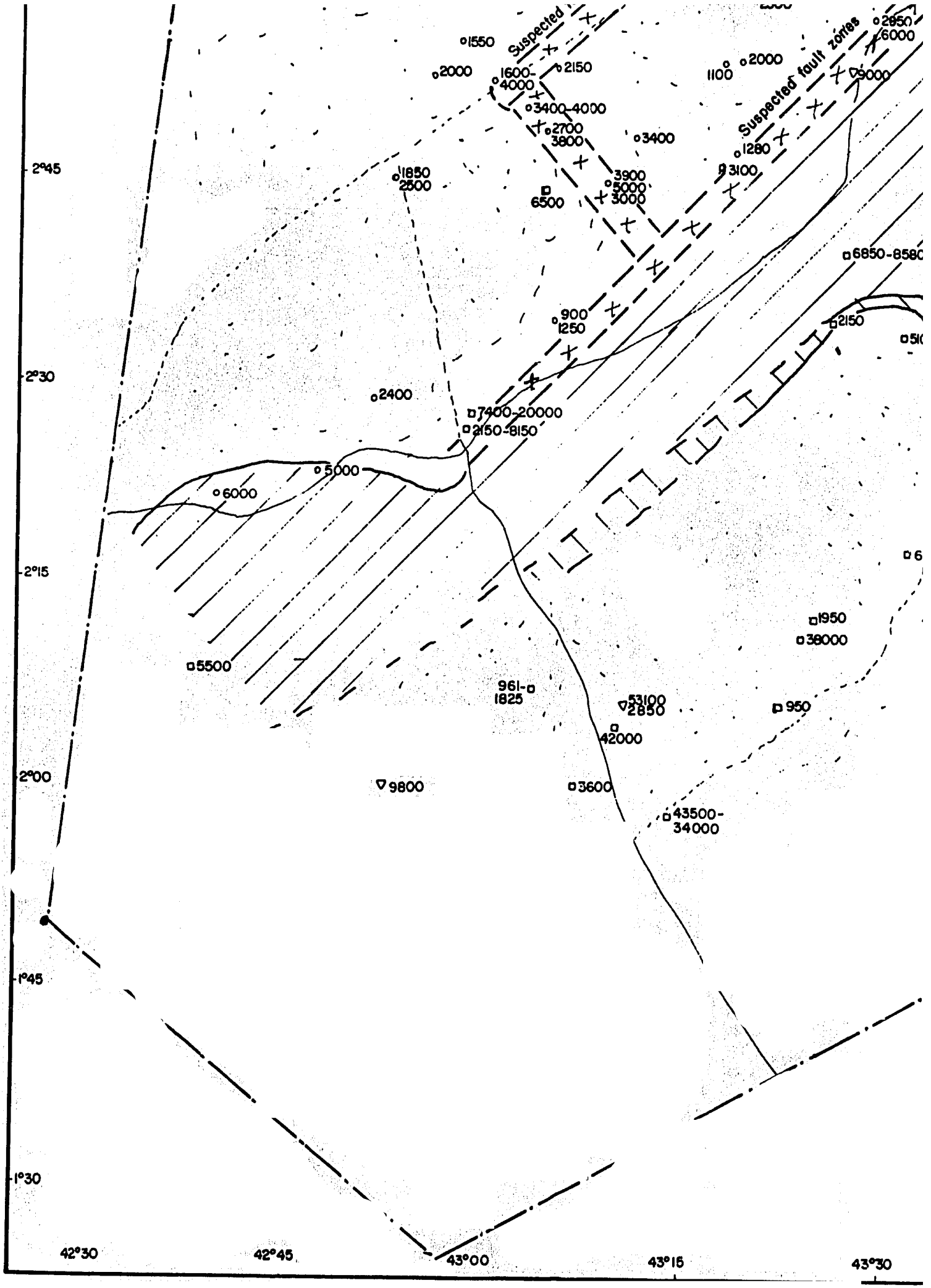
COMPREHENSIVE GROUNDWATER DEVELOPMENT PROJECT

649-0104

SOMALI DEMOCRATIC REPUBLIC
MINISTRY OF MINERAL & WATER RES.
WATER DEVELOPMENT AGENCY

LOUIS BERGER INT'L INC
ROSCOE MOSS CO.

20


Suspected
Suspected fault zones
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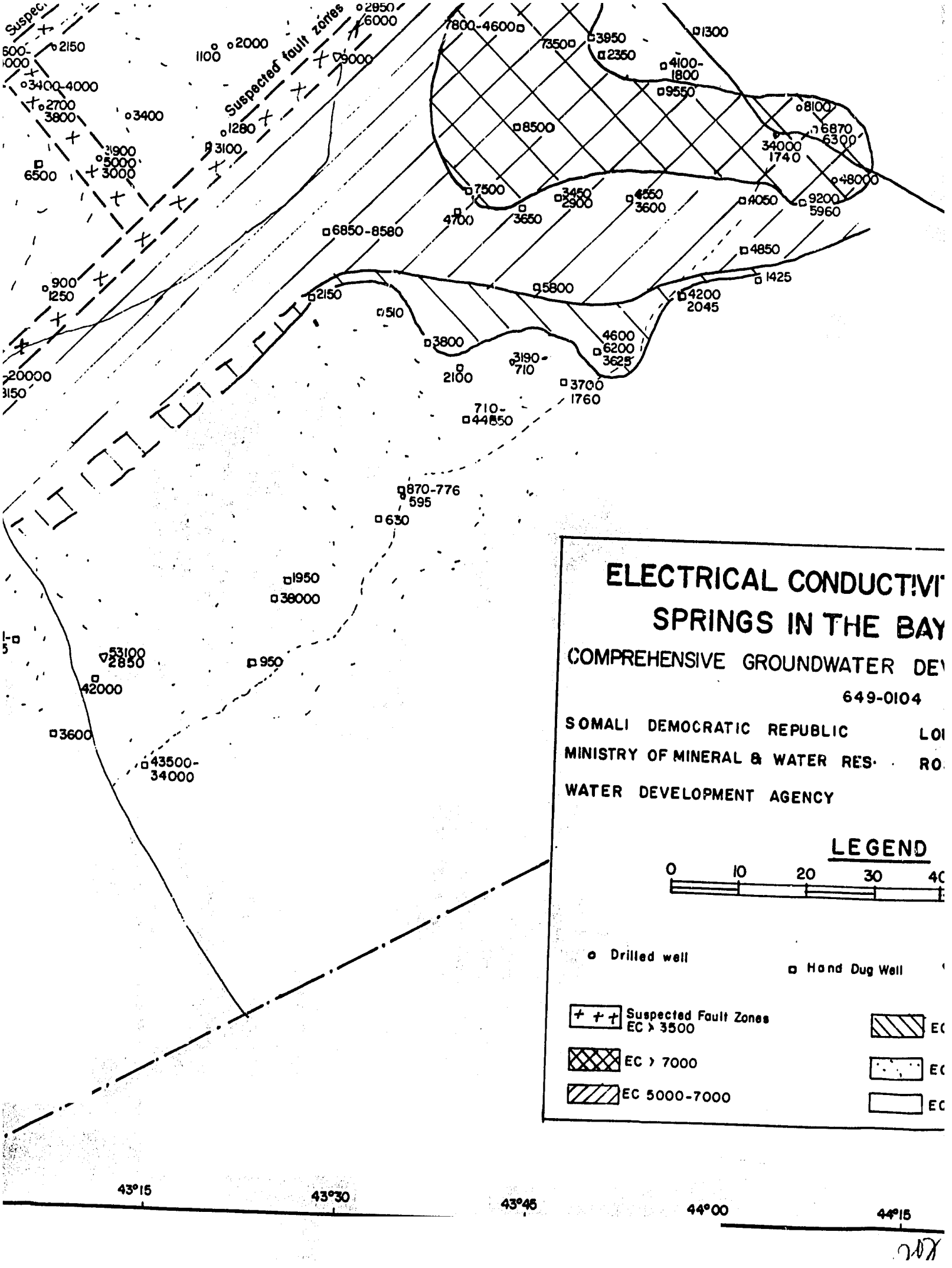
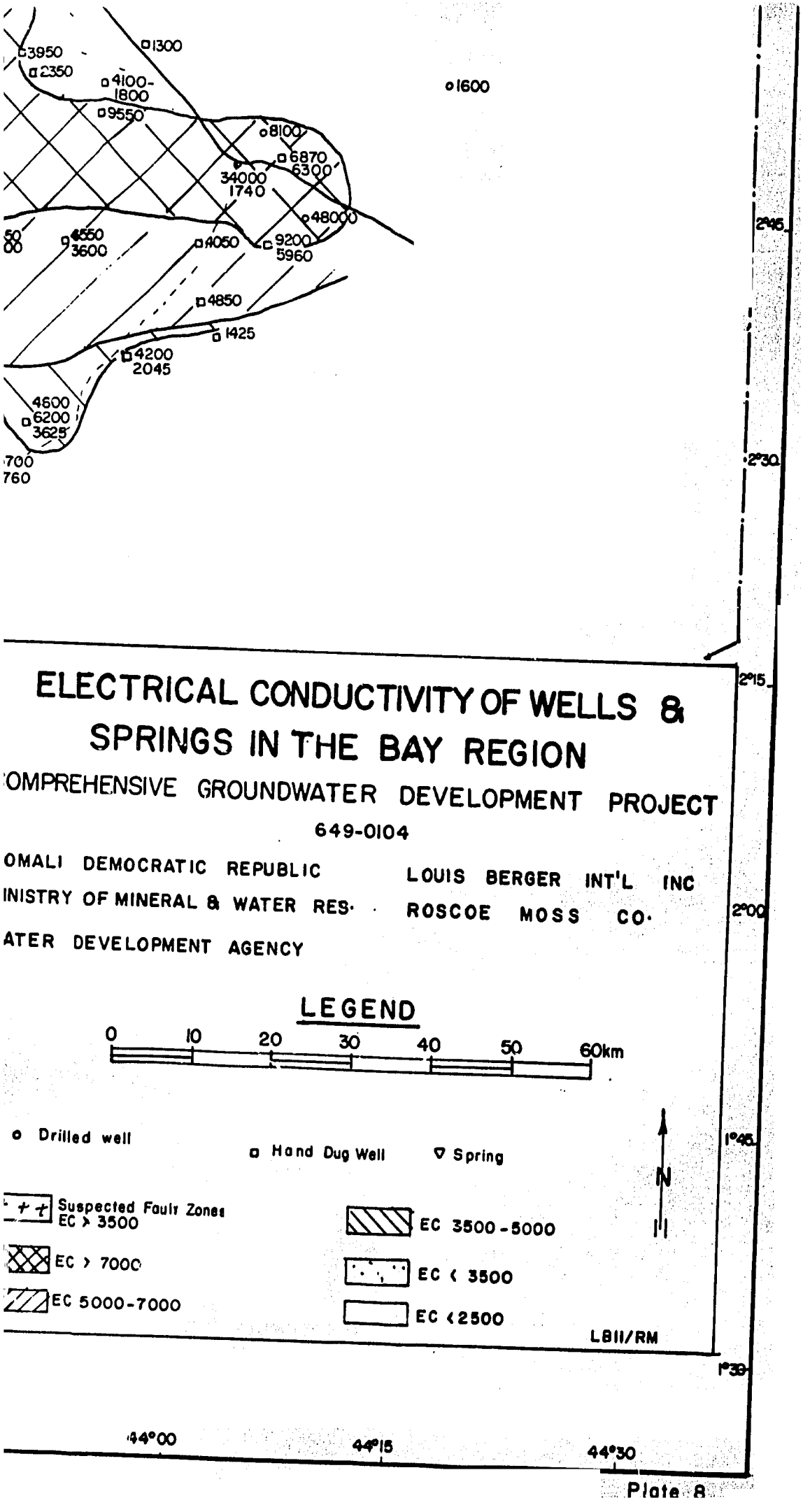
1600-
4000
2150
3400-4000
2700
3800
3400
1100
2000
2950
6000
9000
1280
3100
1850
2500
6500
3900
5000
3000
6850-8580
900
1250
2150
2400
7400-20000
2150-8150
5000
6000
5500
961-
1825
53100
2850
42000
1950
38000
950
9800
3600
43500-
34000
2°45
2°30
2°15
2°00
1°45
1°30
42°30
42°45
43°00
43°15
43°30

301


ELECTRICAL CONDUCTIVI
SPRINGS IN THE BAY
COMPREHENSIVE GROUNDWATER DEV
649-0104
SOMALI DEMOCRATIC REPUBLIC
MINISTRY OF MINERAL & WATER RES.
WATER DEVELOPMENT AGENCY
LEGEND
0 10 20 30
Drilled well
Hand Dug Well
Suspected Fault Zones
EC > 3500
EC > 7000
EC 5000-7000
Suspected fault zones
43°15
43°30
43°45
44°00
44°15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2350
1300
4100-
1800
9550
1600
8100
6870
6300
34000
1740
48000
4550
3600
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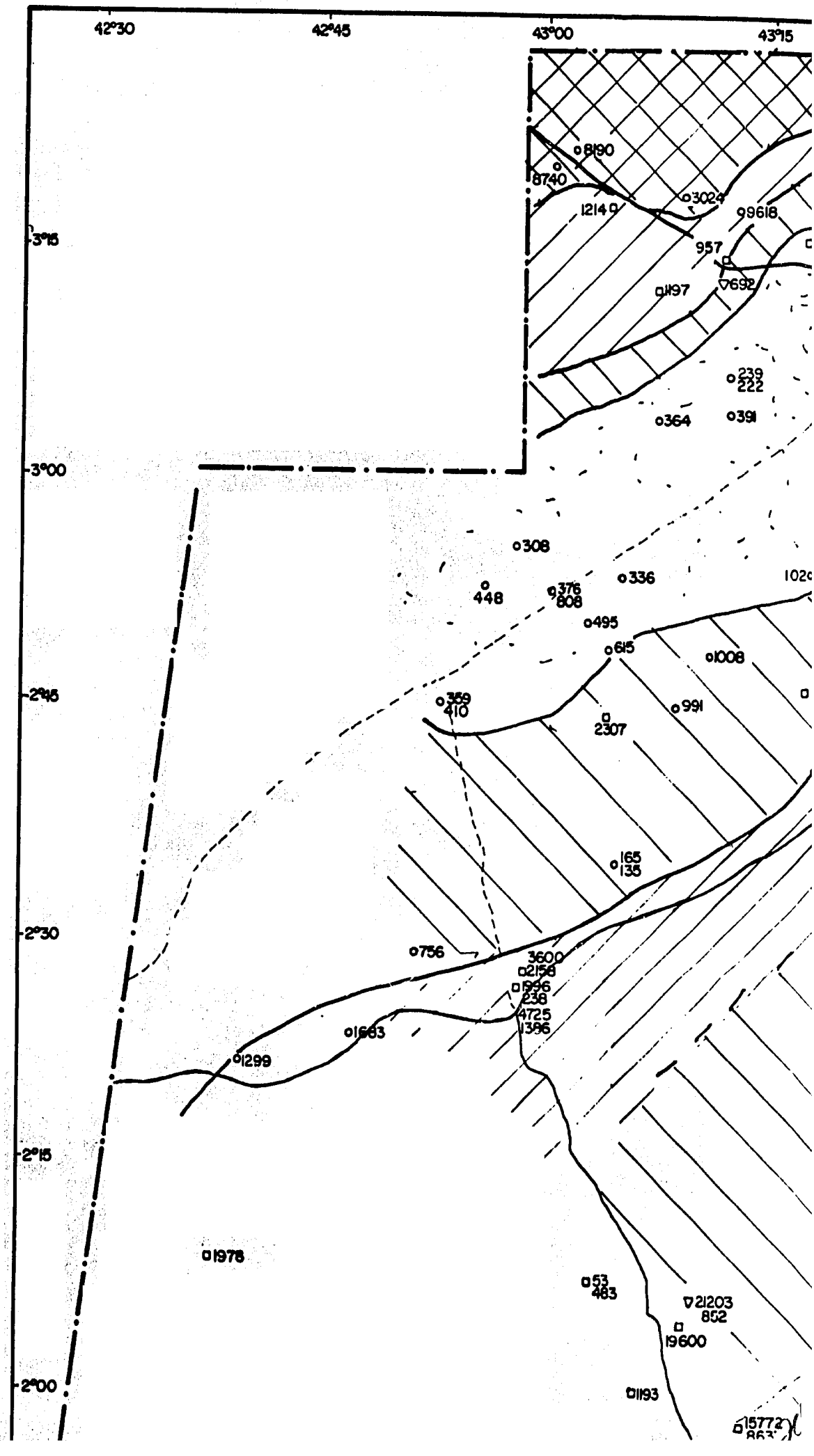
9200
5960
4850
1425
4200
2045
4600
6200
3625
700
760
2°45
2°30
2°15
2°00
1°45
1°30
44°00
44°15
44°30
ELECTRICAL CONDUCTIVITY OF WELLS &
SPRINGS IN THE BAY REGION
OMPREHENSIVE GROUNDWATER DEVELOPMENT PROJECT
649-0104
OMALI DEMOCRATIC REPUBLIC
INISTRY OF MINERAL & WATER RES.
ATER DEVELOPMENT AGENCY
LOUIS BERGER INT'L INC
ROSCOE MOSS CO.
LEGEND
0 10 20 30 40 50 60km
Drilled well
Hand Dug Well
Spring
N
Suspected Fault Zones
EC > 3500
EC > 7000
EC 5000-7000
EC 3500-5000
EC < 3500
EC < 2500
LBII/RM

Plate 8

203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43°00
43°15
3°15
3°00
2°45
2°30
2°15
2°00
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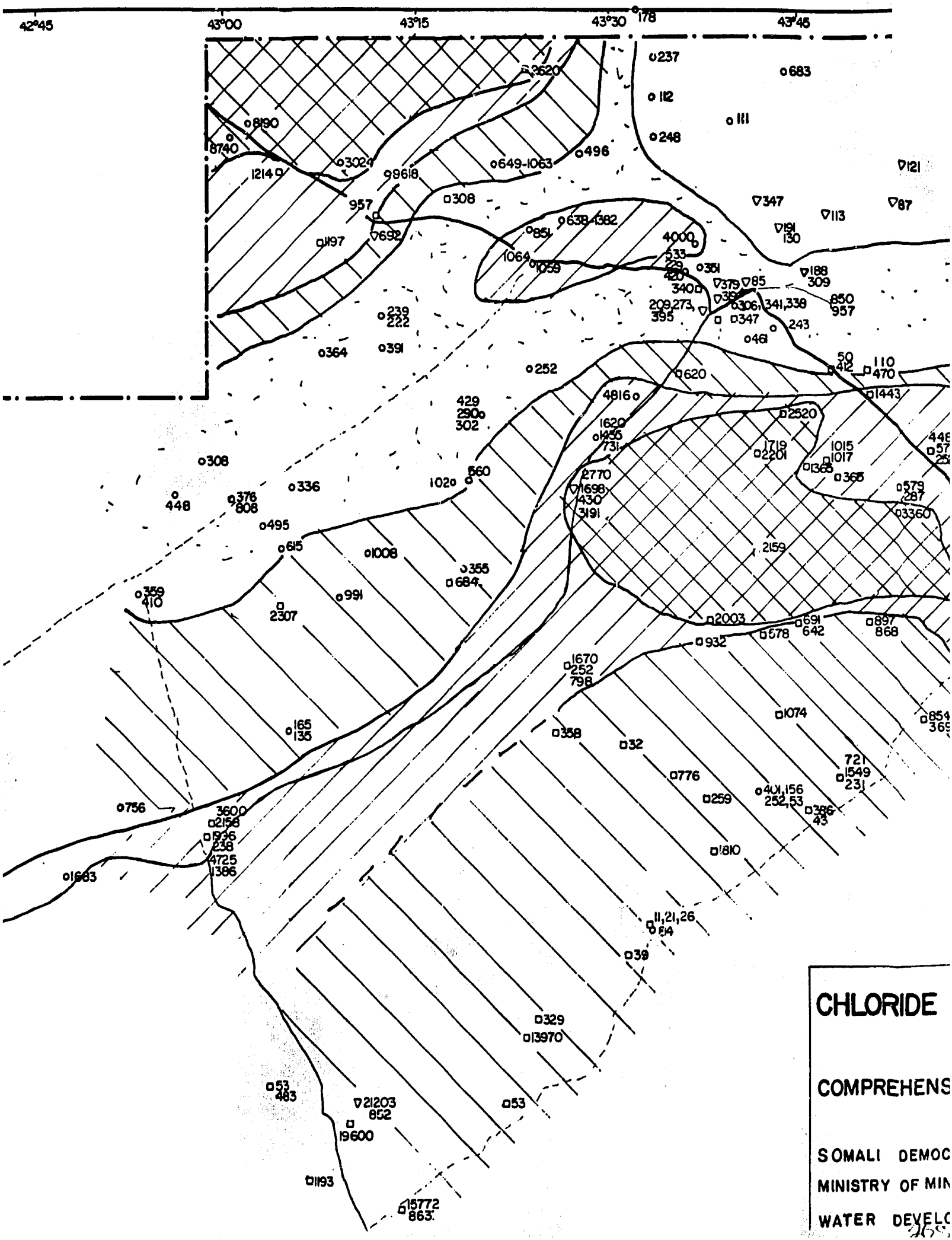
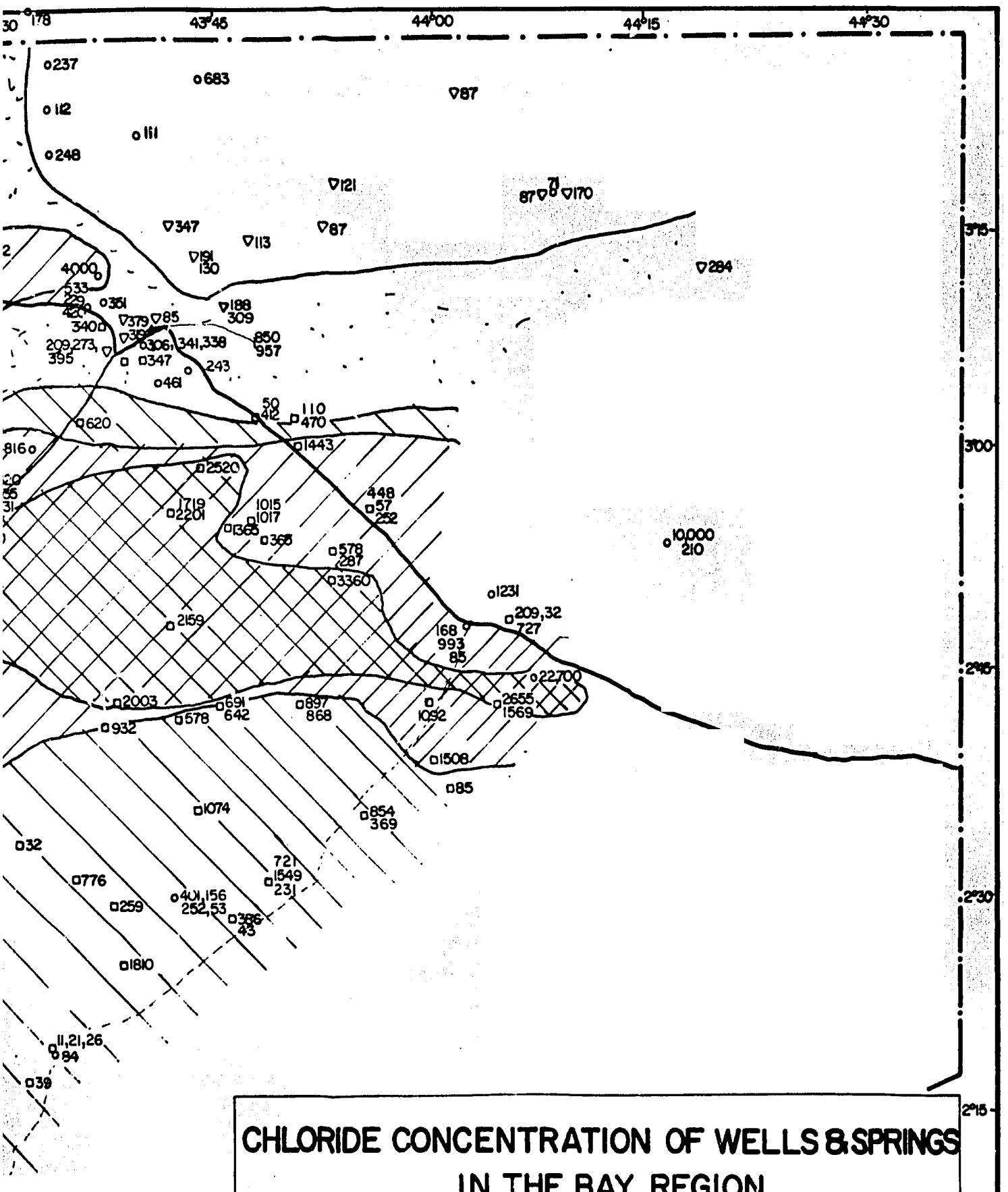
8740
3024
1214
99618
957
692
1197
239
222
364
391
308
448
376
808
336
495
615
1008
359
410
991
2307
165
135
756
3600
2158
1996
238
4725
1386
1663
1299
1978
53
483
21203
852
19600
1193


42°45
43°00
43°15
43°30
43°45
CHLORIDE
COMPREHENS
SOMALI DEMOC
MINISTRY OF MIN
WATER DEVELO



CHLORIDE CONCENTRATION OF WELLS & SPRINGS IN THE BAY REGION

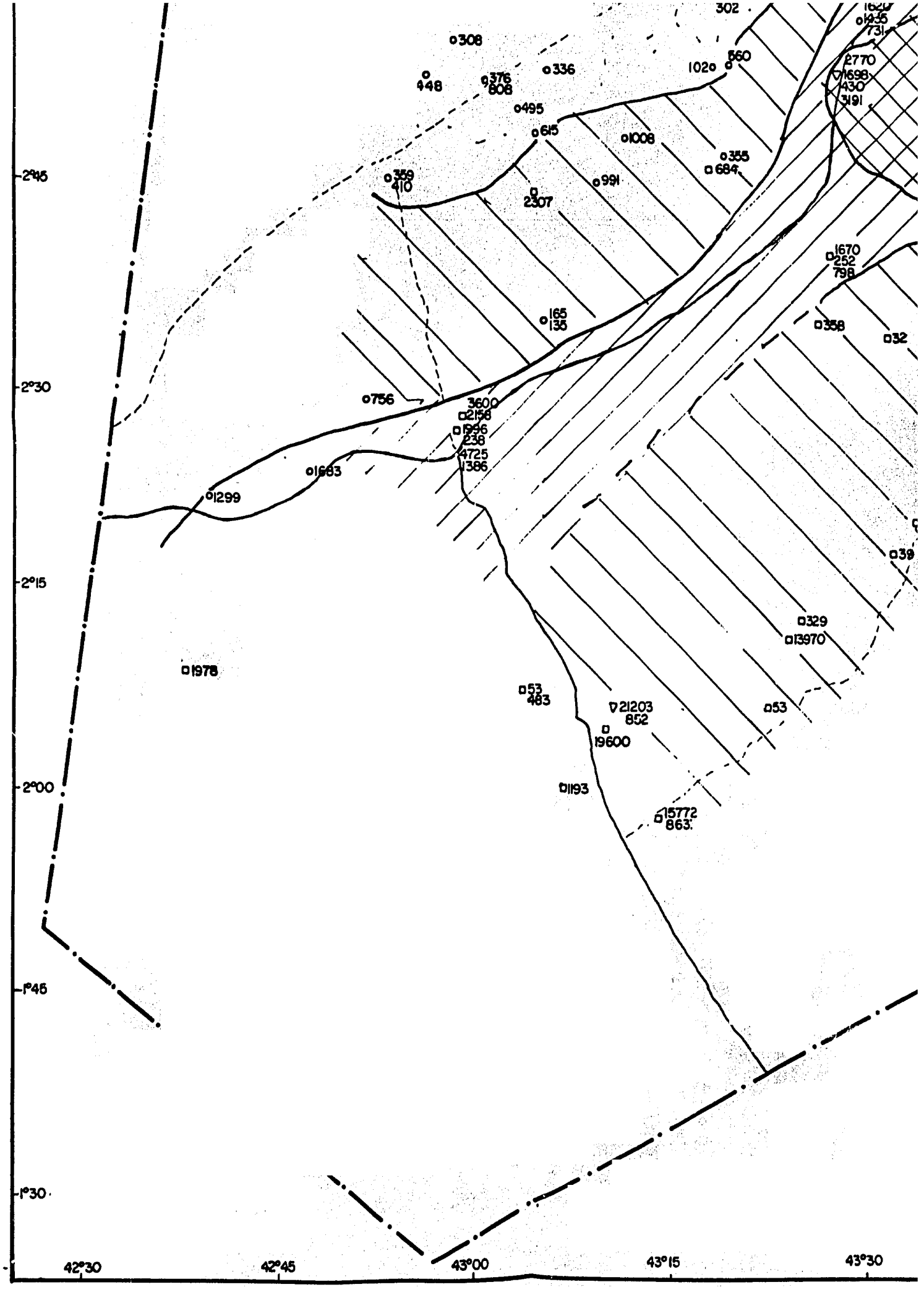
COMPREHENSIVE GROUNDWATER DEVELOPMENT PROJECT

649-0104

SOMALI DEMOCRATIC REPUBLIC
MINISTRY OF MINERAL & WATER RES.
WATER DEVELOPMENT AGENCY

LOUIS BERGER INT'L INC
ROSCOE MOSS CO.

20


302
308
448
376
808
336
495
615
1008
1020
860
355
684
991
359
410
2307
1620
1935
731
2770
1698
430
3191
1670
252
798
165
135
358
32
756
3600
2158
1996
238
4725
1386
1683
1299
39
329
13970
1978
53
483
21203
852
19600
53
1193
15772
863
2°45
2°30
2°15
2°00
1°45
1°30
42°30
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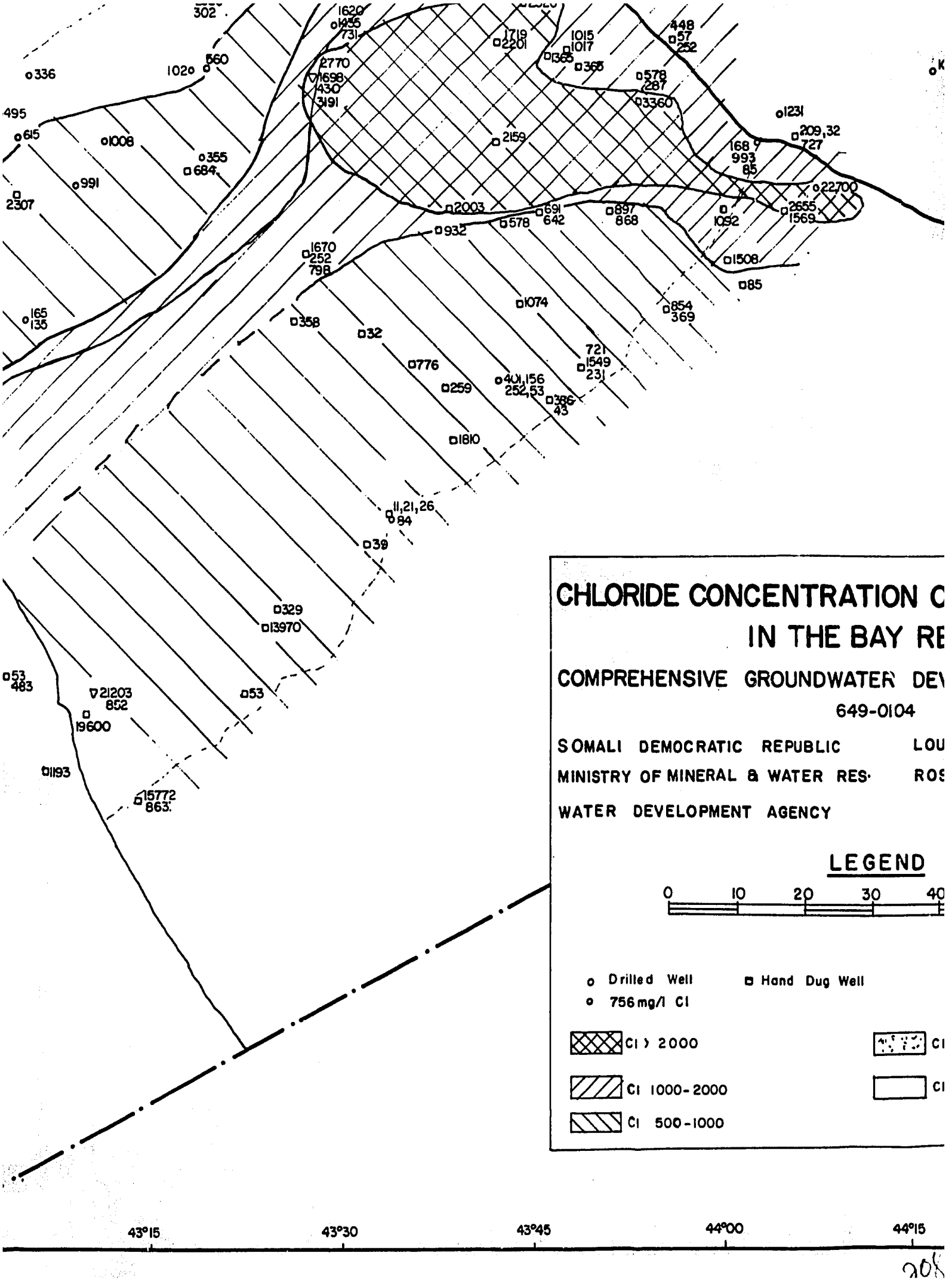
43°00
43°15
43°30


CHLORIDE CONCENTRATION C
IN THE BAY RE
COMPREHENSIVE GROUNDWATER DEV
649-0104
SOMALI DEMOCRATIC REPUBLIC
MINISTRY OF MINERAL & WATER RES.
WATER DEVELOPMENT AGENCY
LOU
ROS
LEGEND
0
10
20
30
40
Drilled Well
Hand Dug Well
756 mg/l Cl
Cl > 2000
Cl 1000-2000
Cl 500-1000
43°15
43°30
43°45
44°00
44°15

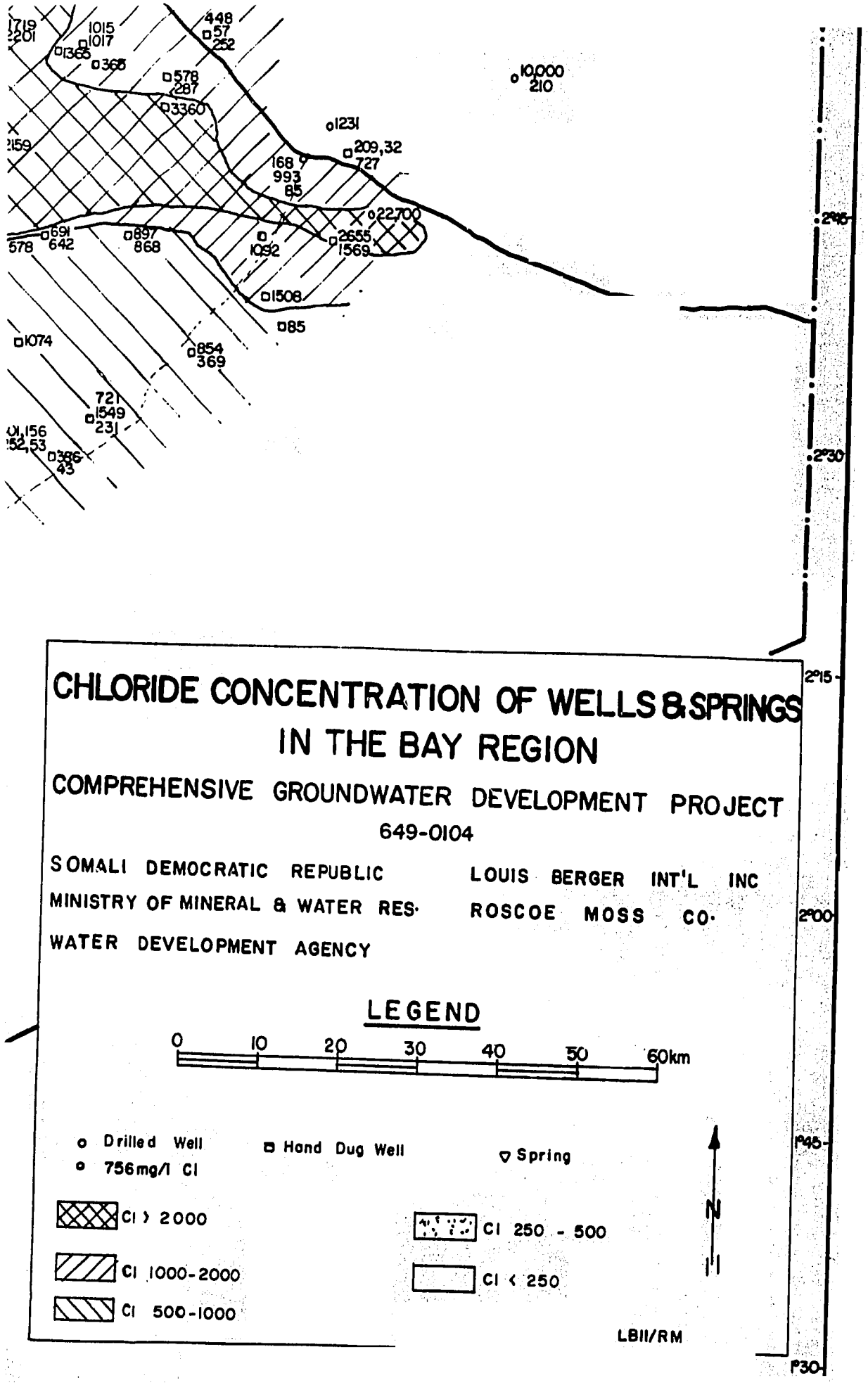

CHLORIDE CONCENTRATION OF WELLS & SPRINGS
IN THE BAY REGION
COMPREHENSIVE GROUNDWATER DEVELOPMENT PROJECT
649-0104
SOMALI DEMOCRATIC REPUBLIC
MINISTRY OF MINERAL & WATER RES.
WATER DEVELOPMENT AGENCY
LOUIS BERGER INT'L INC
ROSCOE MOSS CO.
LEGEND
0 10 20 30 40 50 60km
Drilled Well
756mg/l Cl
Hand Dug Well
Spring
Cl > 2000
Cl 1000-2000
Cl 500-1000
Cl 250 - 500
Cl < 250
N
LBII/RM
44°00
44°15
44°30

Plate 9

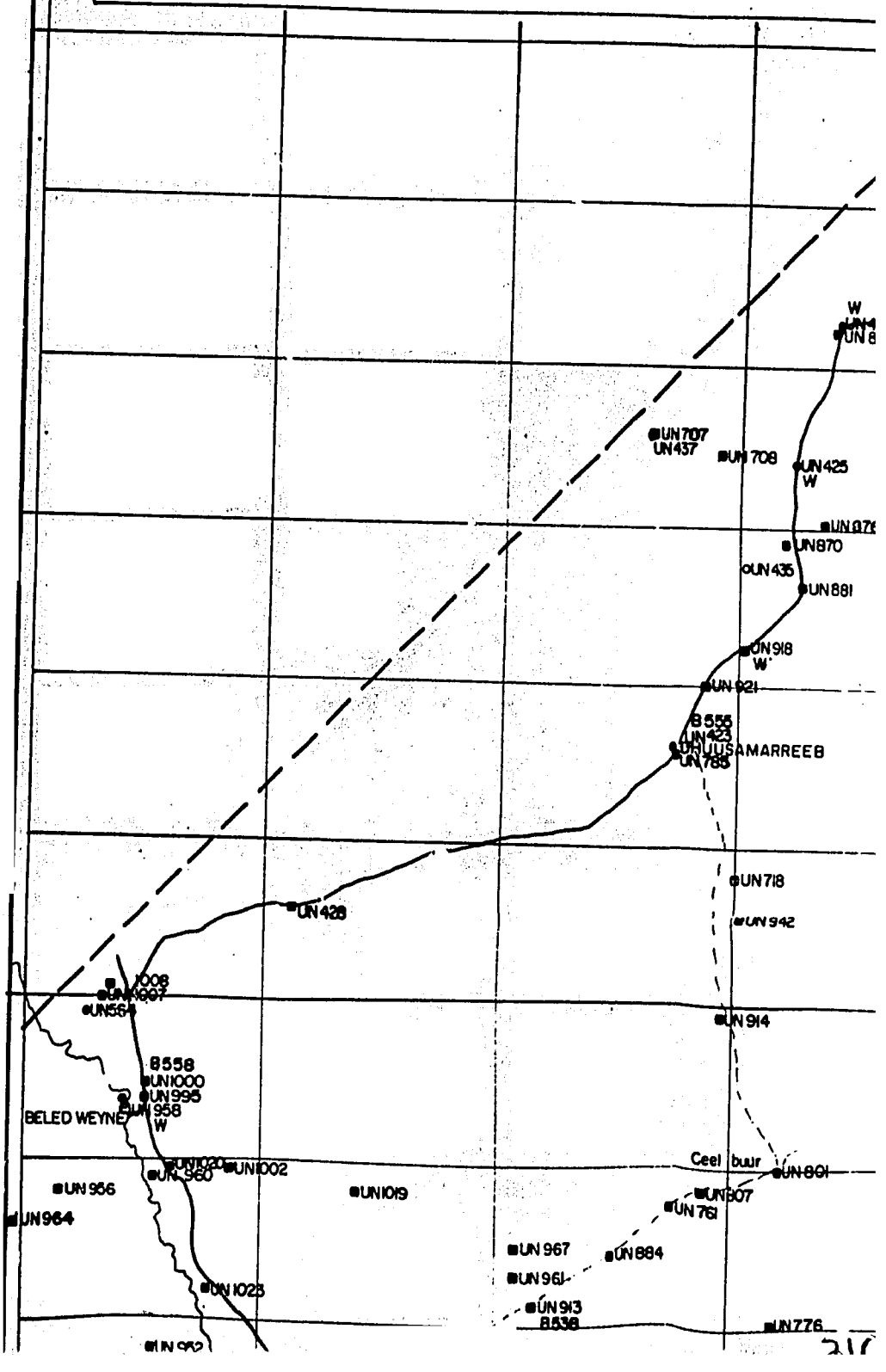
WATER SOURCE LOCATION MAP, CENTRAL RANGELANDS

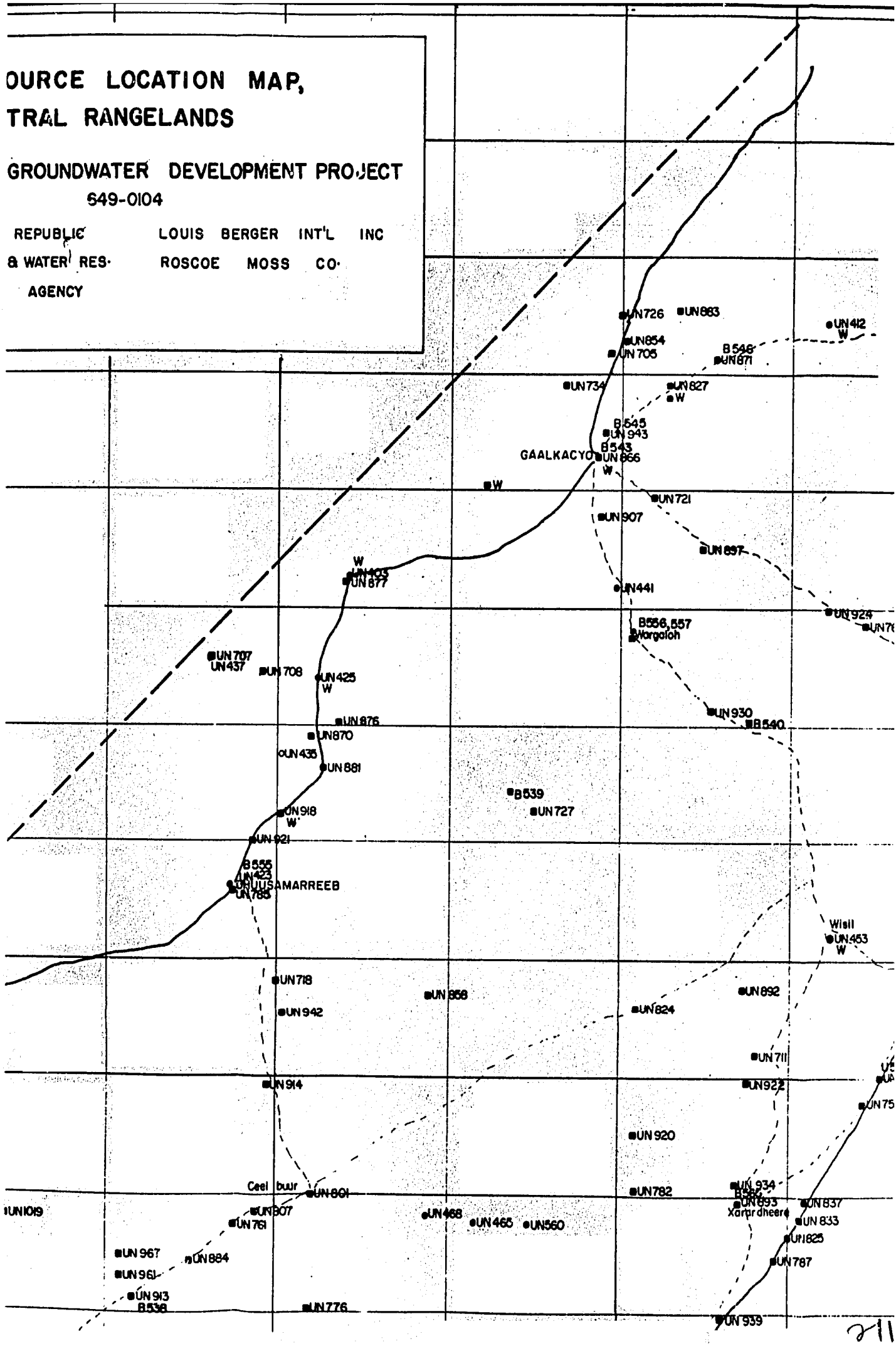
COMPREHENSIVE GROUNDWATER DEVELOPMENT PROJ

649-0104

SOMALI DEMOCRATIC REPUBLIC
MINISTRY OF MINERAL & WATER RES.
WATER DEVELOPMENT AGENCY

LOUIS BERGER INT'L I
ROSCOE MOSS CO.




OURCE LOCATION MAP,
TRAL RANGELANDS
GROUNDWATER DEVELOPMENT PROJECT
649-0104
REPUBLIC
& WATER RES.
AGENCY
LOUIS BERGER INT'L INC
ROSCOE MOSS CO.
UN726
UN863
UN412
W
UN854
UN705
B546
UN871
UN734
UN827
W
B545
UN943
B543
GAALKACYO
UN866
W
W
UN721
UN907
UN897
W
UN405
UN877
UN441
UN924
B556,557
Wargaloh
UN707
UN437
UN708
UN425
W
UN930
B540
UN876
UN870
UN435
UN881
B539
UN727
UN918
W
UN921
B555
UN423
UUSAMARREEB
UN785
Wisil
UN453
W
UN718
UN858
UN892
UN942
UN824
UN711
UN914
UN922
UN75
UN920
Ceel buur
UN801
UN782
UN934
UN893
Xardheere
UN837
UN1019
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UN776
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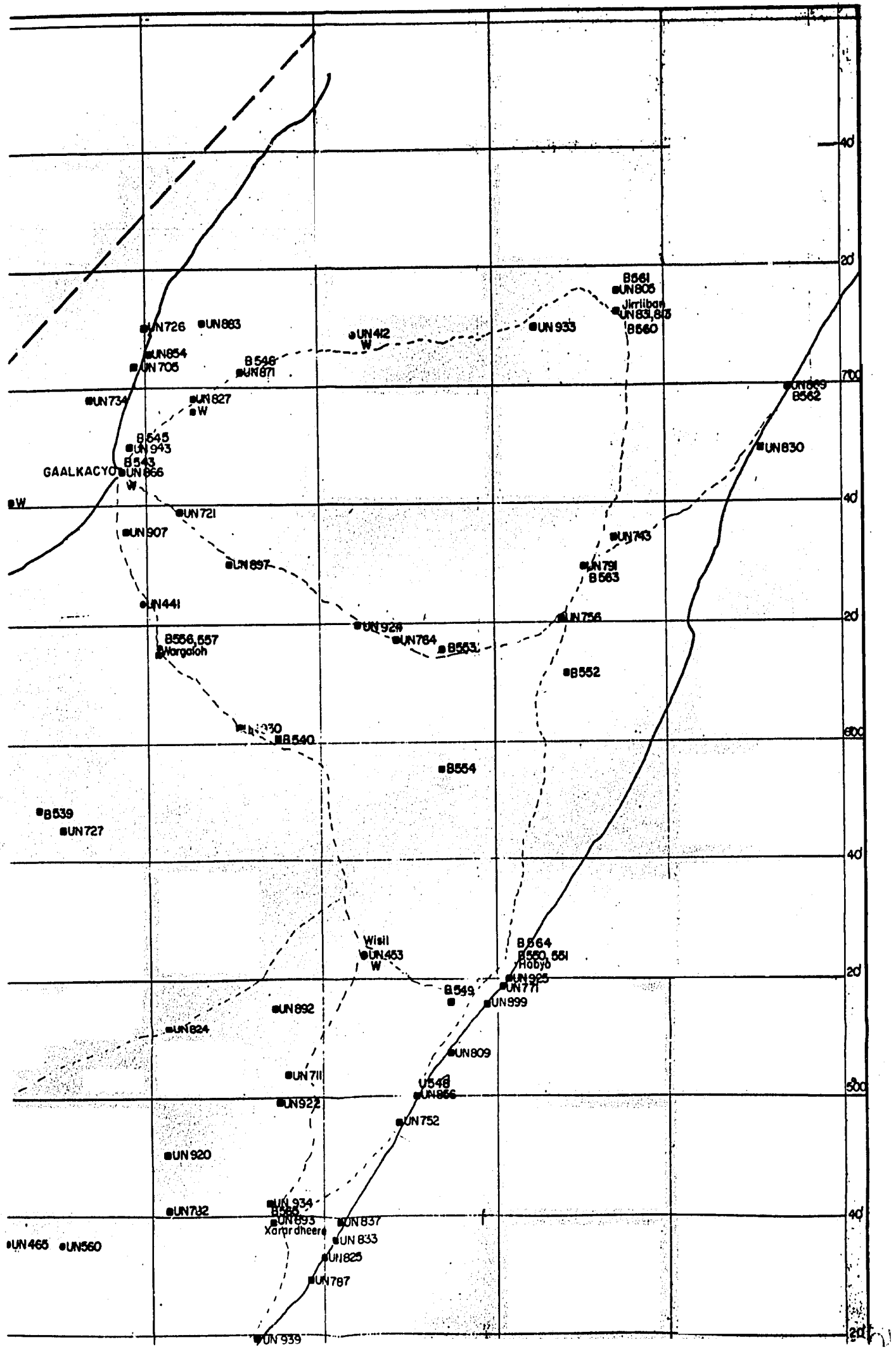
4d
2d
700
4d
2d
600
4d
2d
500
4d
2d
B561
UN805
Jirrilban
UN831,813
B560
UN933
UN412
W
UN726
UN863
UN854
UN705
B546
UN871
UN734
UN827
W
B545
UN943
B543
GAALKACYO
UN866
W
W
UN721
UN907
UN897
UN441
B556,557
Wargaloh
UN928
UN784
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UN791
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UN743
UN830
B562
B552
B540
B554
B539
UN727
Wisil
UN453
W
B564
B550,551
Hobyo
UN925
UN771
B549
UN999
UN892
UN824
UN809
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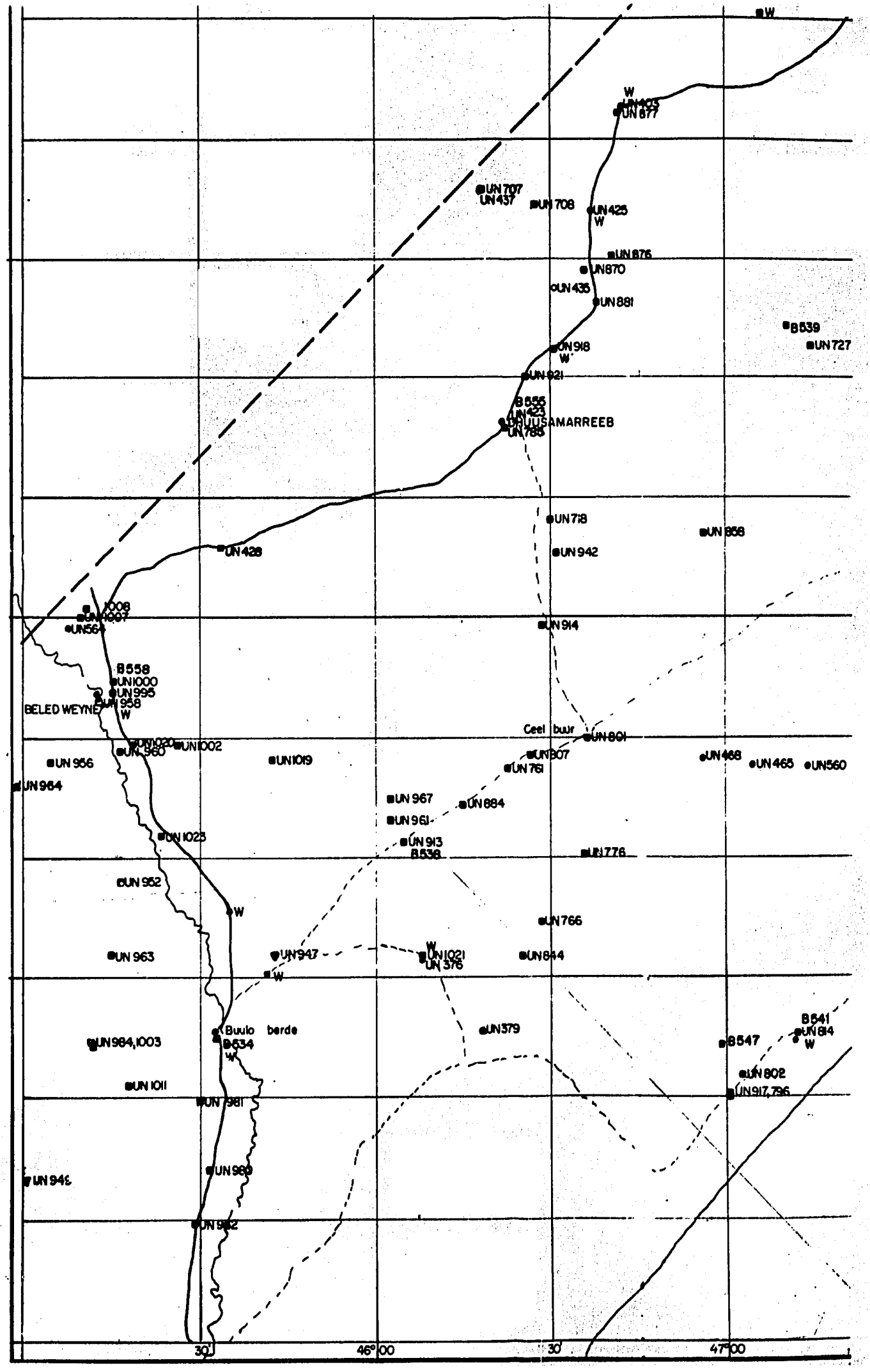
W
UN 877
UN 707
UN 437
UN 708
UN 425
W
UN 876
UN 870
UN 435
UN 881
B539
UN 727
UN 918
W
UN 921
B555
UN 423
UUSAMARREEB
UN 785
UN 718
UN 858
UN 942
UN 428
1008
UN 1007
UN 564
UN 914
B558
UN 1000
UN 995
UN 958
W
BELED WEYNE
Ceel buur
UN 801
UN 1020
UN 1002
UN 560
UN 956
UN 1019
UN 807
UN 761
UN 468
UN 465
UN 560
UN 964
UN 967
UN 884
UN 961
UN 1023
UN 913
B538
UN 776
UN 952
W
UN 766
UN 963
UN 947
W
UN 1021
UN 376
UN 844
W
Buulo berde
B534
W
UN 379
B541
UN 814
W
UN 984,1003
B547
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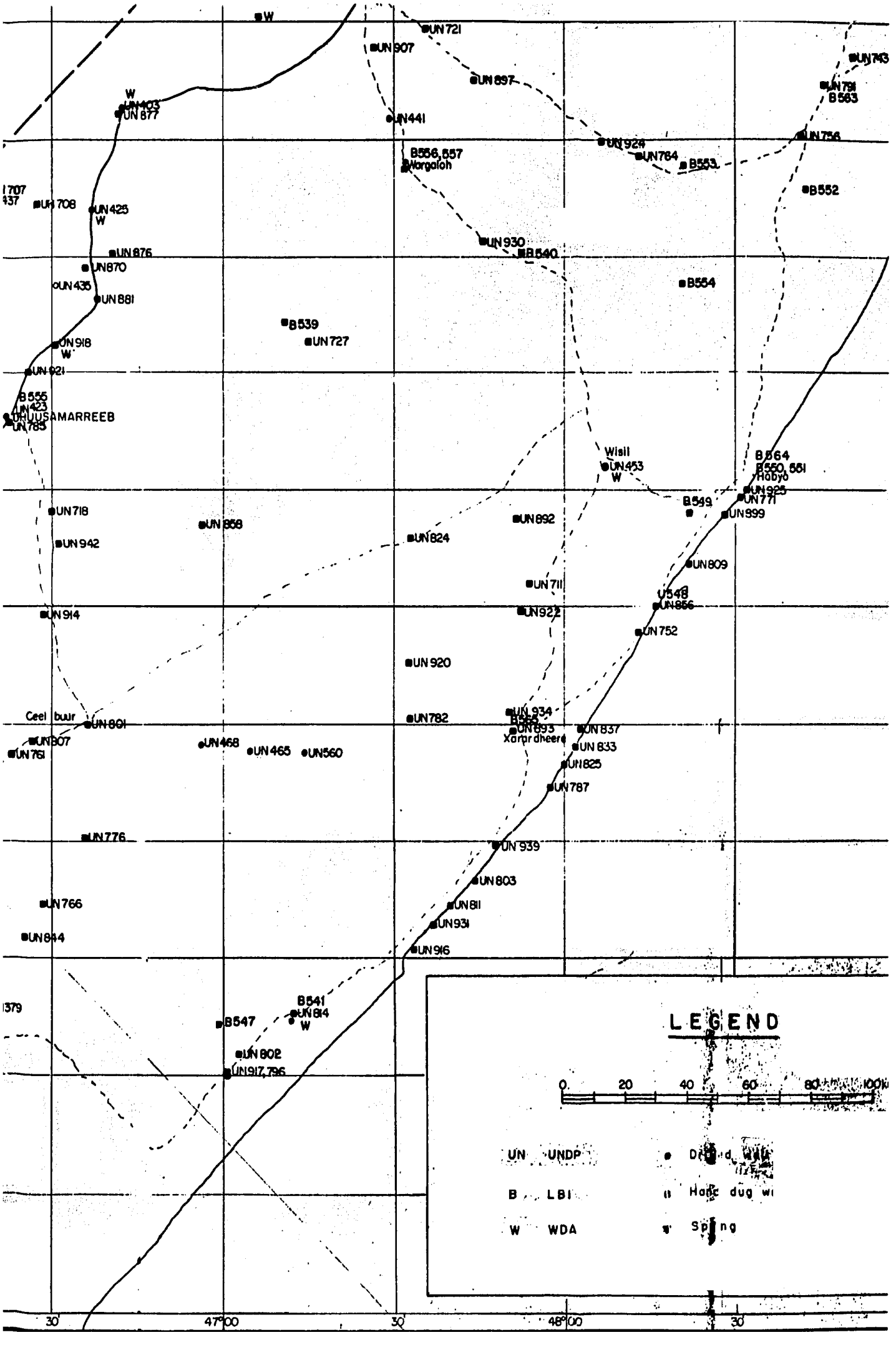
UN 802
UN 917,796
UN 981
UN 949
UN 989
UN 982
30'
46°00
30'
47°00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UN907
UN897
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B556,557
Wargaloh
B552
1707
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W
UN930
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UN870
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UN727
UN918
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UN921
B555
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DHUUSAMARREEB
UN785
Wisil
UN453
W
B564
B550,551
Hobyo
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UN771
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UN718
UN858
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UN942
UN824
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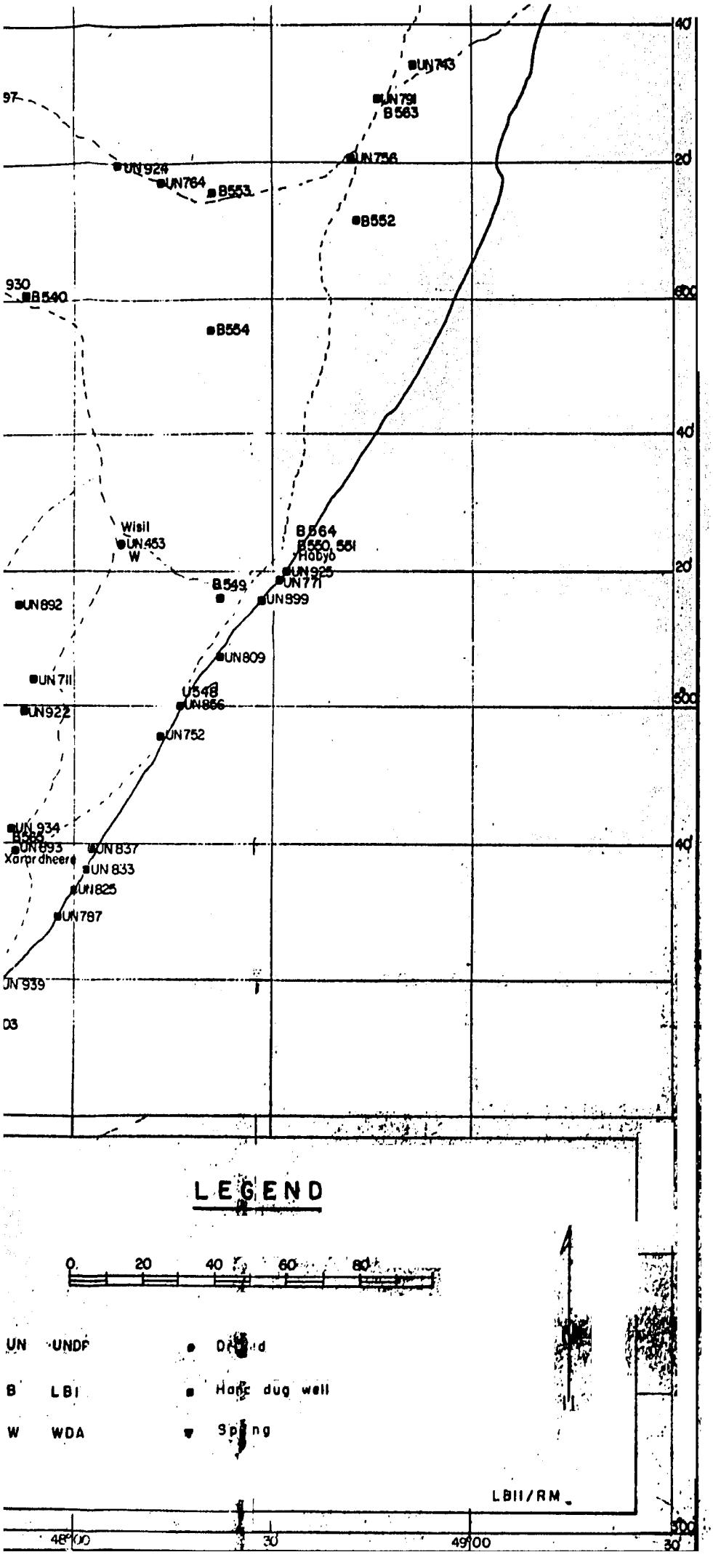
UN711
U548
UN856
UN914
UN922
UN752
UN920
Ceel buur
UN801
UN782
UN934
B565
UN893
Xardheere
UN837
UN807
UN761
UN468
UN465
UN560
UN833
UN825
UN787
UN776
UN939
UN803
UN766
UN811
UN931
UN844
UN916
1379
B541
UN814
W
B547
UN802
UN917,796
LEGEND
0
20
40
60
80
100
UN UNDP
B LBI
W WDA
Hand dug wi
Spring
30'
47°00
30'
48°00
30'

214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UN791
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UN764
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B540
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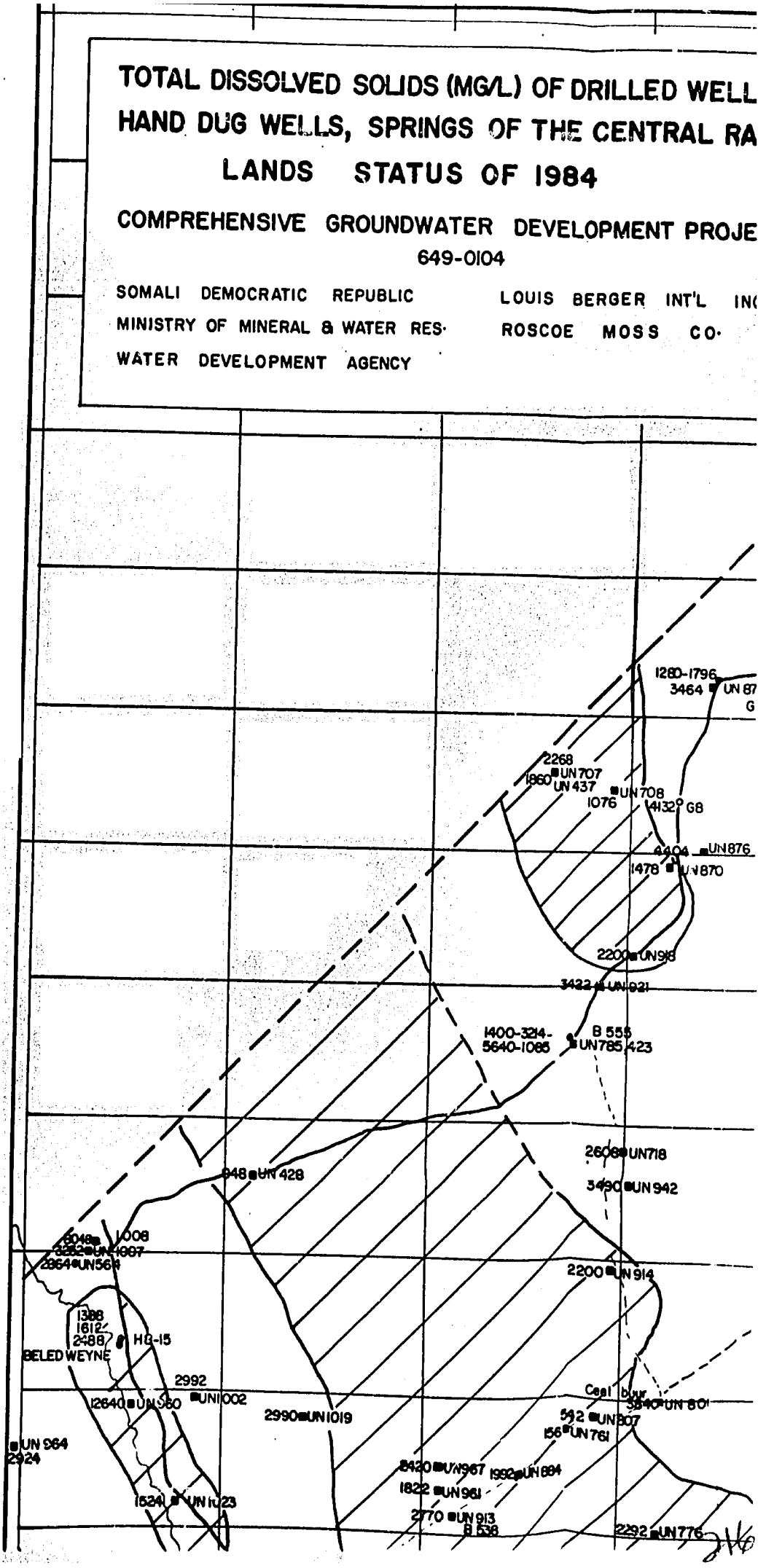
Wisil
UN453
W
B564
B550, 561
Habyo
UN925
UN771
B549
UN899
UN892
UN809
UN711
U548
UN856
UN922
UN752
UN934
UN837
UN833
UN825
UN787
UN939
LEGEND
0
20
40
60
80
UN UNDP
B LBI
W WDA
Dug well
Hand dug well
Spring
LBII/RM
48°00
30
49°00
30

TOTAL DISSOLVED SOLIDS (MG/L) OF DRILLED WELL
HAND DUG WELLS, SPRINGS OF THE CENTRAL RA
LANDS STATUS OF 1984

COMPREHENSIVE GROUNDWATER DEVELOPMENT PROJE
649-0104

SOMALI DEMOCRATIC REPUBLIC
MINISTRY OF MINERAL & WATER RES·
WATER DEVELOPMENT AGENCY

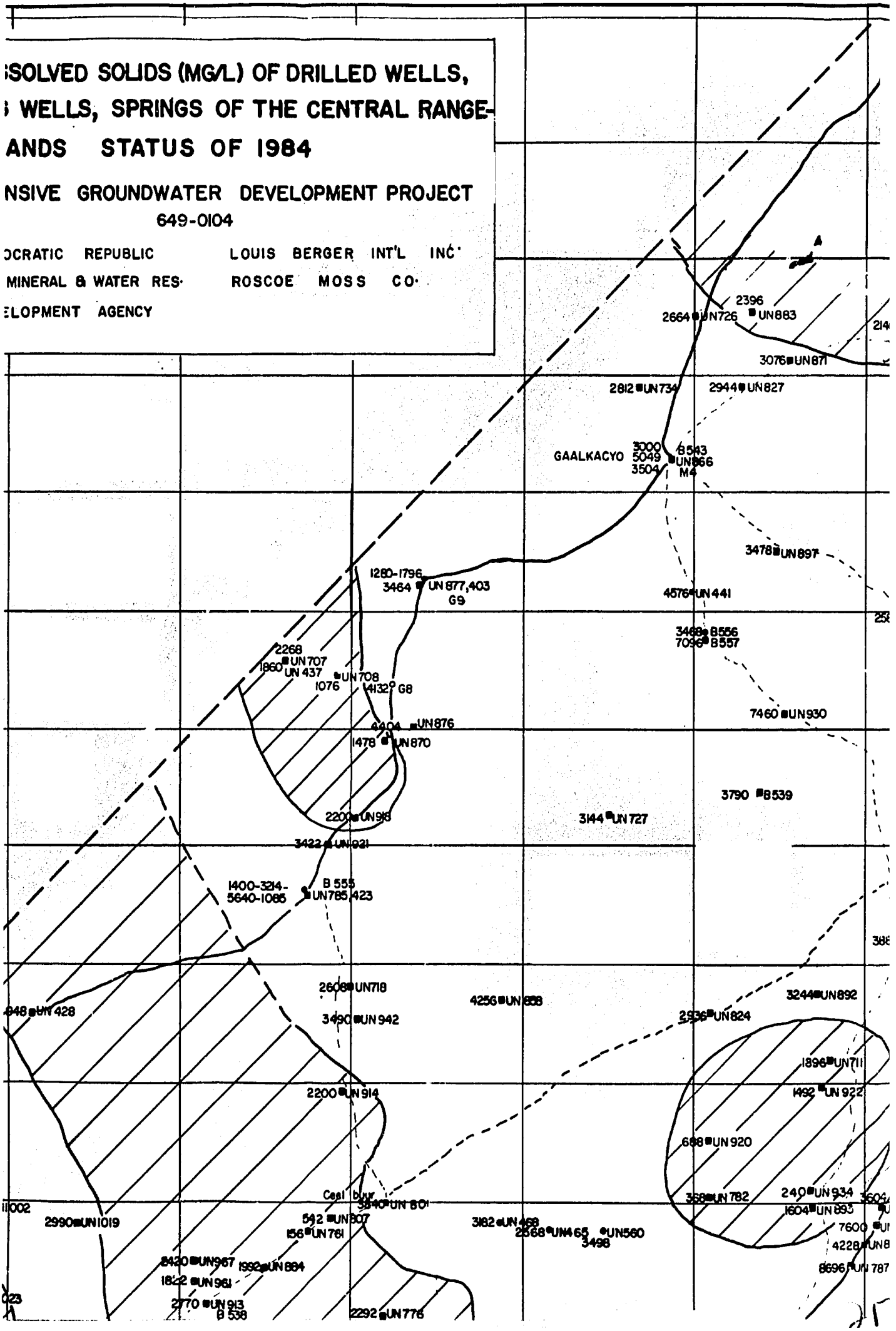
LOUIS BERGER INT'L IN
ROSCOE MOSS CO·

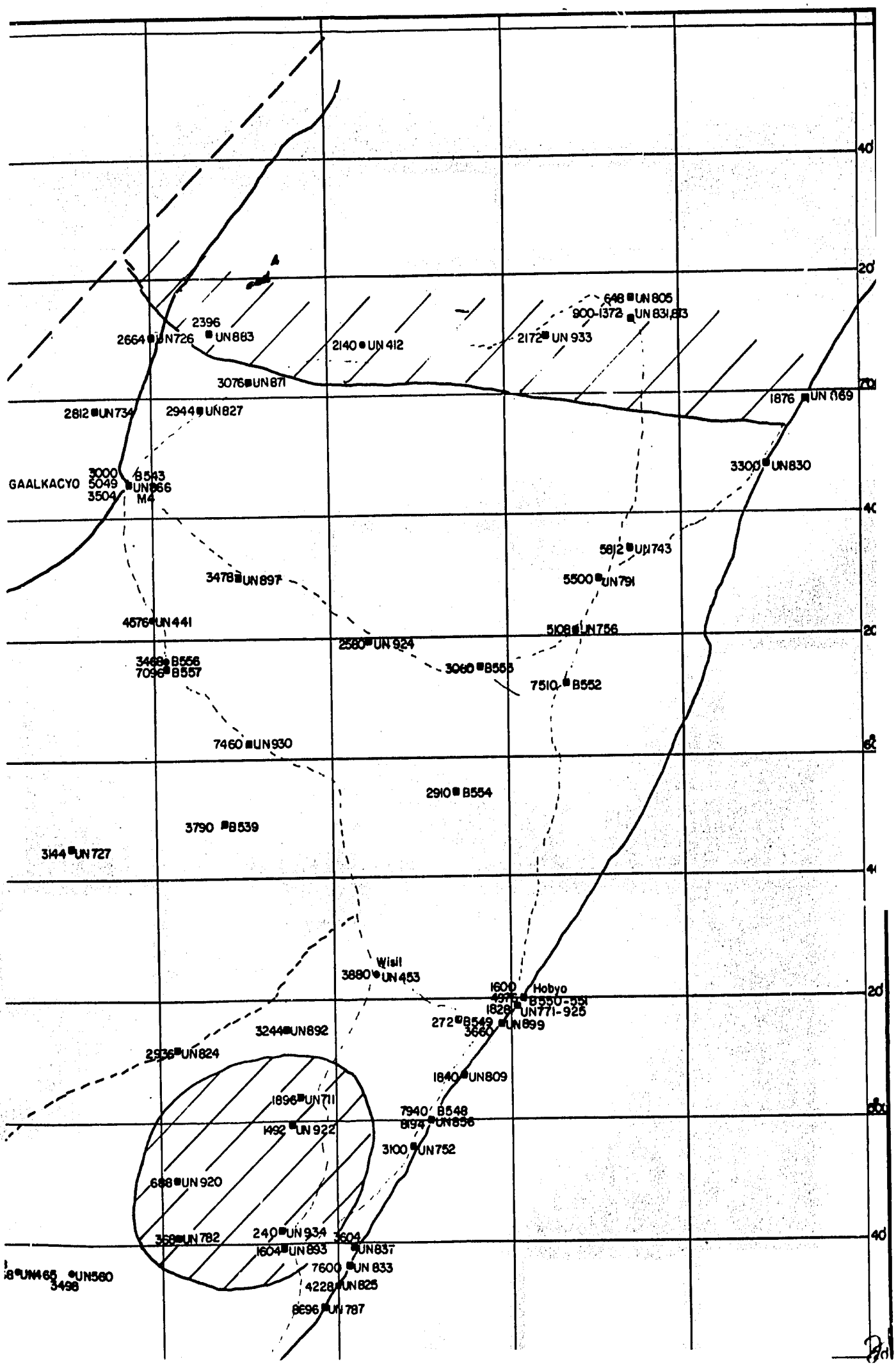


SOLVED SOLIDS (MG/L) OF DRILLED WELLS,
WELLS, SPRINGS OF THE CENTRAL RANGE-
ANDS STATUS OF 1984

NSIVE GROUNDWATER DEVELOPMENT PROJECT
649-0104

OCRATIC REPUBLIC LOUIS BERGER INT'L INC·
MINERAL & WATER RES· ROSCOE MOSS CO·
ELOPMENT AGENCY




648 UN 805
900-1372 UN 831,833
2396
2664 UN726
UN 883
2140 UN 412
2172 UN 933
3076 UN 871
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2812 UN 734
2944 UN 827
3300 UN 830
GAALKACYO
3000
5049
3504
B543
UN 866
M4
5812 UN 743
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5500 UN 791
4576 UN 441
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3790 B539
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Wisil
3880 UN 453
1600
Hobyo
4975 B550-551
1828 UN 771-925
272 B549
3660 UN 899
3244 UN 892
2936 UN 824
1840 UN 809
1896 UN 711
7940 B548
8194 UN 856
1492 UN 922
3100 UN 752
688 UN 920
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1604 UN 893
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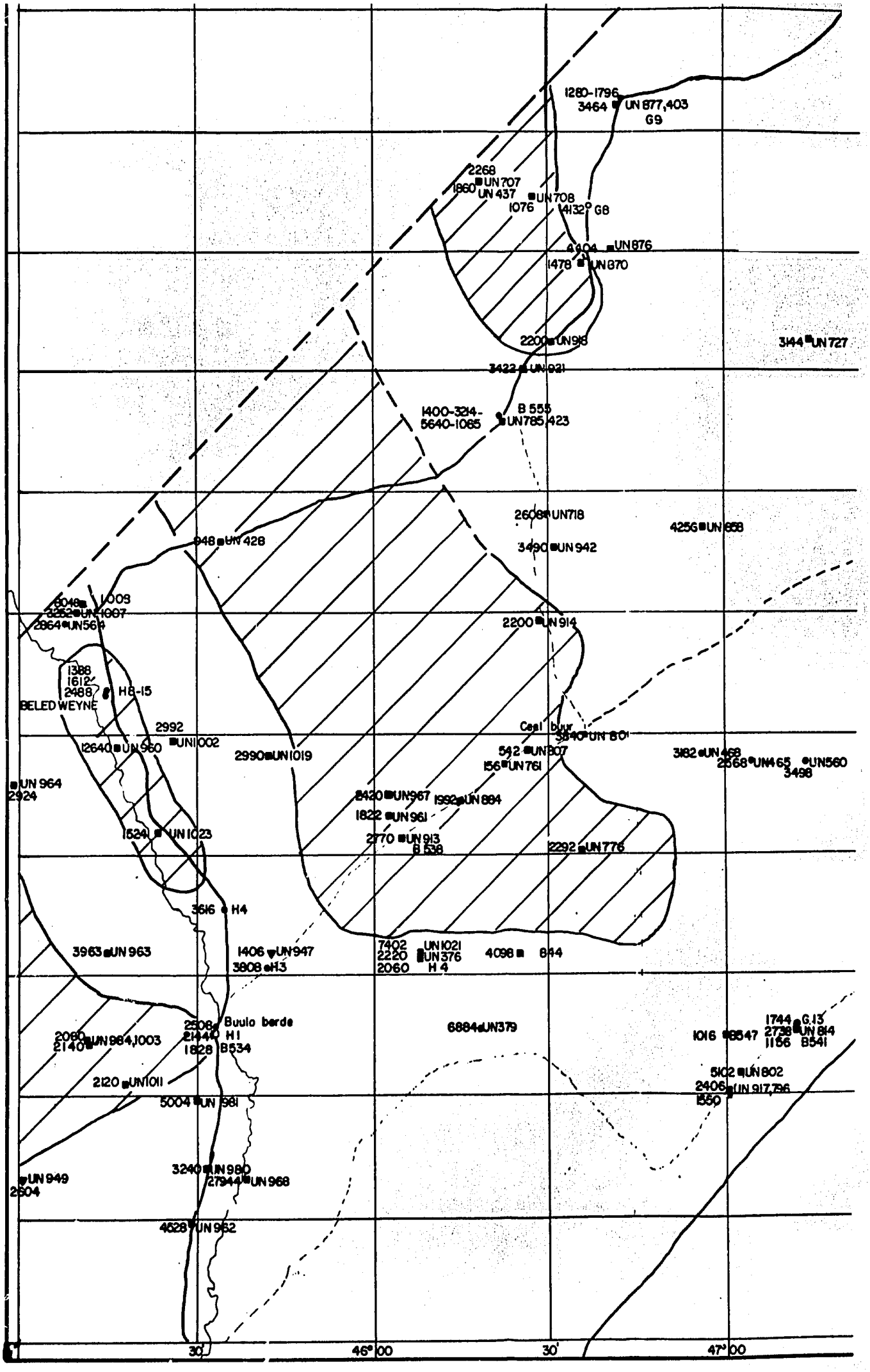
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1860 UN 707
UN 437
UN 708
1076
14132 G8
4604 UN 876
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2200 UN 918
3144 UN 727
3422 UN 921
1400-3214-
5640-1085
B 555
UN 785,423
2608 UN 718
4256 UN 858
948 UN 428
3490 UN 942
8048
1003
3252 UN 1007
2864 UN 564
2200 UN 914
1388
1612
2488
H8-15
BELED WEYNE
2992
UN 1002
Ceel buur
3840 UN 801
12640 UN 960
2990 UN 1019
542 UN 807
156 UN 761
3182 UN 468
2568 UN 465
UN 560
3498
UN 964
2924
2420 UN 967
1992 UN 884
1822 UN 961
1524 UN 1023
2770 UN 913
B 538
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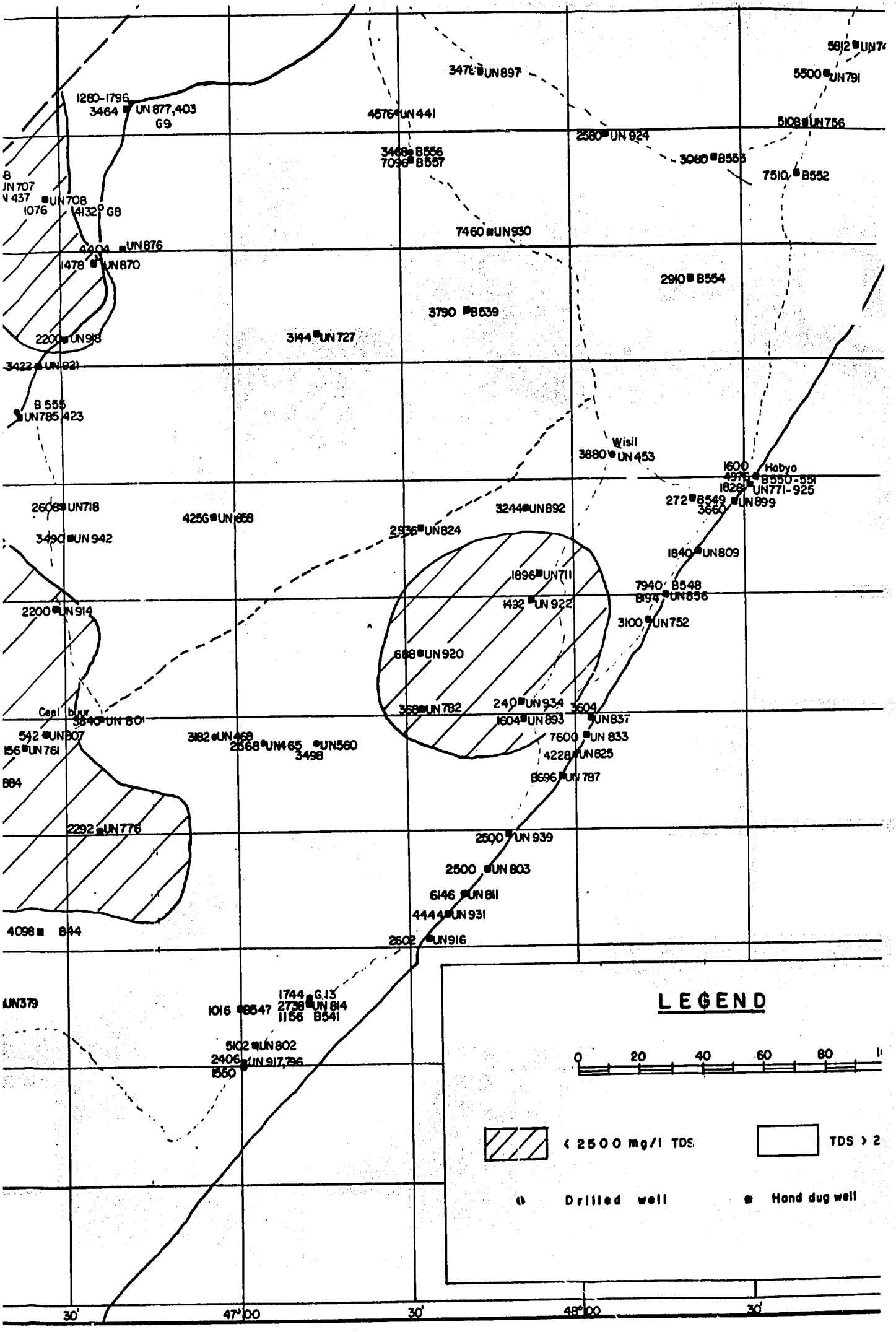
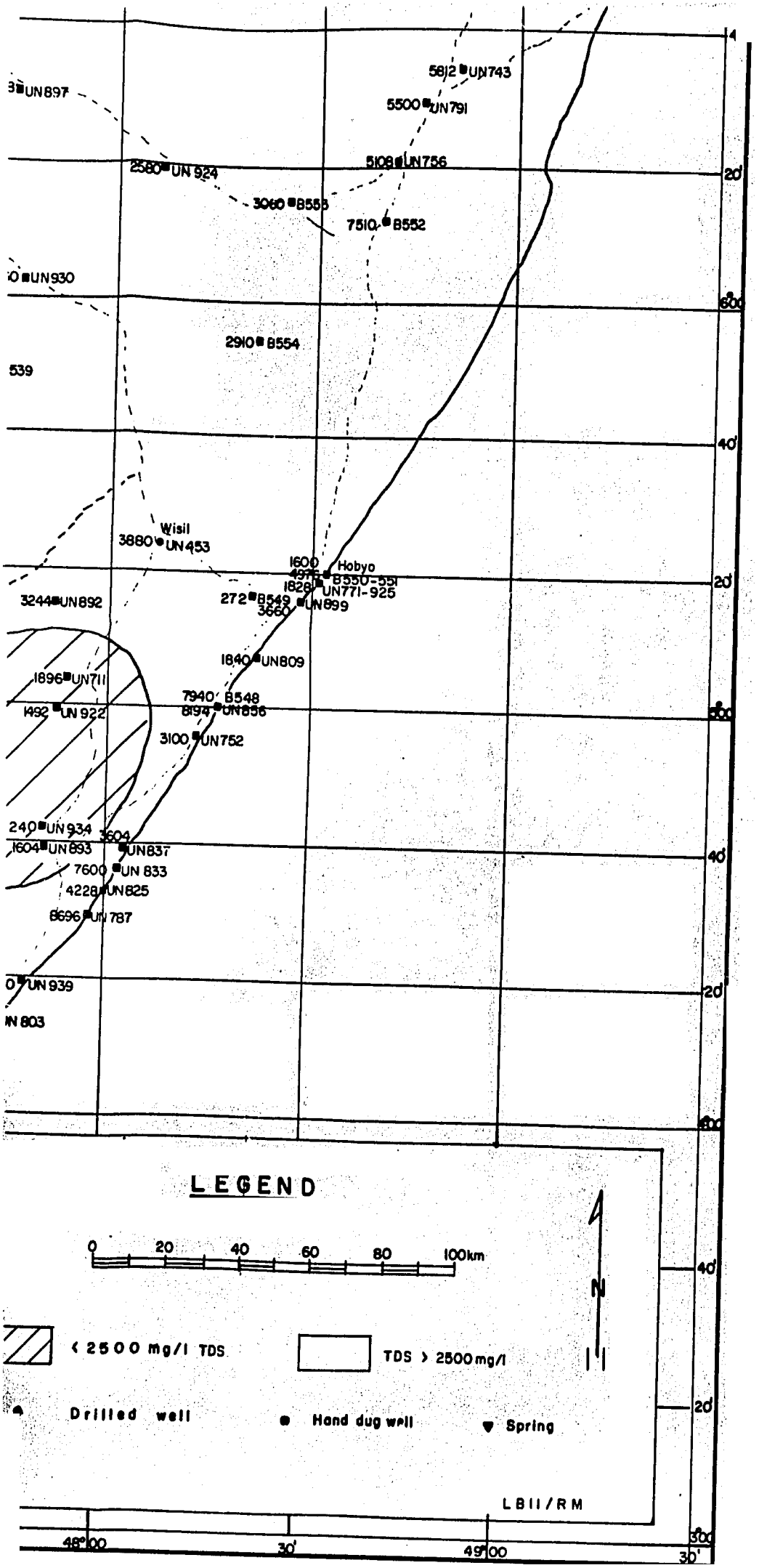
3616 H4
3963 UN 963
1406 UN 947
3808 H3
7402
2220
2060
UN 1021
UN 376
H 4
4098
844
2508
Buulo berde
21440 H1
1828 B534
6884 UN 379
1744 G13
2736 UN 814
1156 B541
1016
8547
2060
2140 UN 984,1003
2120 UN 1011
5004 UN 981
5102 UN 802
2406 UN 917,796
1550
3240 UN 980
27944 UN 968
UN 949
2604
4628 UN 962
30'
46° 00
30'
47° 00

219


LEGEND
0 20 40 60 80
< 2500 mg/l TDS
TDS > 2
Drilled well
Hand dug well
Wisil
Hobyo
Ceel buur
30'
47°00
30'
48°00
30'

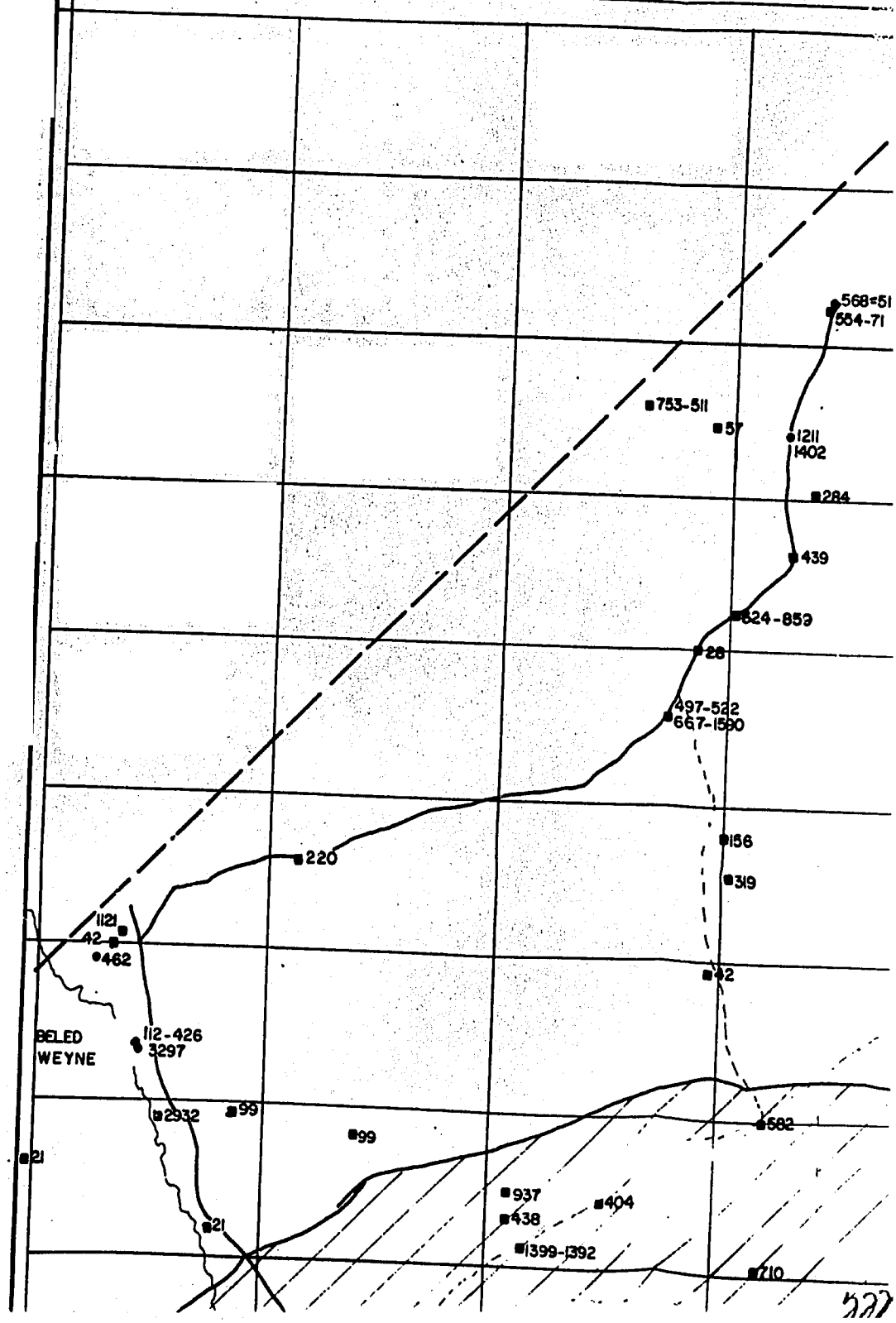

5812 UN743
5500 UN791
3 UN897
2580 UN924
5108 UN756
3060 B553
7510 B552
0 UN930
2910 B554
539
Wisil
3880 UN453
1600
4975 Hobyo
B550-551
1828 UN771-925
3244 UN892
272 B549
3660 UN899
1840 UN809
1896 UN711
7940 B548
1492 UN922
8194 UN856
3100 UN752
240 UN934
3604
1604 UN893
UN837
7600 UN833
4228 UN825
8696 UN787
0 UN939
N 803
LEGEND
0 20 40 60 80 100km
N
< 2500 mg/l TDS
TDS > 2500 mg/l
Drilled well
Hand dug well
Spring
LBII/RM
48°00
30'
49°00
30'
40'
20'
00
300

CHLORIDE CONCENTRATION OF DRILLED WELLS HAND DUG WELLS & SPRINGS OF THE CENTRAL RAN LANDS STATUS OF 1984

COMPREHENSIVE GROUNDWATER DEVELOPMENT PROJEC
649-0104

SOMALI DEMOCRATIC REPUBLIC
MINISTRY OF MINERAL & WATER RES.
WATER DEVELOPMENT AGENCY

LOUIS BERGER INT'L INC
ROSCOE MOSS CO.

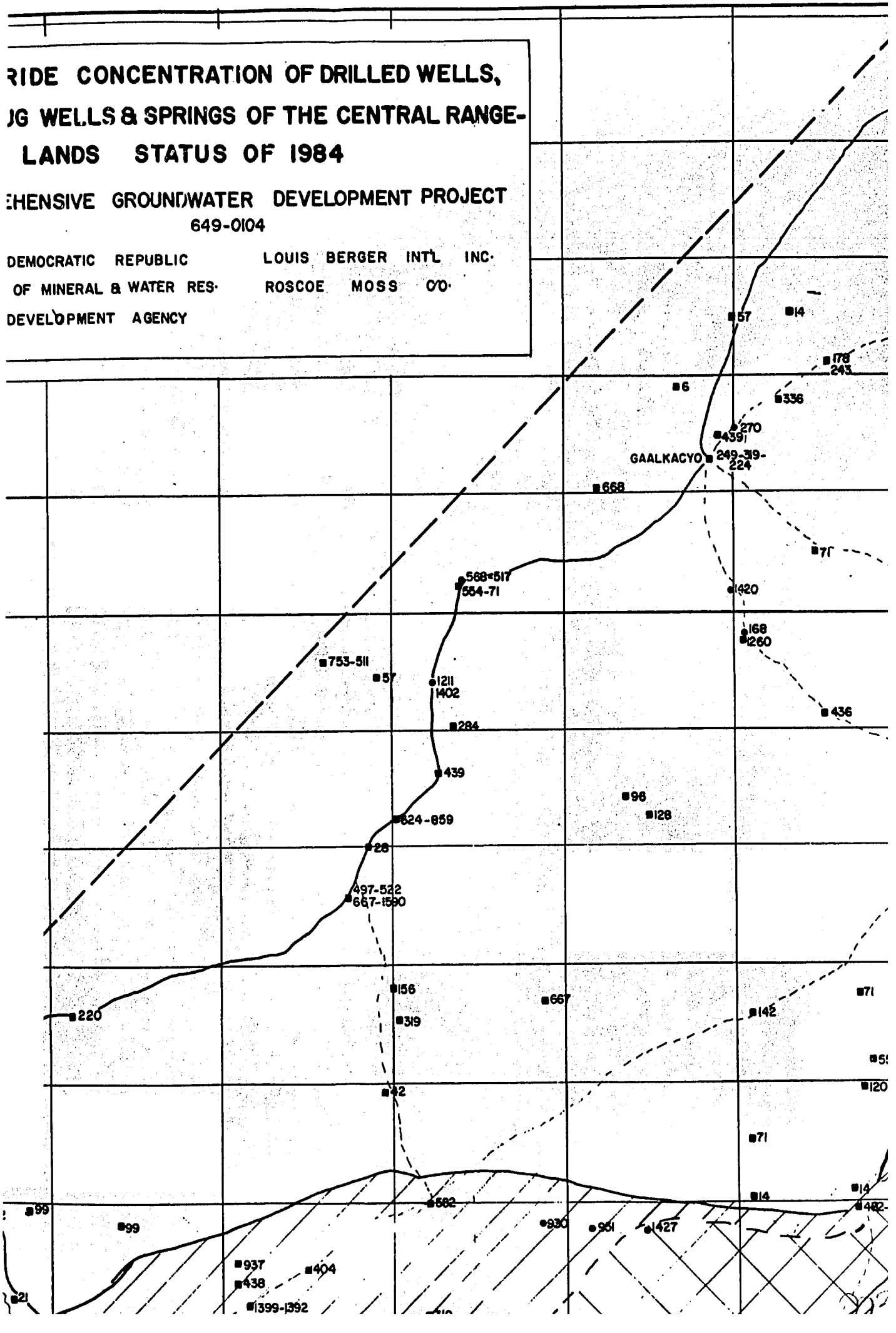


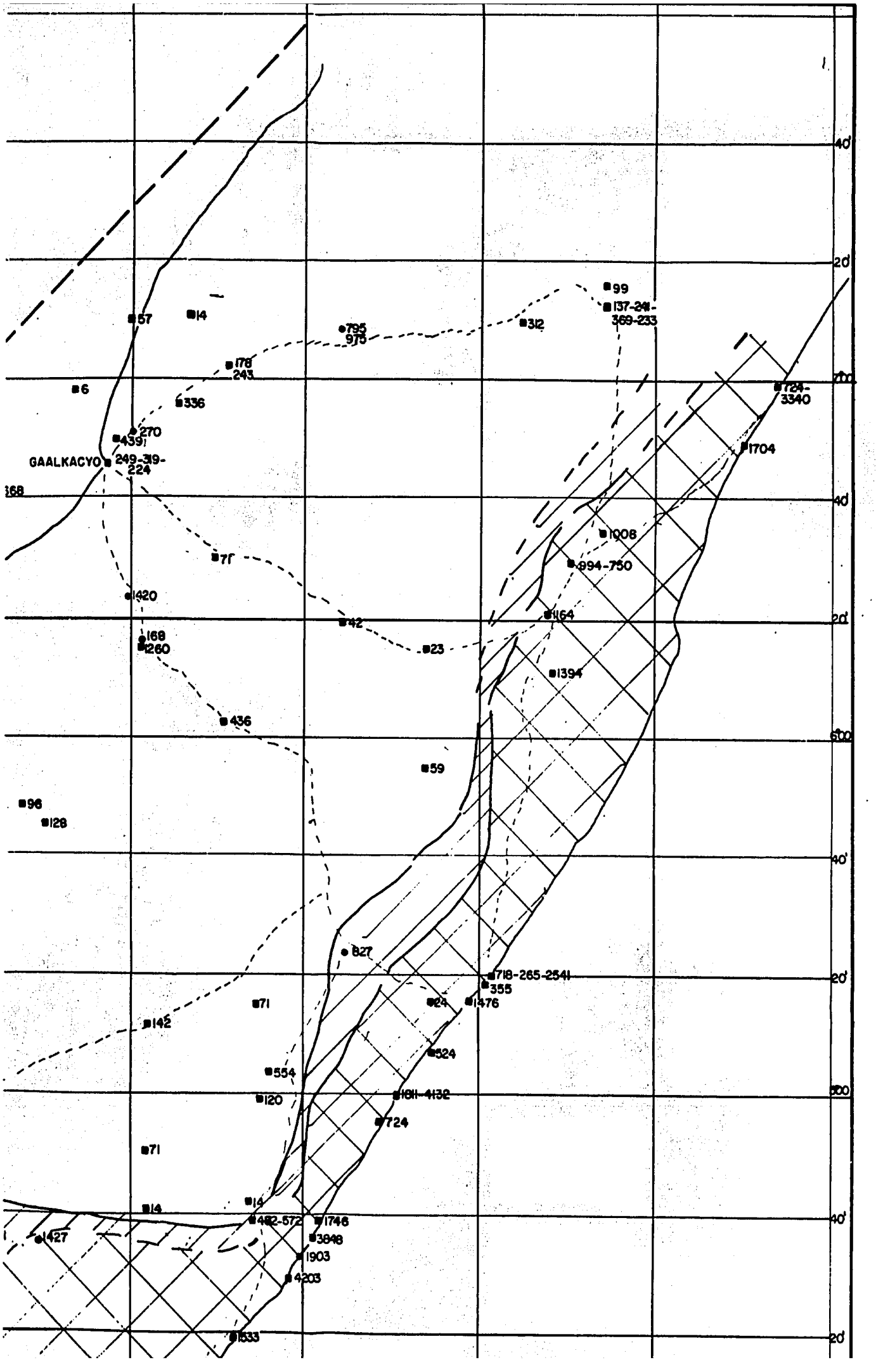
RIDE CONCENTRATION OF DRILLED WELLS,
JG WELLS & SPRINGS OF THE CENTRAL RANGE-
LANDS STATUS OF 1984

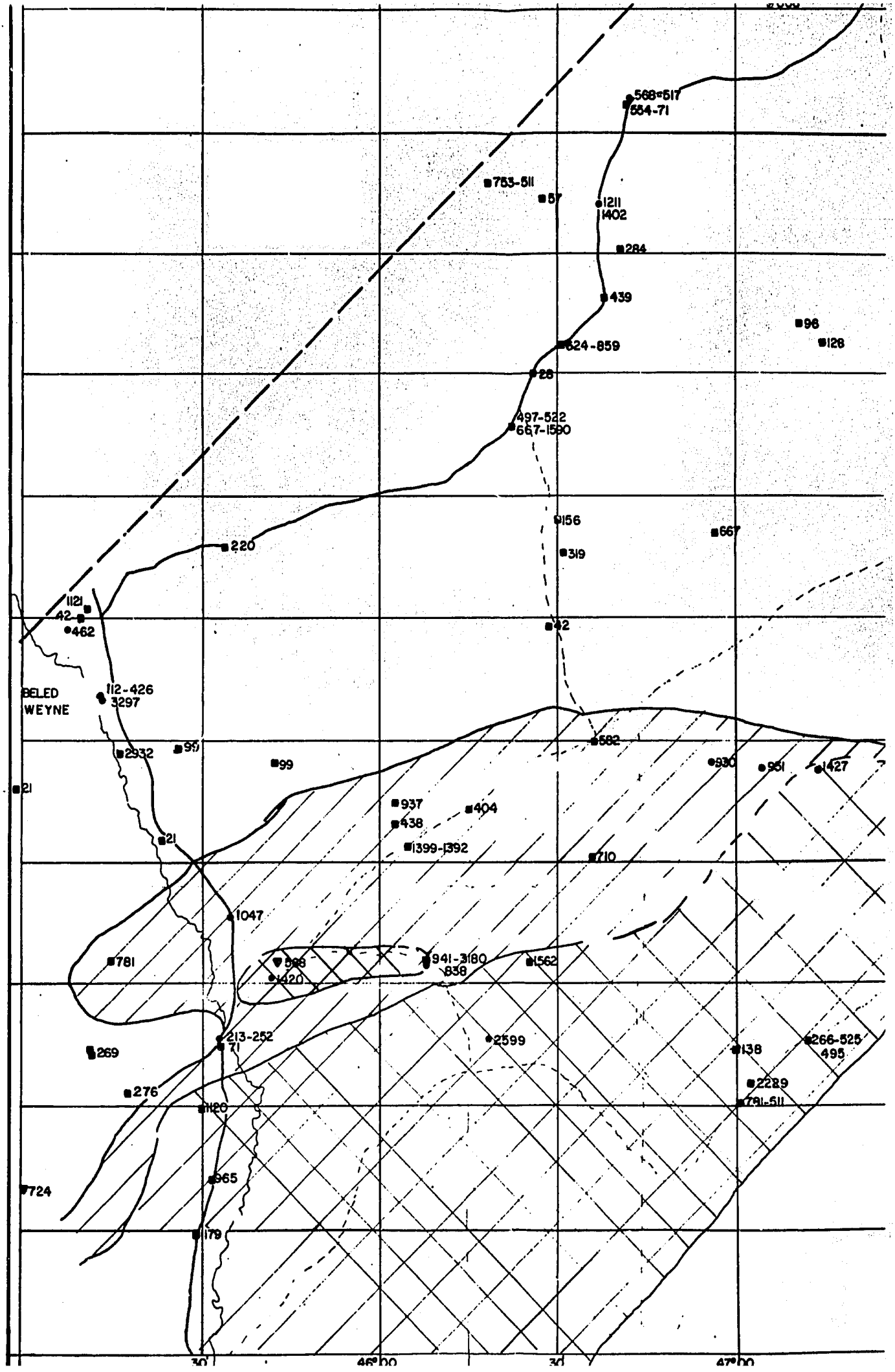
:HENSIVE GROUNDWATER DEVELOPMENT PROJECT
649-0104

DEMOCRATIC REPUBLIC OF MINERAL & WATER RES. DEVELOPMENT AGENCY

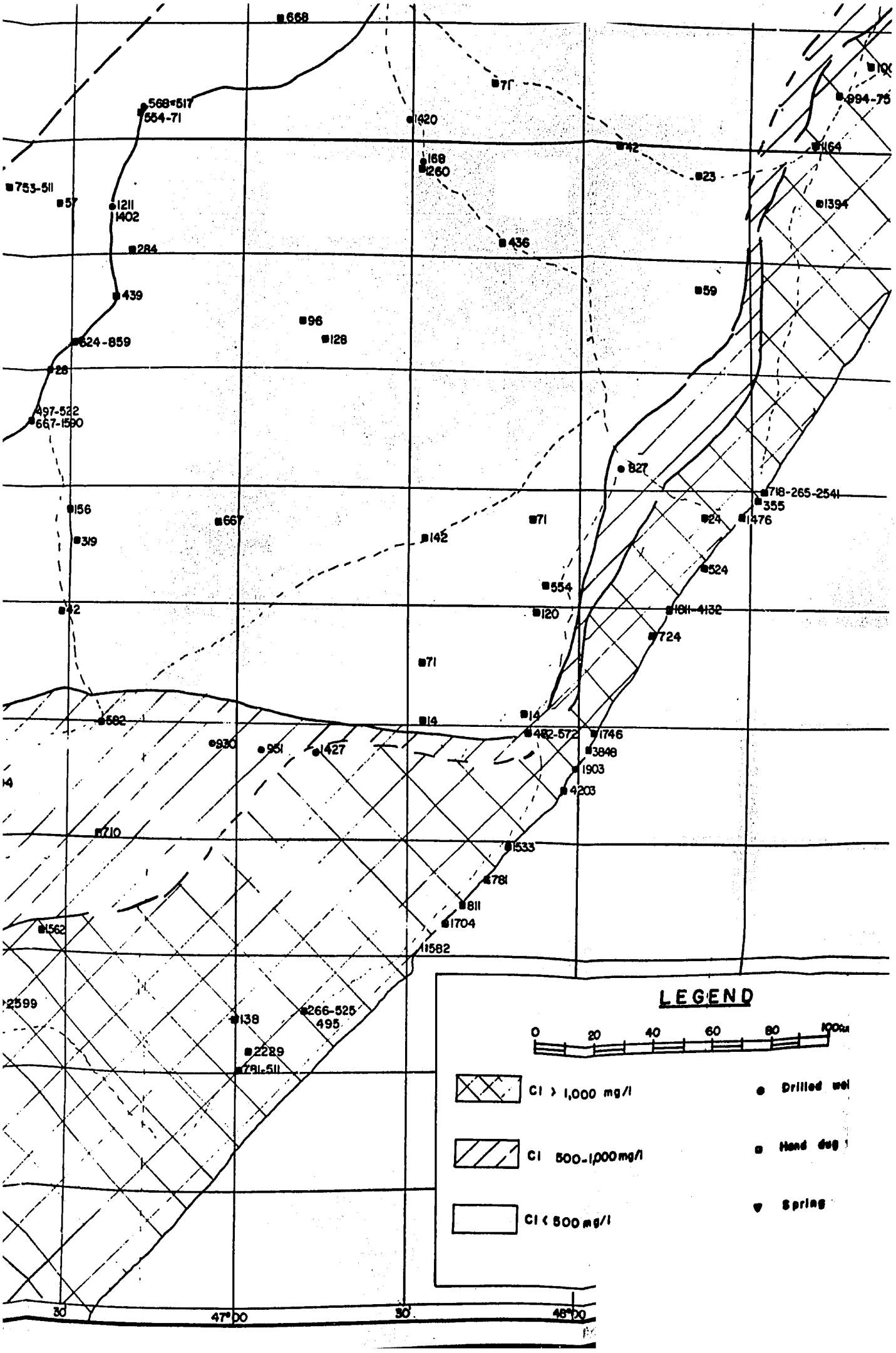
LOUIS BERGER INT'L INC.
ROSCOE MOSS CO.

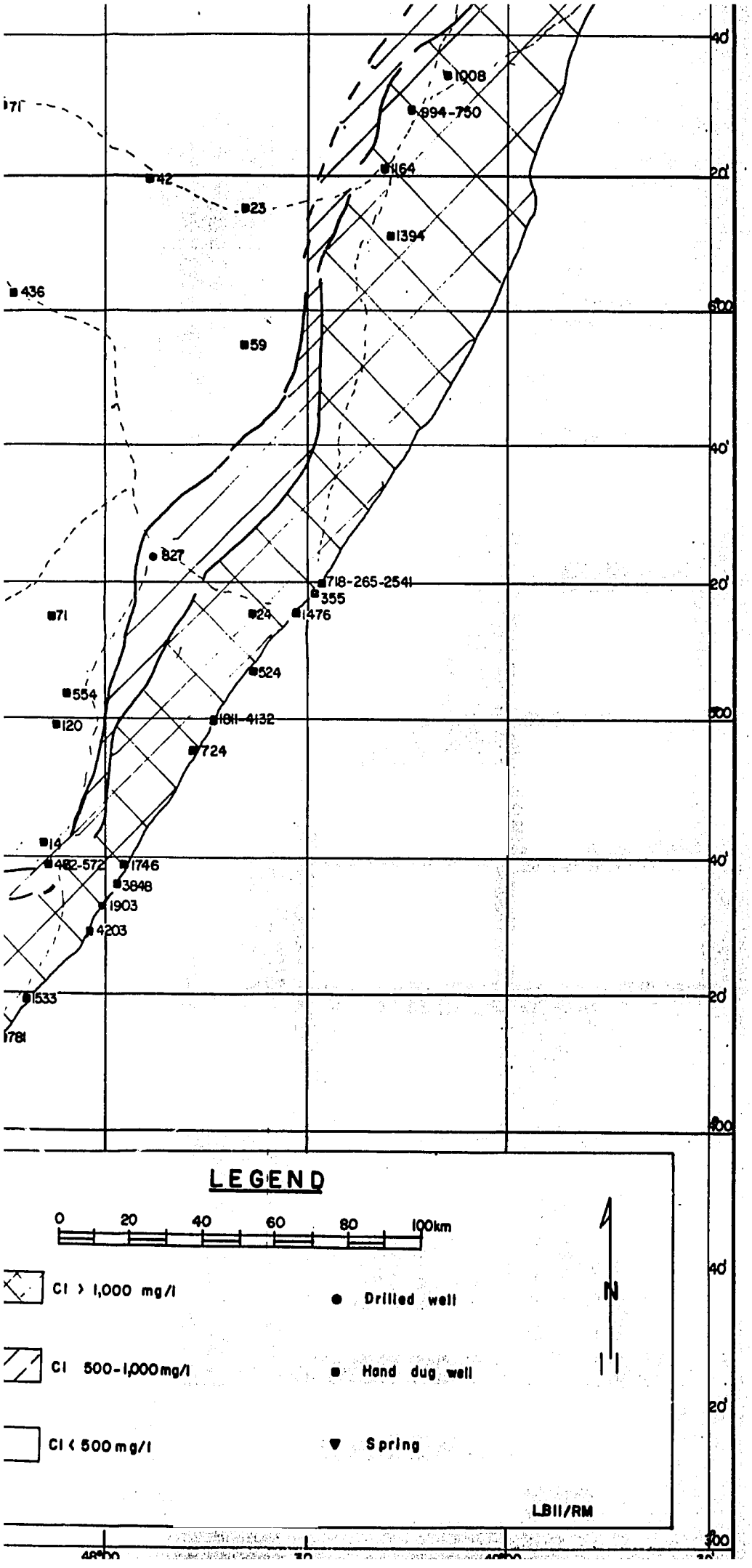



GAALKACYO
57
14
795
975
312
99
137-241-
369-233
178
243
6
336
724-
3340
270
439
249-319-
224
1704
368
1008
894-750
71
1420
42
1164
168
1260
23
1394
436
59
96
128
827
718-265-2541
355
71
24
1476
142
524
554
120
1811-4132
724
71
14
14
482-572
1746
1427
3848
1903
4203
1533
40'
20'
700
40'
20'
600
40'
20'
500
40'
20'

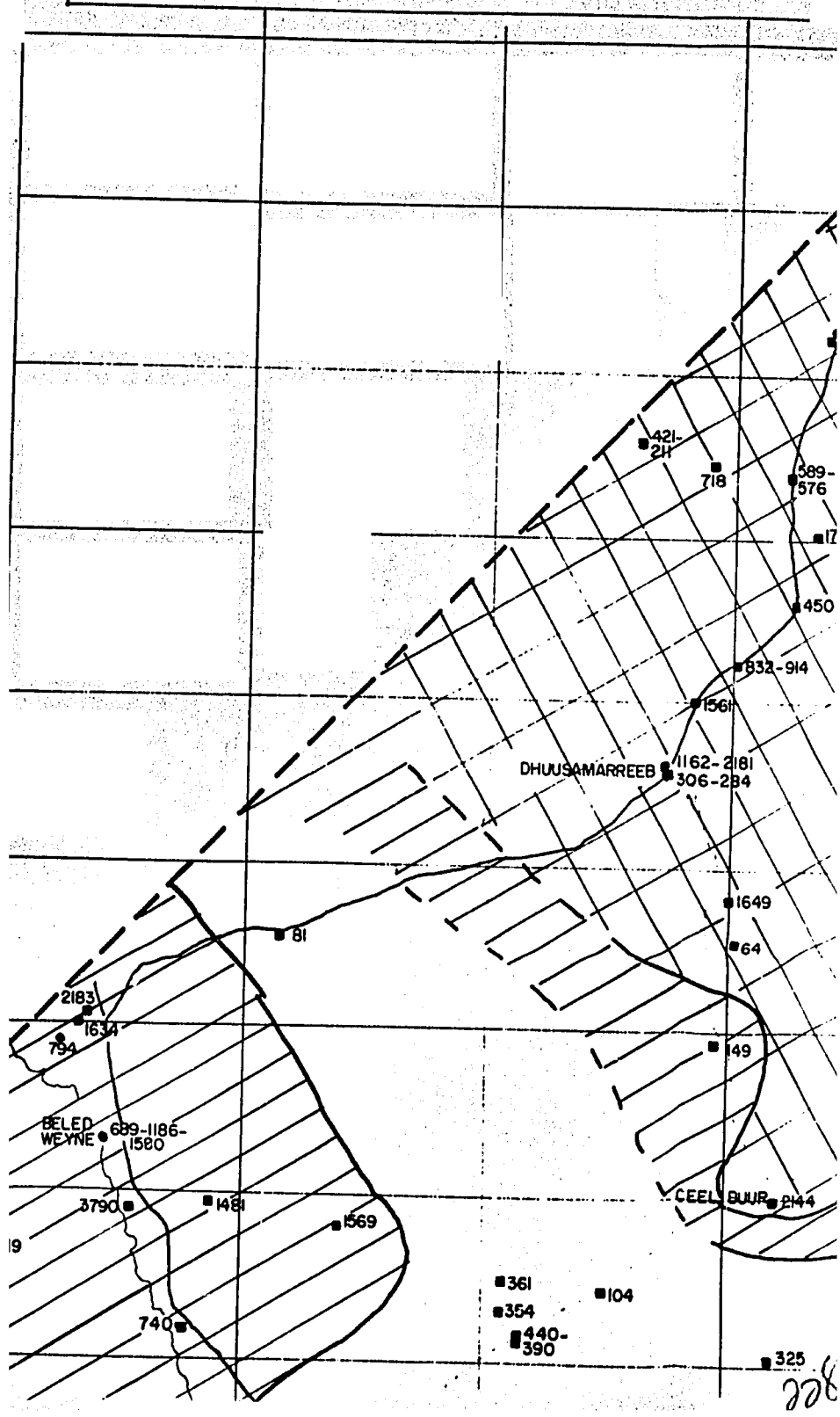

568-517
554-71
753-511
57
1211
1402
284
439
96
128
624-859
28
497-522
667-1590
9156
667
220
319
1121
42
462
42
BELED
WEYNE
112-426
3297
582
2932
99
99
930
951
1427
21
937
404
438
21
1399-1392
710
1047
781
588
1420
941-3180
838
1562
213-252
71
2599
269
138
266-525
495
276
2289
791-511
1120
724
965
179
30
46°00
30
47°00

205

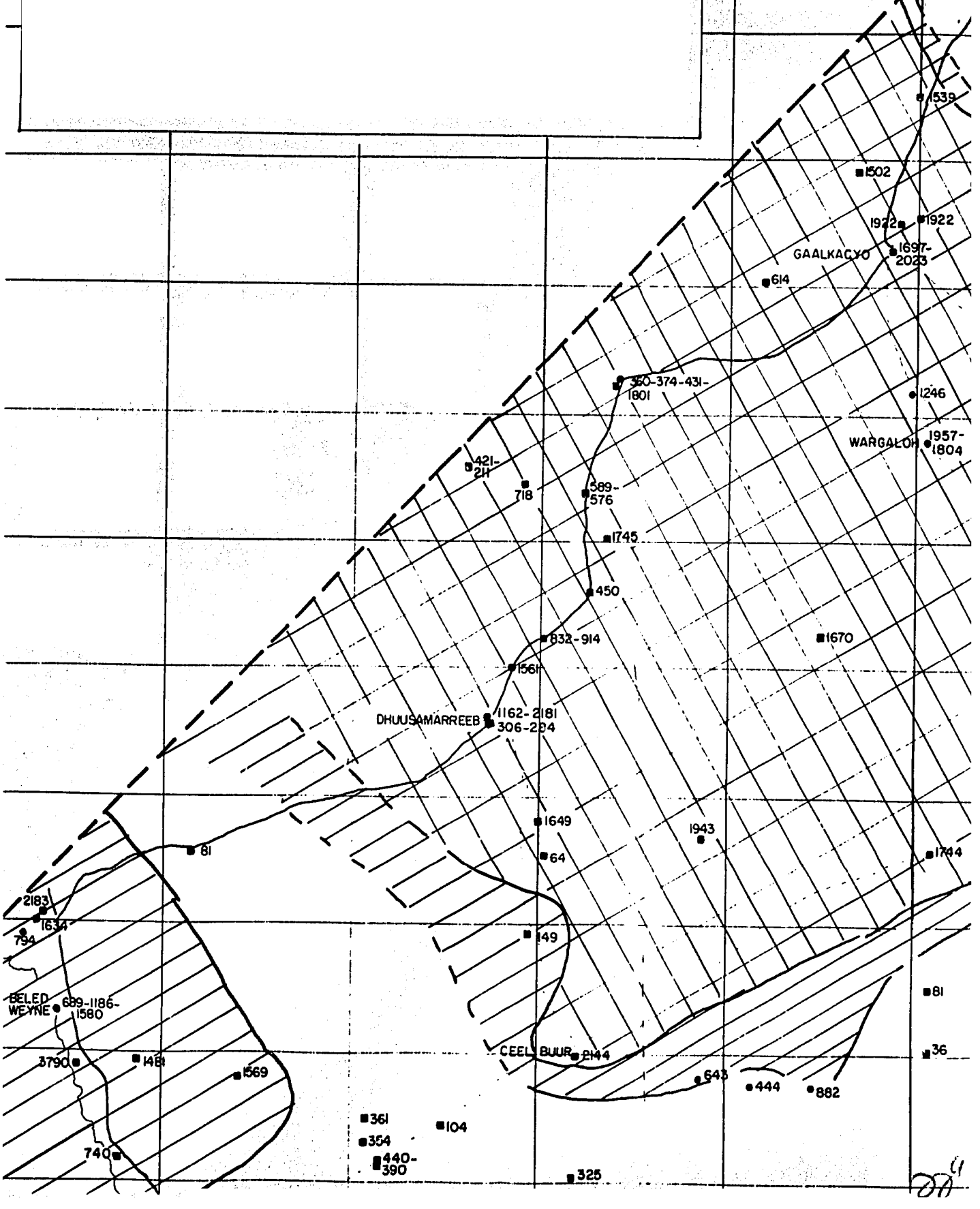

LEGEND
0 20 40 60 80 100
Cl > 1,000 mg/l
Cl 500-1,000 mg/l
Cl < 500 mg/l
Drilled wel
Hand dug
Spring
30
47°00
30
48°00

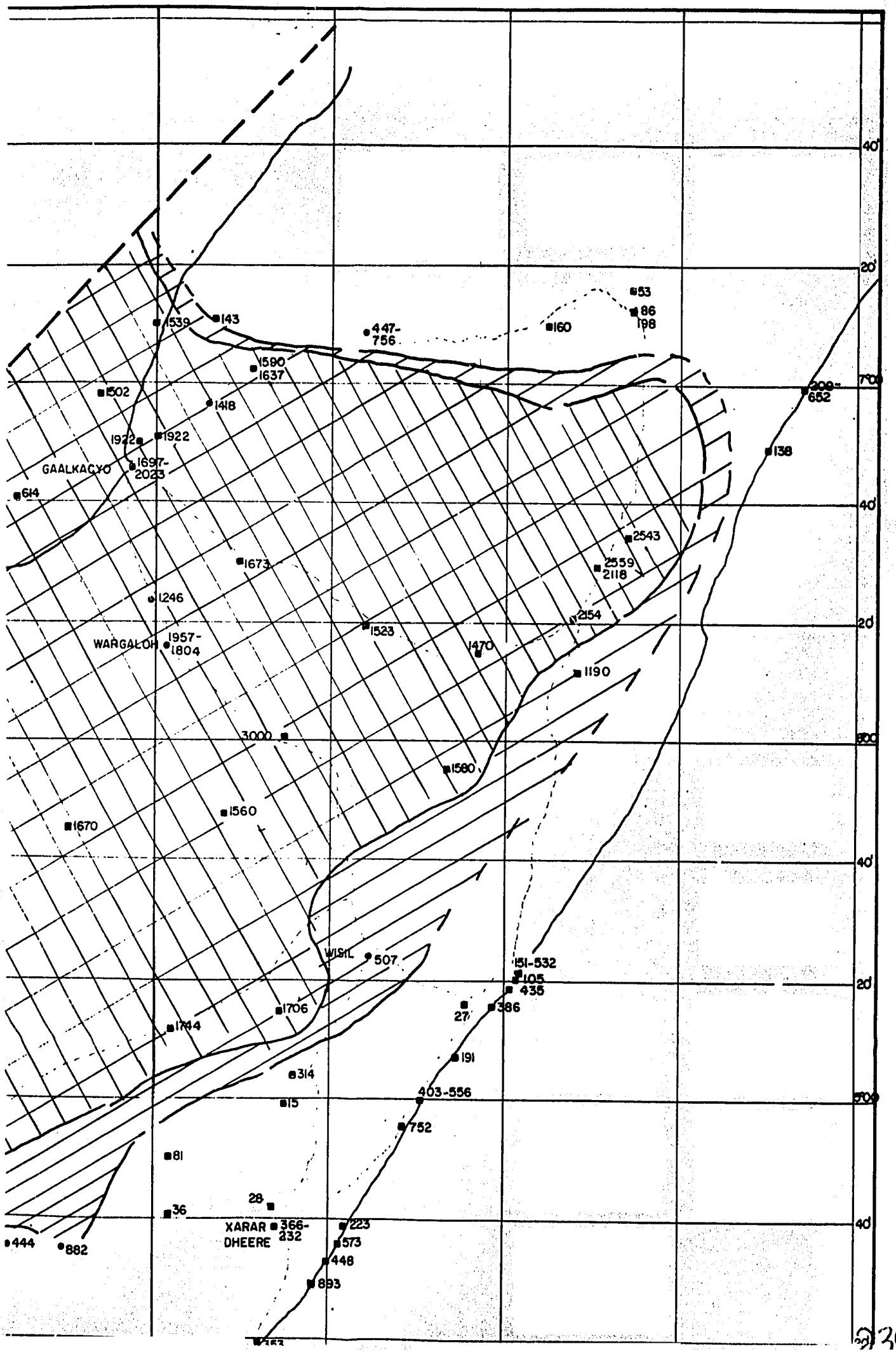

1008
994-750
1164
42
23
1394
436
59
827
718-265-2541
355
71
24
1476
524
554
120
1811-4132
724
14
482-572
1746
3848
1903
4203
1533
1781
LEGEND
0 20 40 60 80 100km
Cl > 1,000 mg/l
Cl 500-1,000mg/l
Cl < 500 mg/l
Drilled well
Hand dug well
Spring
N
LB11/RM

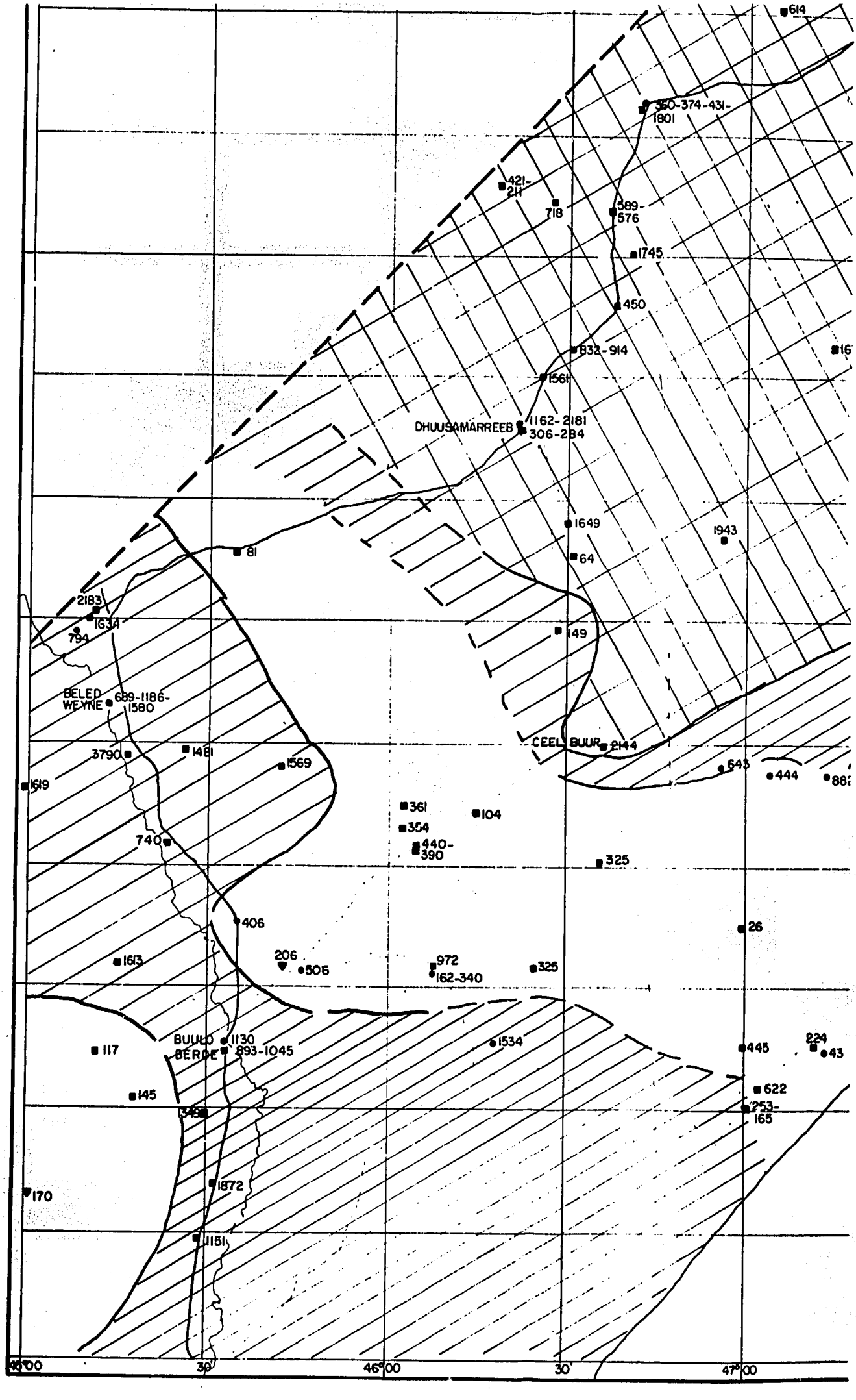
SULFATE CONCENTRATIONS OF DRILLED WELLS, HAND DUG WELLS AND SPRINGS IN THE CENTRAL RANGELANDS, STATUS OF 1984



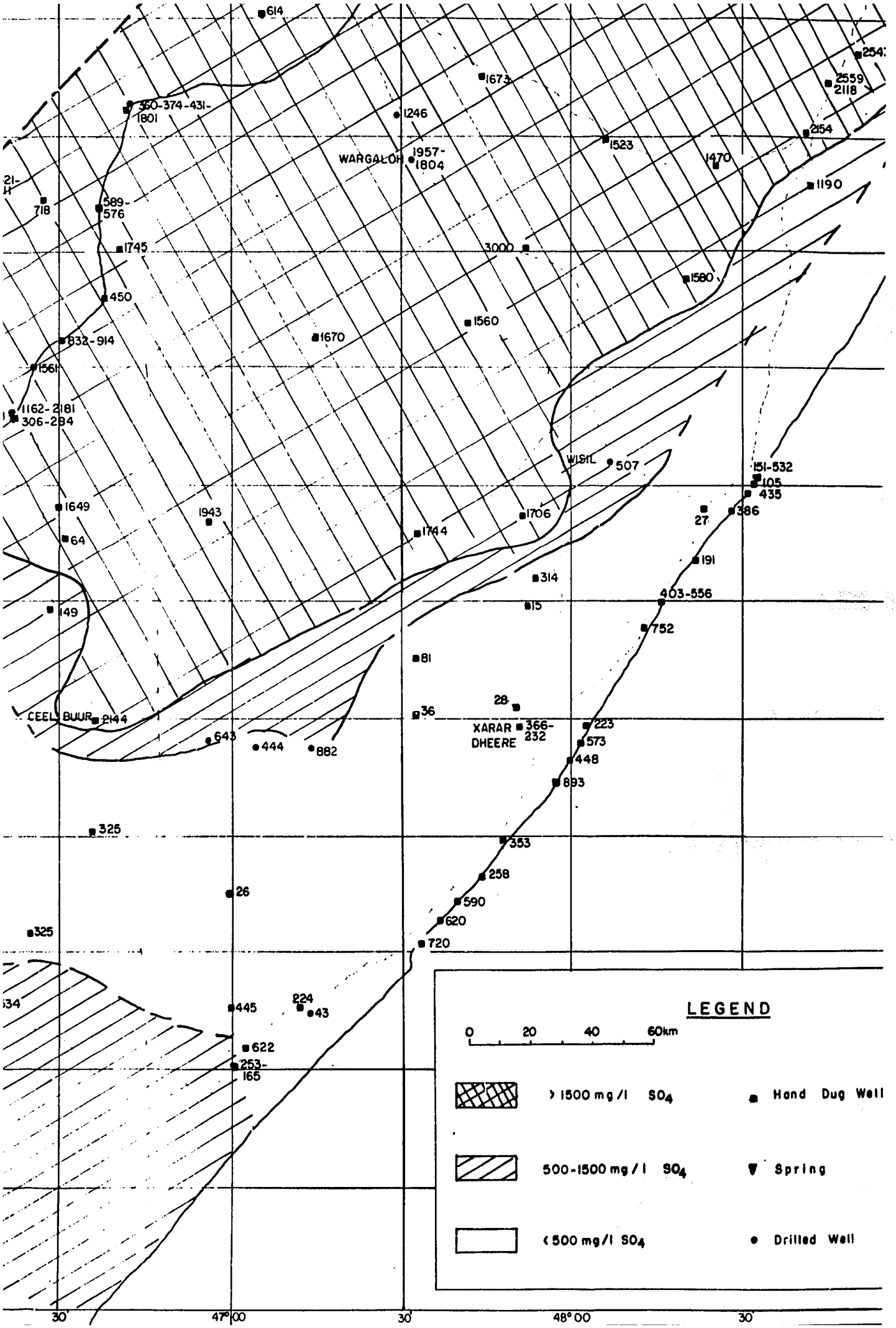
SULFATE CONCENTRATIONS OF DRILLED WELLS, HAND DUG WELLS AND SPRINGS IN THE CENTRAL RANGELANDS, STATUS OF 1984



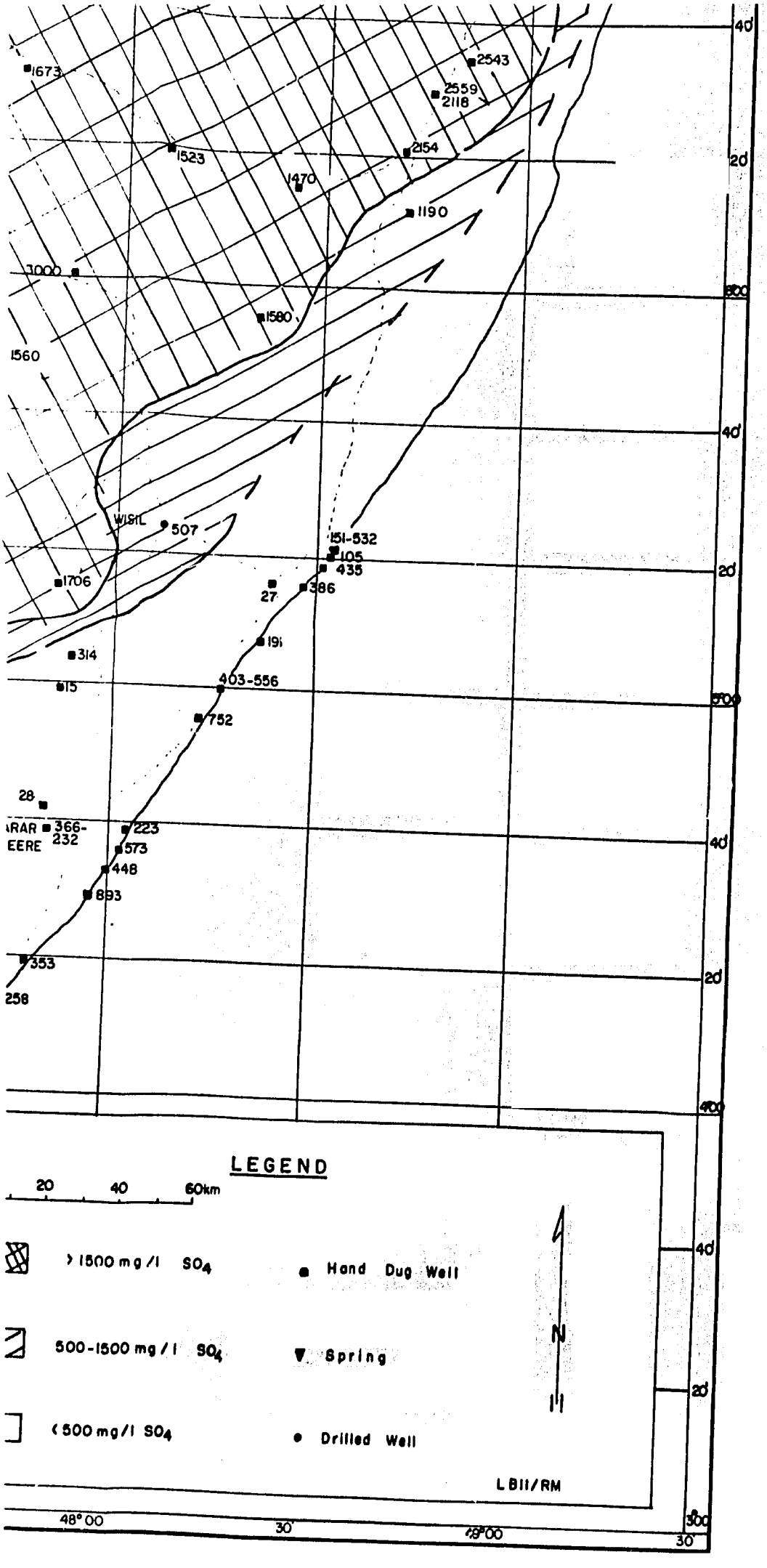

40'
20'
700
40'
20'
800
40'
20'
500
40'
53
86
198
160
447-
756
143
1539
1590
1637
1502
1418
1922
1922
1697-
2023
GAALKACYO
614
300-
652
138
2543
2559
2118
1673
1246
2154
1523
1957-
1804
WARGALOH
1470
1190
3000
1580
1560
1670
WISIL
507
151-532
105
435
386
27
1706
1744
191
314
403-556
15
752
81
28
36
XARAR
DHEERE
366-
232
223
573
448
893
444
882


614
350-374-431-
1801
421-
211
718
589-
576
1745
450
832-914
1561
DHUUSAMARREEB
1162-2181
306-284
1649
1943
81
64
2183
1634
794
149
BELED
WEYNE
689-1186-
1580
CEEL BUUR
2144
3790
1481
1569
643
444
1619
361
104
354
440-
390
740
325
406
26
206
1613
506
972
162-340
325
BUULO
BERDE
1130
893-1045
1534
445
224
43
117
145
622
253-
165
170
1872
1151
46°00
30'
46°00
30'
47°00

231

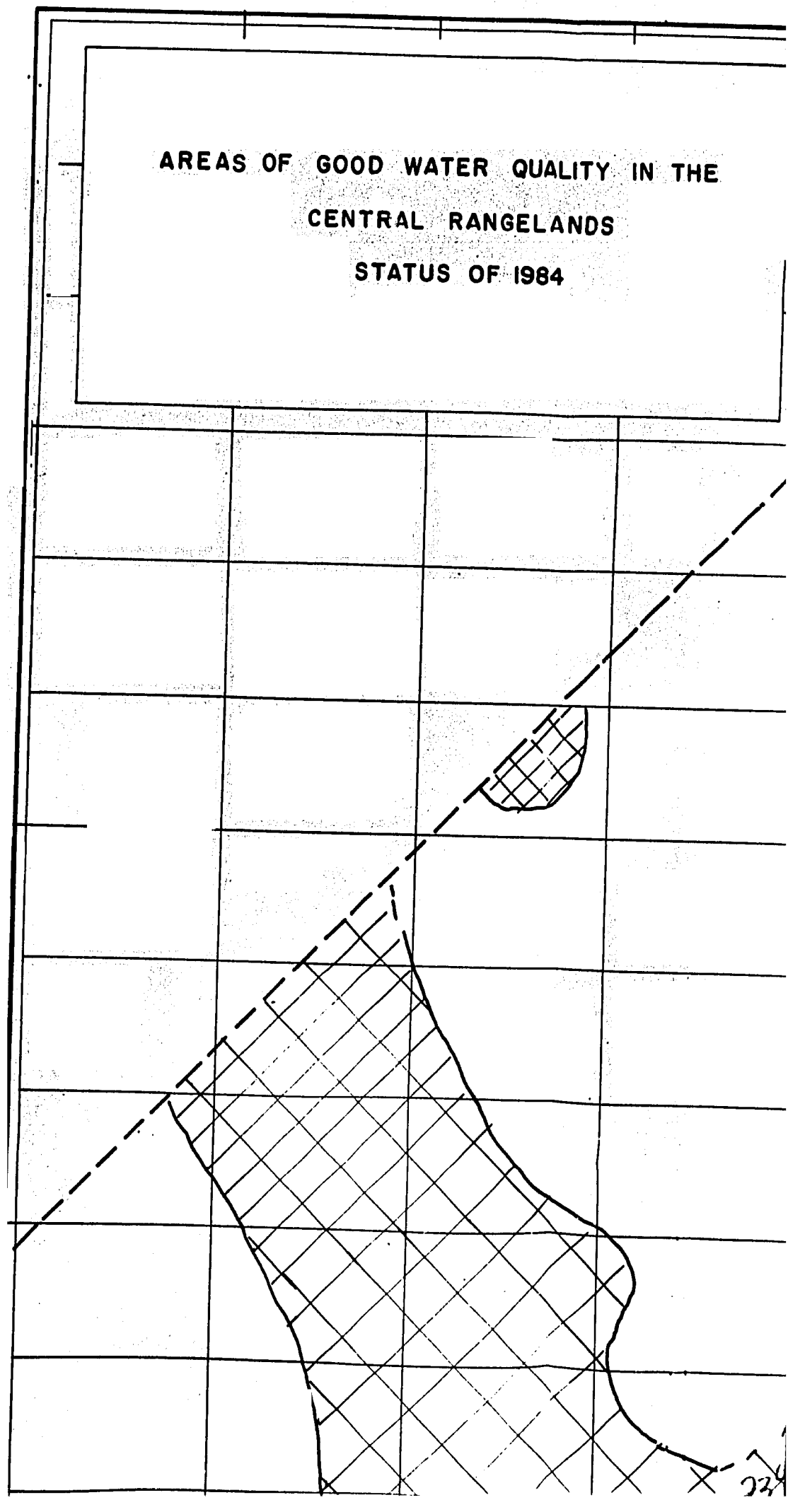

614
1673
2559
2118
1246
1523
2154
1470
1190
WARGALOH
1957-
1804
718
589-
576
1745
3000
1580
450
1560
1670
832-914
1561
1162-2181
306-284
WISIL
507
151-532
105
435
386
27
1649
1943
1706
1744
64
191
314
403-556
149
15
752
81
28
36
CEEL BUUR
2144
XARAR
DHEERE
366-
232
223
573
643
444
882
448
893
325
353
258
26
590
620
720
325
224
43
445
622
253-
165
LEGEND
0
20
40
60km
> 1500 mg/l SO4
500-1500 mg/l SO4
< 500 mg/l SO4
Hand Dug Well
Spring
Drilled Well
30'
47°00
30'
48°00
30'

230


1673
2543
2559
2118
1523
2154
1470
1190
3000
1580
1560
WISIL
507
151-532
105
435
1706
27
386
191
314
15
403-556
752
28
ARAR
EERE
366-
232
223
573
448
893
353
258
LEGEND
20
40
60km
> 1500 mg/l SO4
500-1500 mg/l SO4
< 500 mg/l SO4
Hand Dug Well
Spring
Drilled Well
N
LBII/RM
48°00
30'
49°00
30'

233

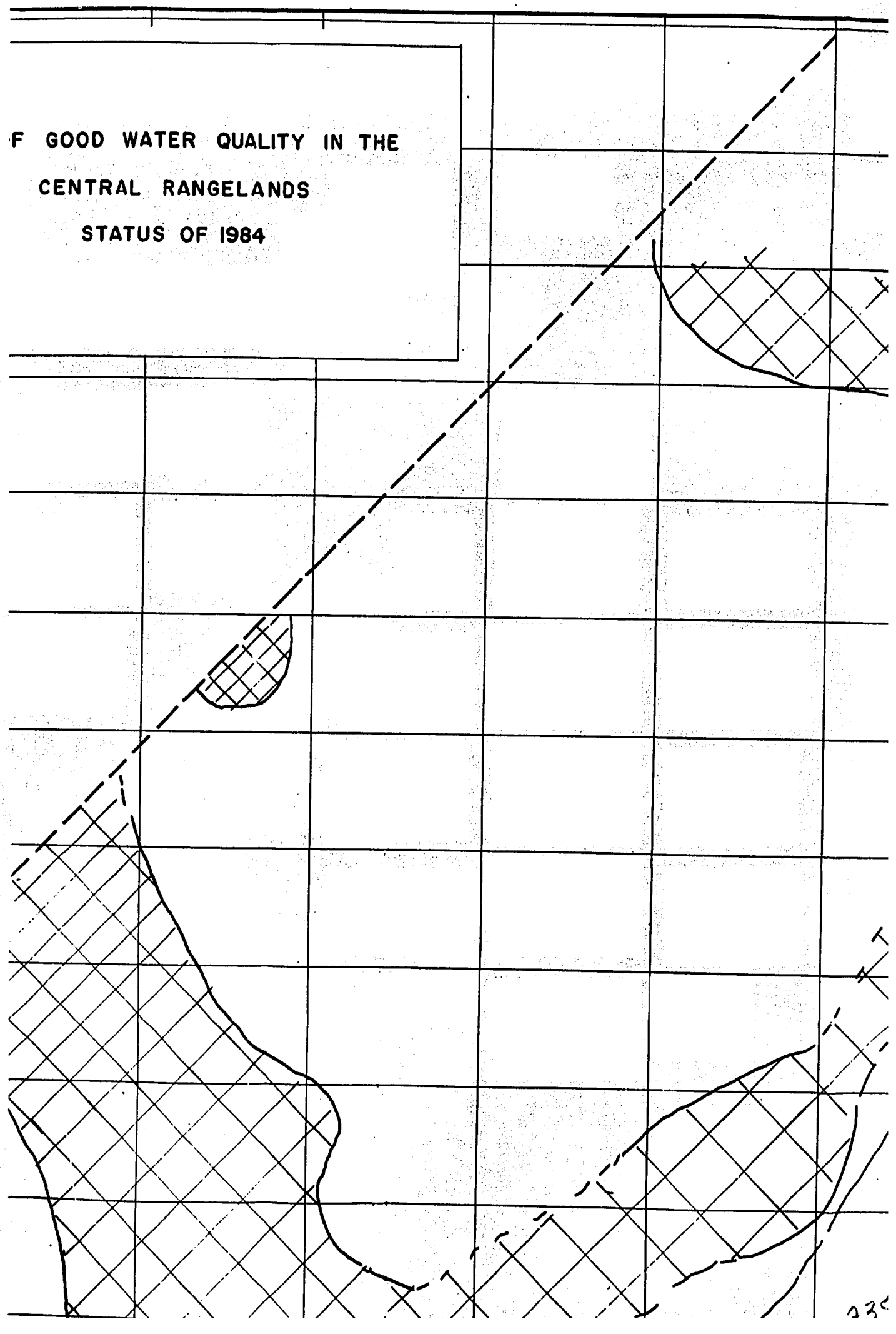
AREAS OF GOOD WATER QUALITY IN THE CENTRAL RANGELANDS STATUS OF 1984

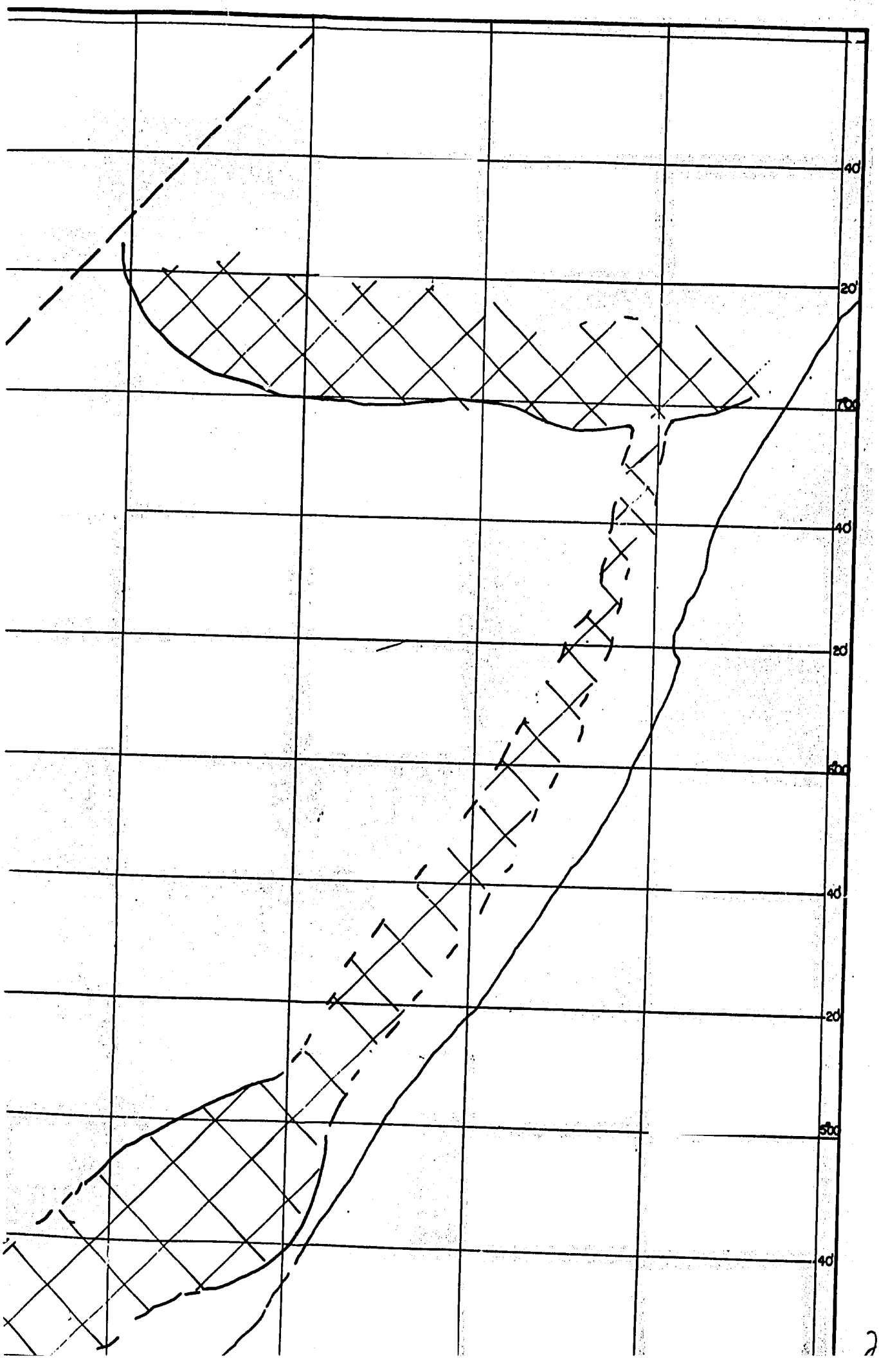


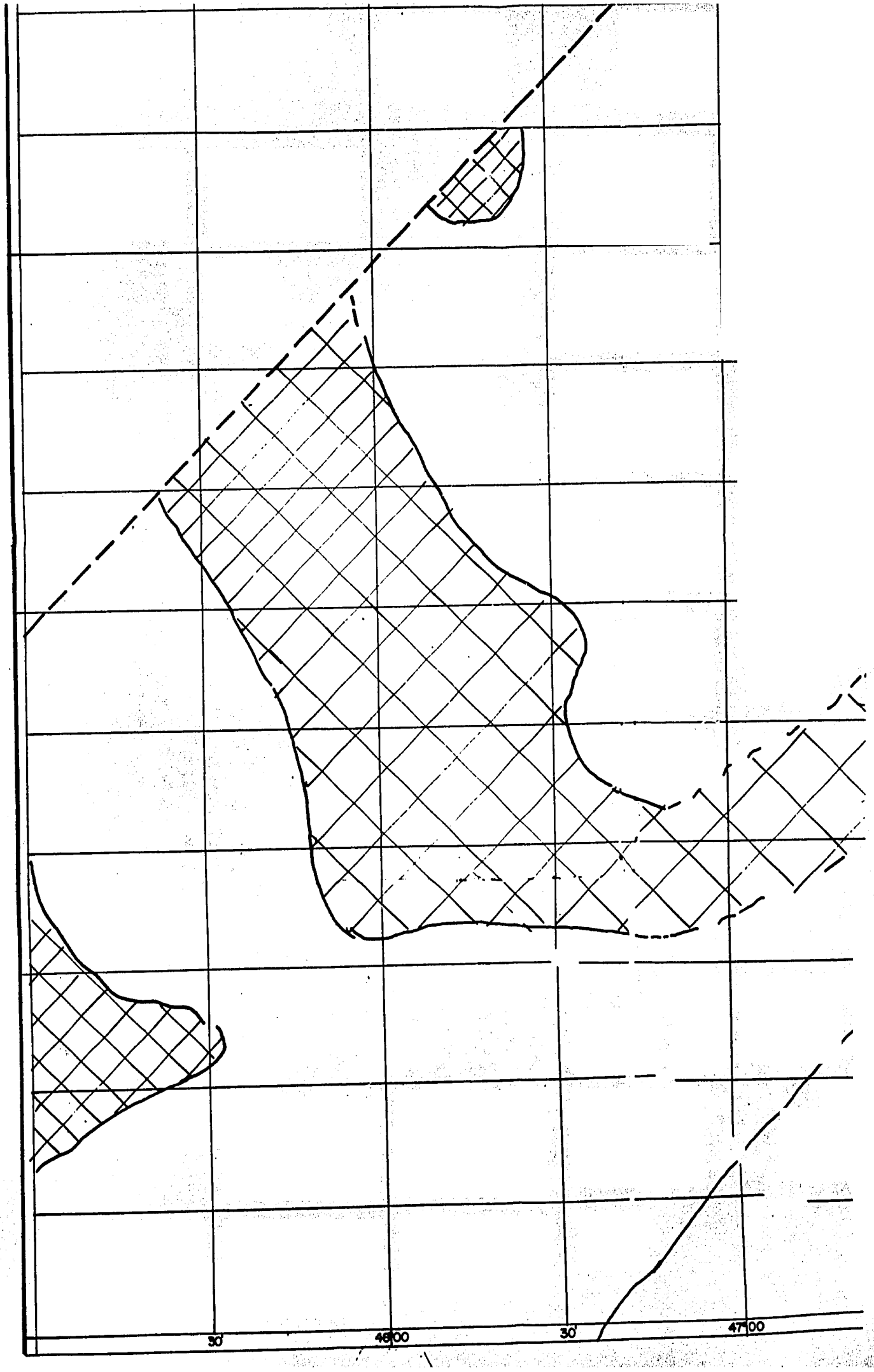
F GOOD WATER QUALITY IN THE

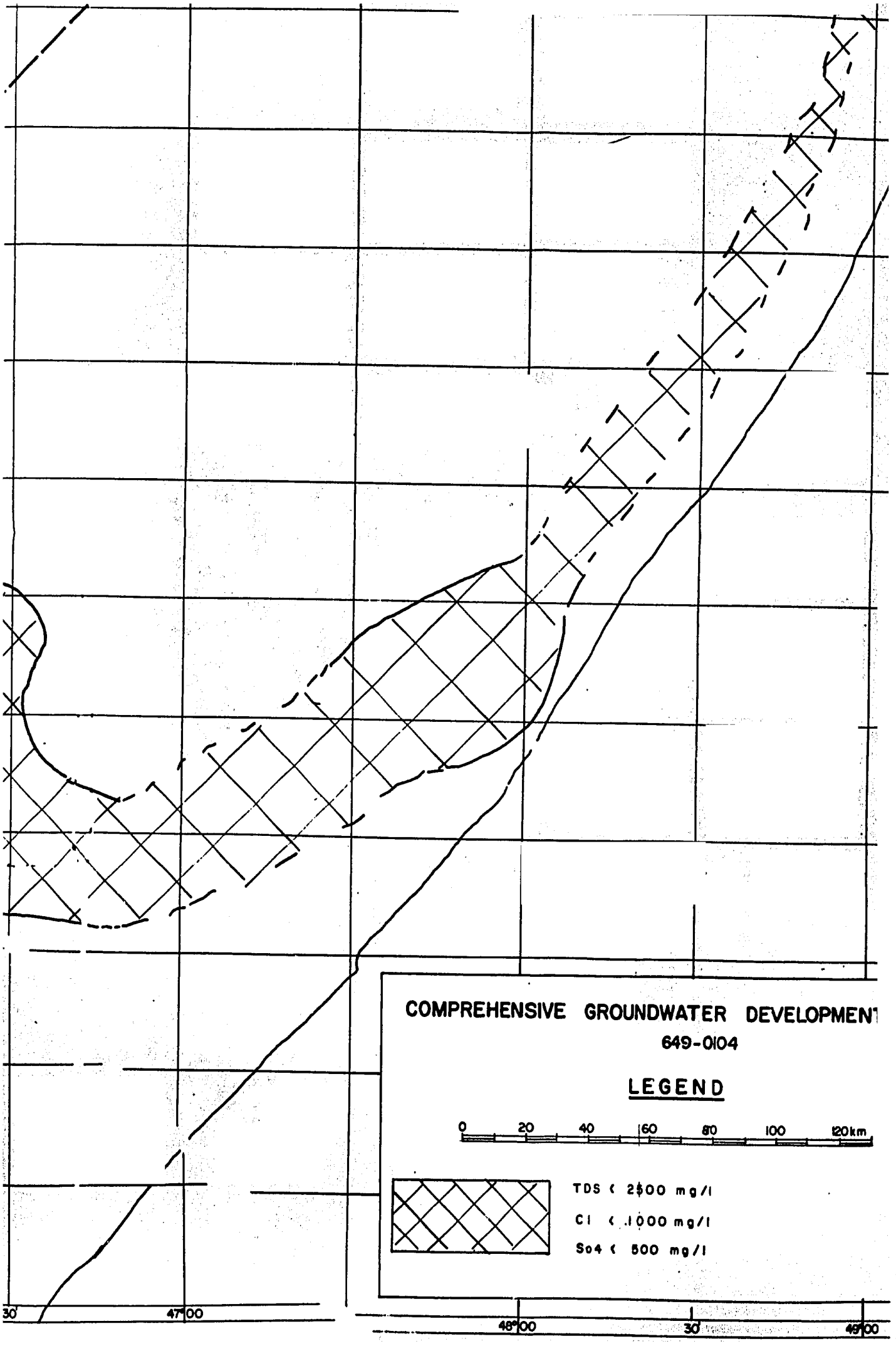
CENTRAL RANGELANDS

STATUS OF 1984

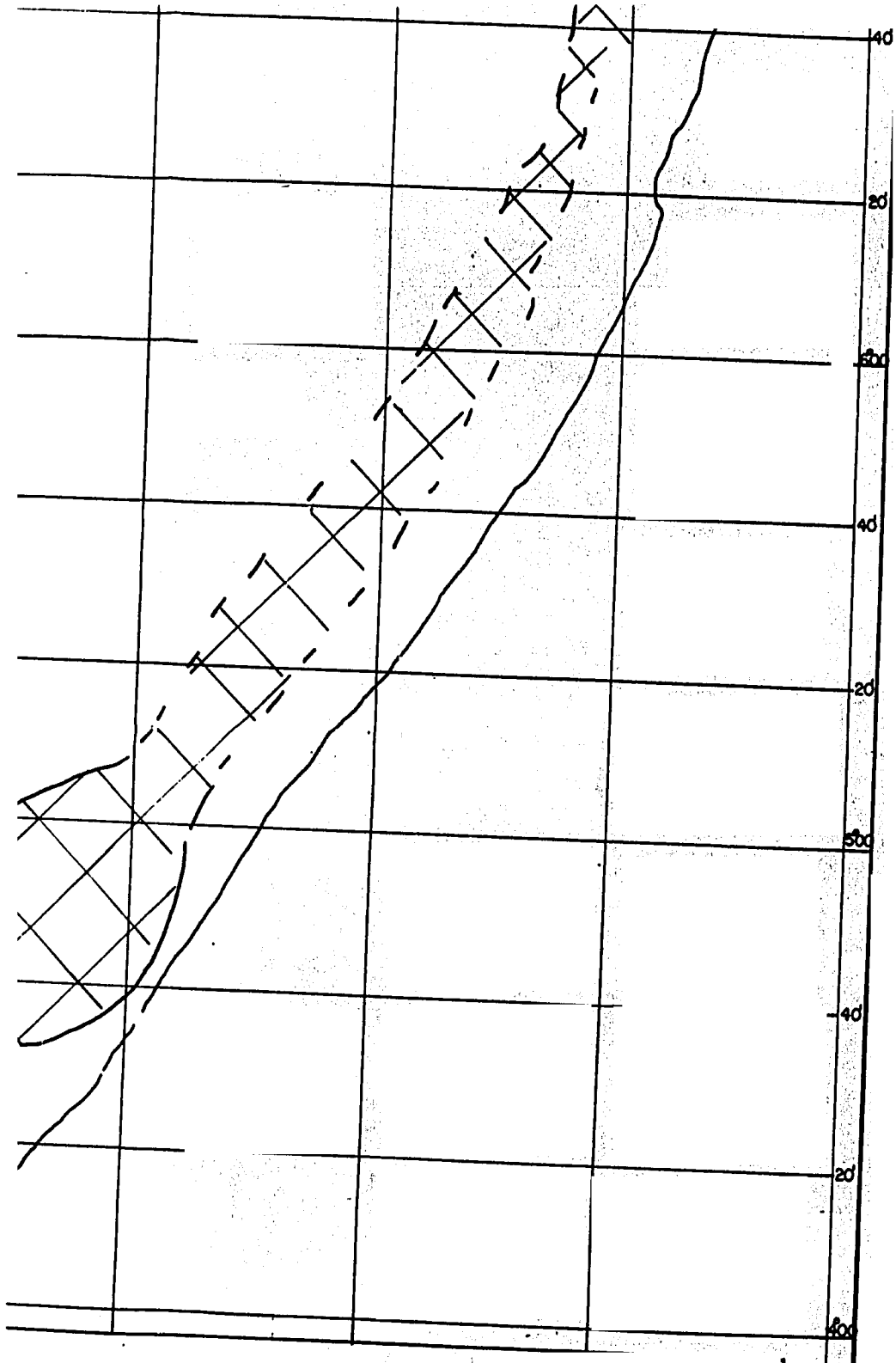



40'
20'
700
40'
20'
500
40'
20'
500
40'


30'
46'00
30'
47'00


COMPREHENSIVE GROUNDWATER DEVELOPMENT
649-0104
LEGEND
0 20 40 60 80 100 120km
TDS < 2500 mg/l
Cl < 1000 mg/l
So4 < 500 mg/l
30'
47°00
48°00
30'
49°00

238



IPREHENSIVE GROUNDWATER DEVELOPMENT PROJECT

649-0104

LEGEND

0 20 40 60 80 100 120 km

TDS < 2500 mg/l

Cl < 1000 mg/l

So4 < 500 mg/l

N

WDA WELL LOCATIONS IN CENTRAL RANGELANDS

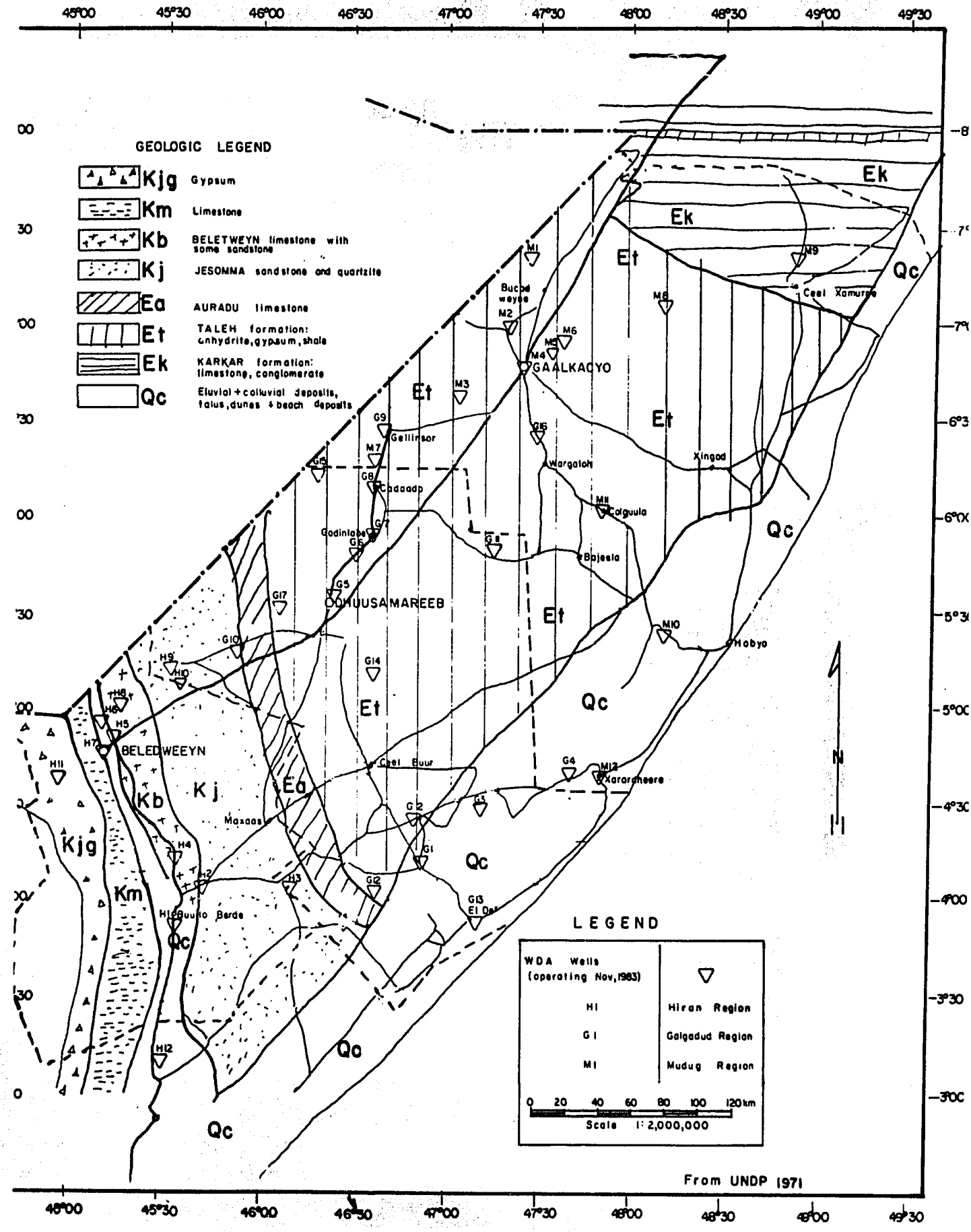


Plate 15

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