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MINISTRY OF PUBLIC WORKS
GENERAL DIRECTORATE OF
HYDRAULICS

JAPAN INTERNATIONAL
COOPERATION AGENCY
(JICA)

THE STUDY
ON
RURAL WATER SUPPLY IN THE PRE-RIF REGION
IN
MOROCCO

FINAL REPORT
VOLUME IV DRAWINGS

AUGUST 1996

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LIST OF DRAWINGS

1. Meteorology, Hydrology and Surface Water Development

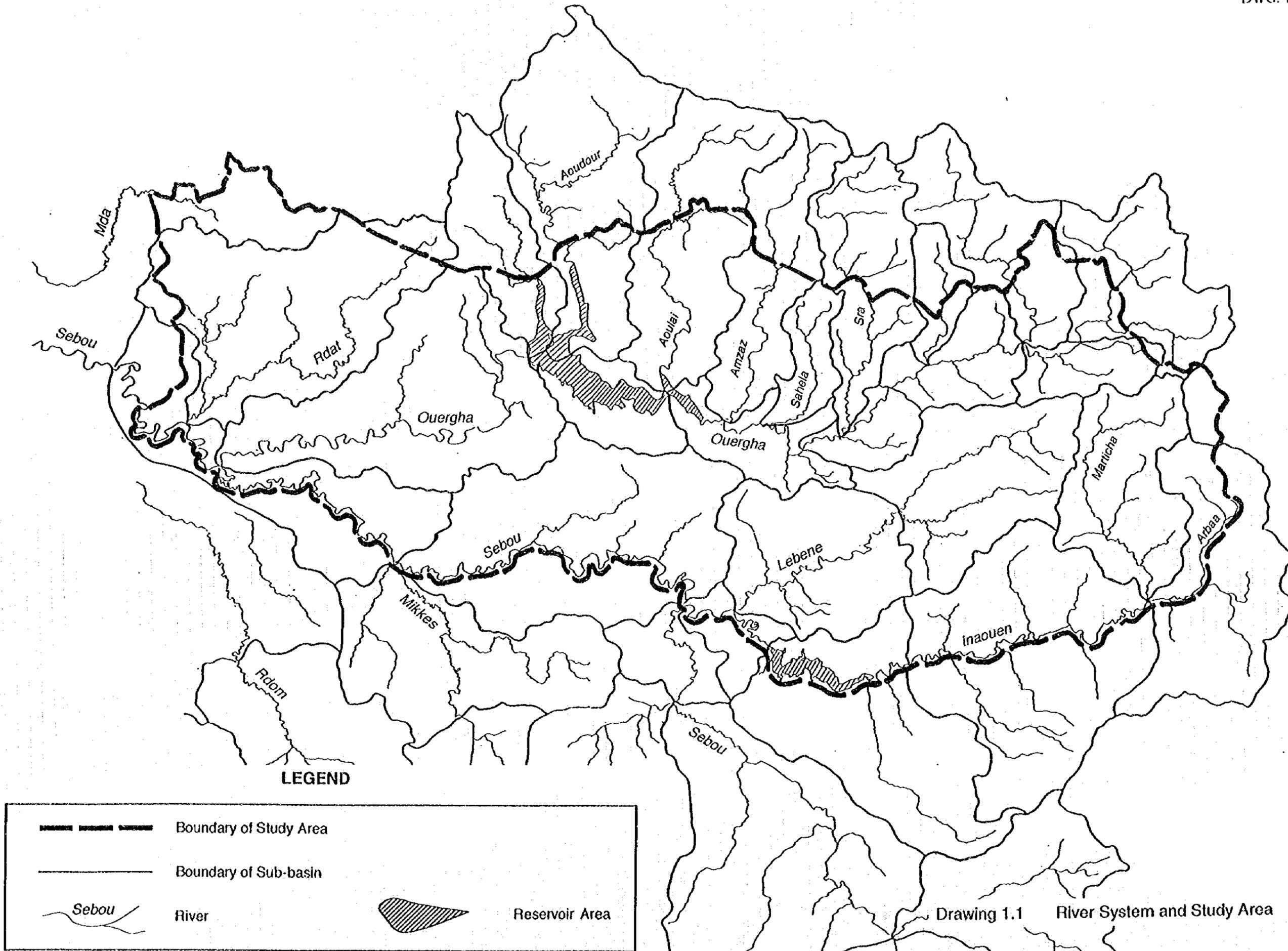
No.	Title
DWG. 1.1	River System and Study Area
DWG. 1.2	Isohyetal Map of Annual Rainfall
DWG. 1.3	Location of Meteorological Stations
DWG. 1.4	Location of Stream Gauging Stations
DWG. 1.5	Location of Dams Proposed by the SBO Master Plan
DWG. 1.6	Location of Medium Scale Dam Sites

2. Hydrogeology

No.	Title
DWG. 2.1	Location Map of Groundwater Potential Structures
DWG. 2.2	Location Map of Existing Dugholes and Springs
DWG. 2.3	Location Map of Additional Groundwater Potential Structures
DWG. 2.4	Location of Model Areas
DWG. 2.5	Location Map of Ain Defali
DWG. 2.6	Location Map of Teroual
DWG. 2.7	Location Map of J. Berda
DWG. 2.8	Topography of Ain Defali
DWG. 2.9	Topography of Teroual
DWG. 2.10	Topography of J. Berda
DWG. 2.11	Mesh Diagram Covering Groundwater Potential Structure - Ain Defali
DWG. 2.12	Mesh Diagram Covering Groundwater Potential Structure - Teroual
DWG. 2.13	Mesh Diagram Covering Groundwater Potential Structure - J. Berda
DWG. 2.14	Estimated Contour Map of Groundwater Level - Ain Defali
DWG. 2.15	Estimated Contour Map of Groundwater Level - Teroual
DWG. 2.16	Estimated Contour Map of Groundwater Level - J. Berda

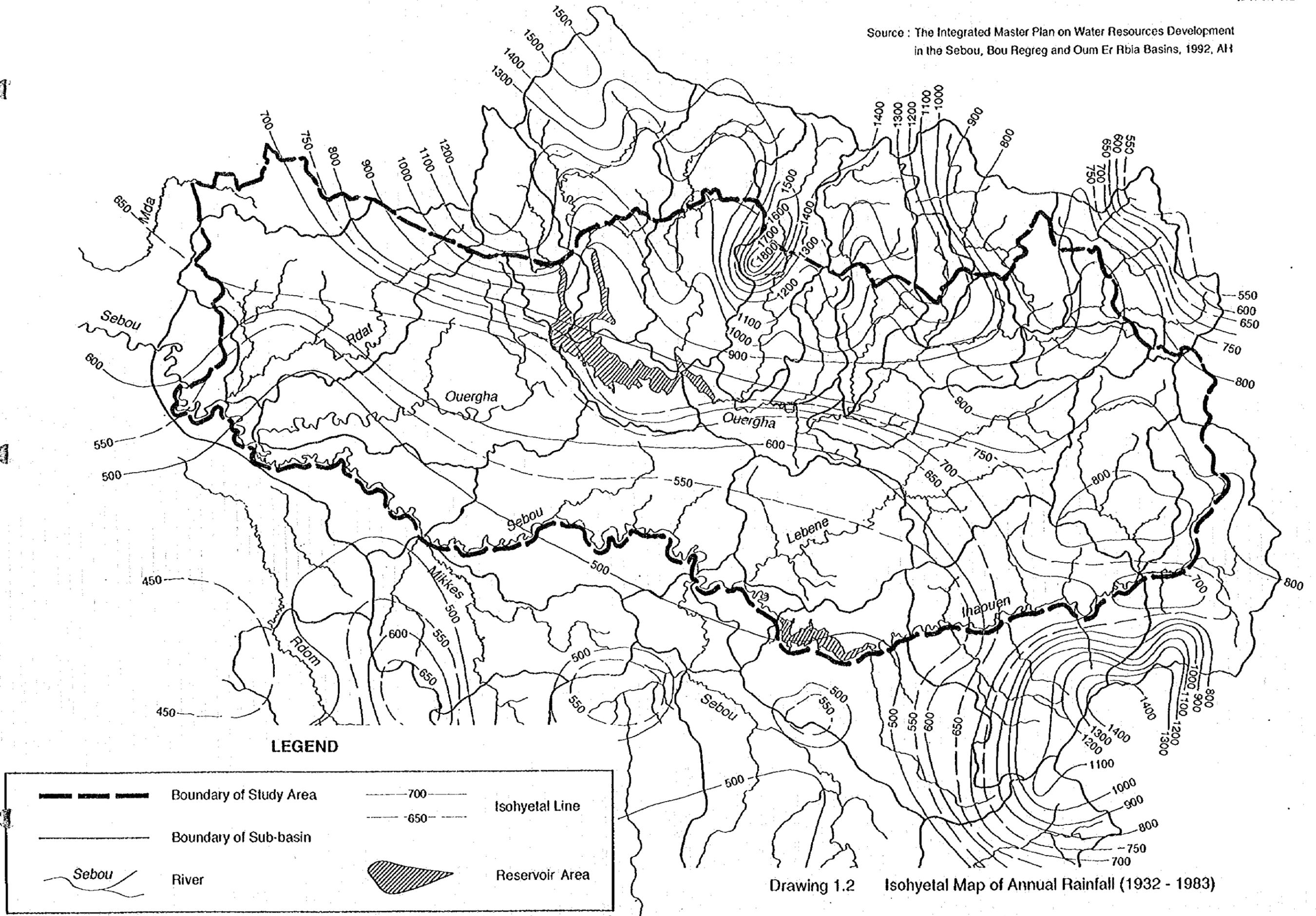
3. Water Supply

No.	Title
DWG. 3.1	Location of Facilities on Existing Water Supply System
DWG. 3.2	Plan of Ain Defali Water Supply System
DWG. 3.3	Plan of Teroual Water Supply System
DWG. 3.4	Plan of Ain Berda Water Supply System
DWG. 3.5	Hydraulic Profile (Ain Defali) (1/6)
DWG. 3.6	Hydraulic Profile (Ain Defali) (2/6)
DWG. 3.7	Hydraulic Profile (Ain Defali) (3/6)
DWG. 3.8	Hydraulic Profile (Ain Defali) (4/6)
DWG. 3.9	Hydraulic Profile (Ain Defali) (5/6)
DWG. 3.10	Hydraulic Profile (Ain Defali) (6/6)
DWG. 3.11	Hydraulic Profile (Teroual) (1/3)
DWG. 3.12	Hydraulic Profile (Teroual) (2/3)
DWG. 3.13	Hydraulic Profile (Teroual) (3/3)
DWG. 3.14	Hydraulic Profile (Ain Berda) (1/4)
DWG. 3.15	Hydraulic Profile (Ain Berda) (2/4)
DWG. 3.16	Hydraulic Profile (Ain Berda) (3/4)
DWG. 3.17	Hydraulic Profile (Ain Berda) (4/4)
DWG. 3.18	Schematic Diagram of Facilities at Ain Defali Exploratory Well Sites
DWG. 3.19	Schematic Diagram of Facilities at Teroual Exploratory Well Sites
DWG. 3.20	Schematic Diagram of Facilities at Berda Exploratory Well Sites

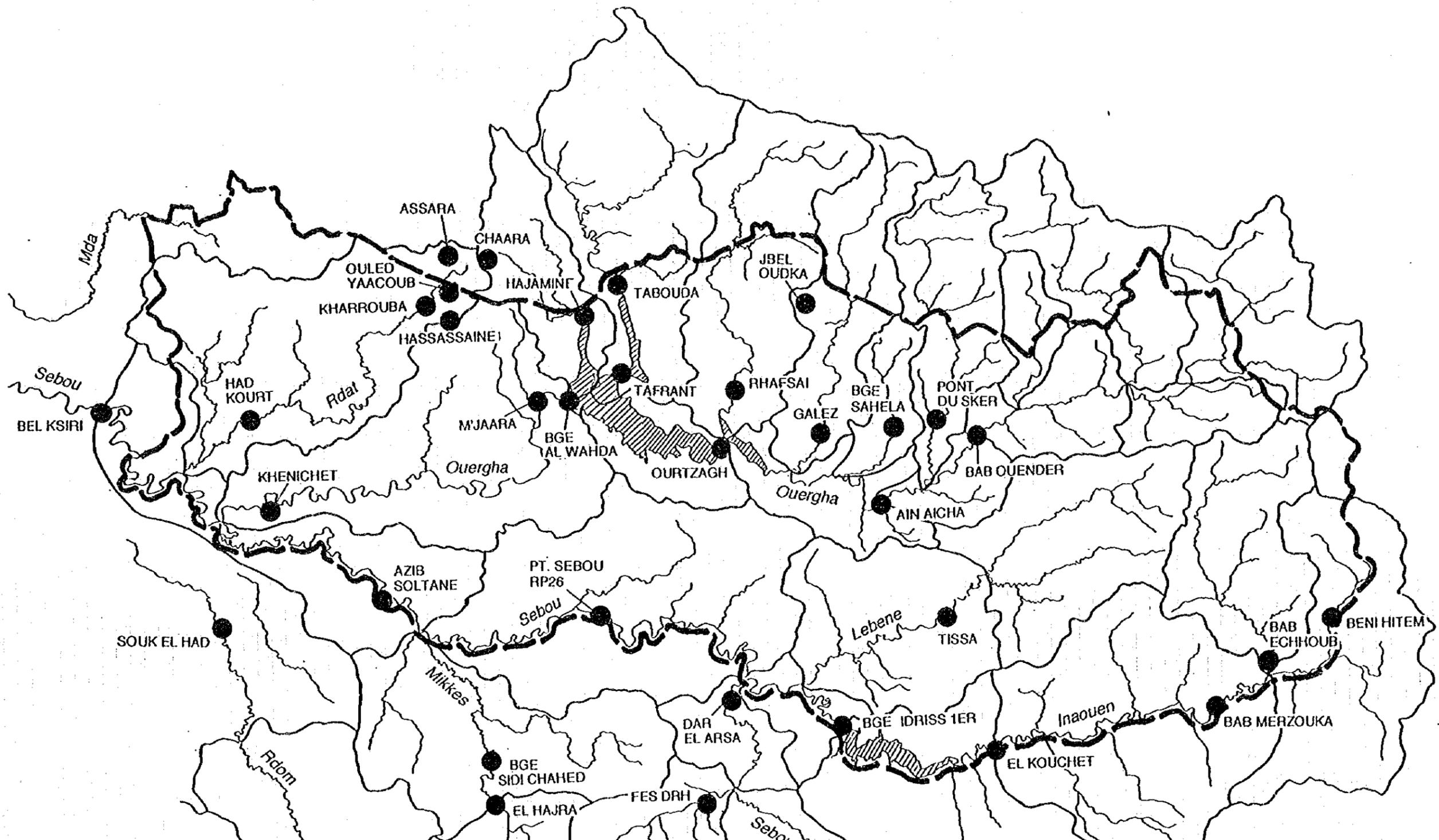


Drawing 1.1 River System and Study Area

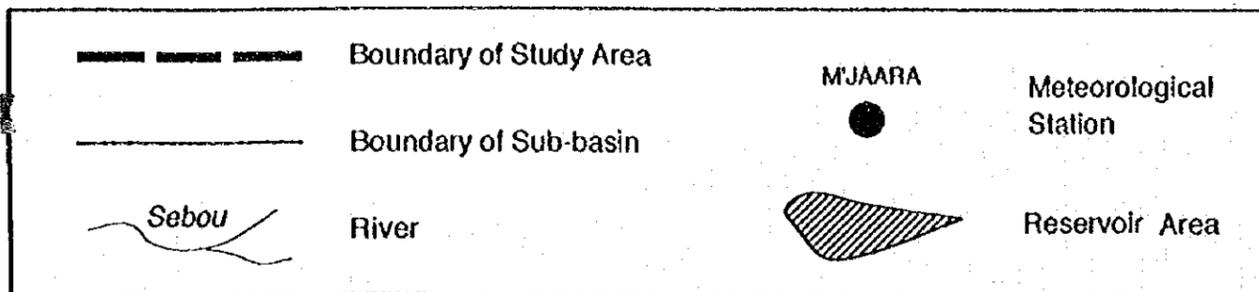
Source : The Integrated Master Plan on Water Resources Development
in the Sebou, Bou Regreg and Oum Er Rbia Basins, 1992, AH



Drawing 1.2 Isohyetal Map of Annual Rainfall (1932 - 1983)

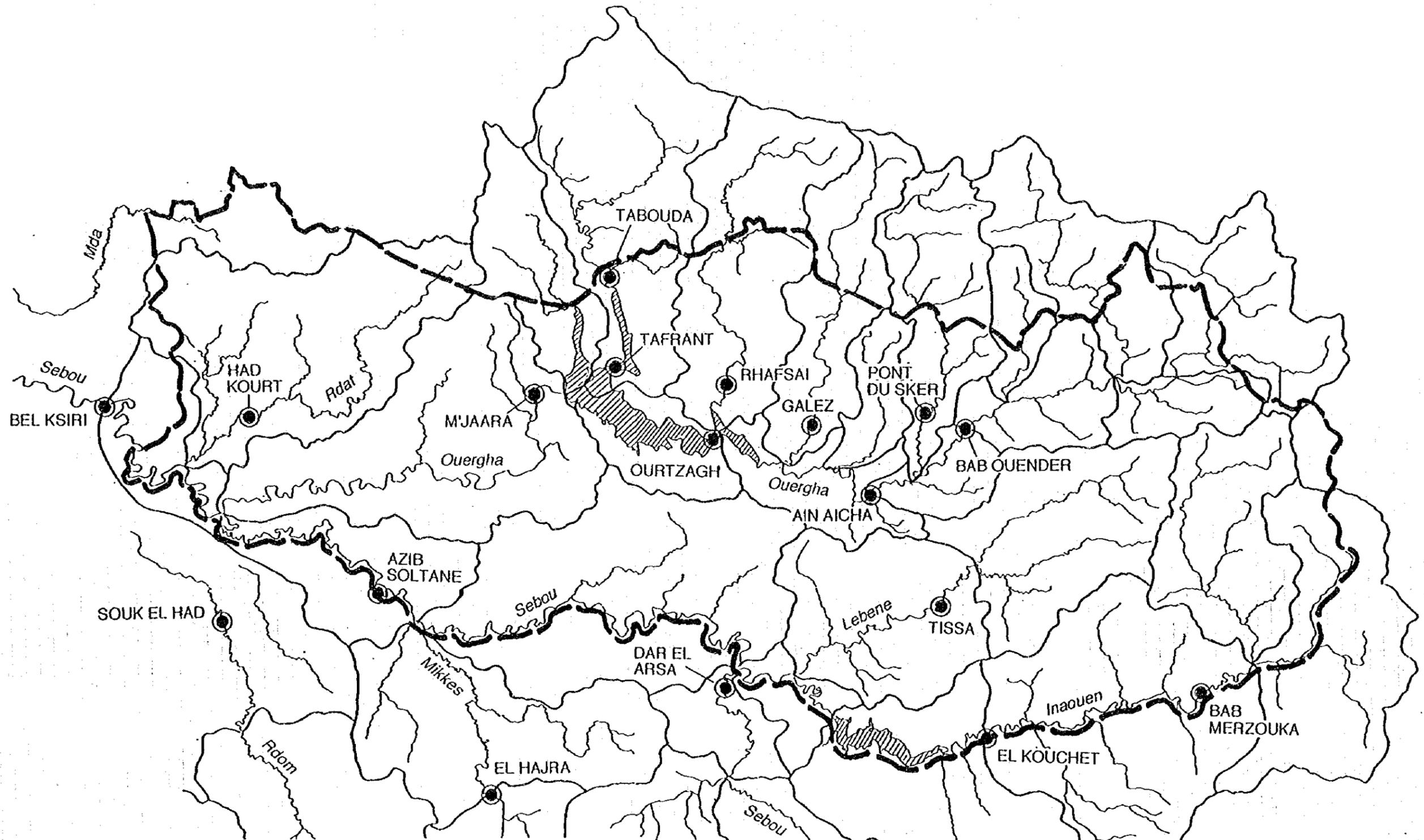


LEGEND

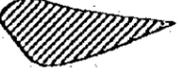


Source : AH

Drawing 1.3 Location of Meteorological Stations



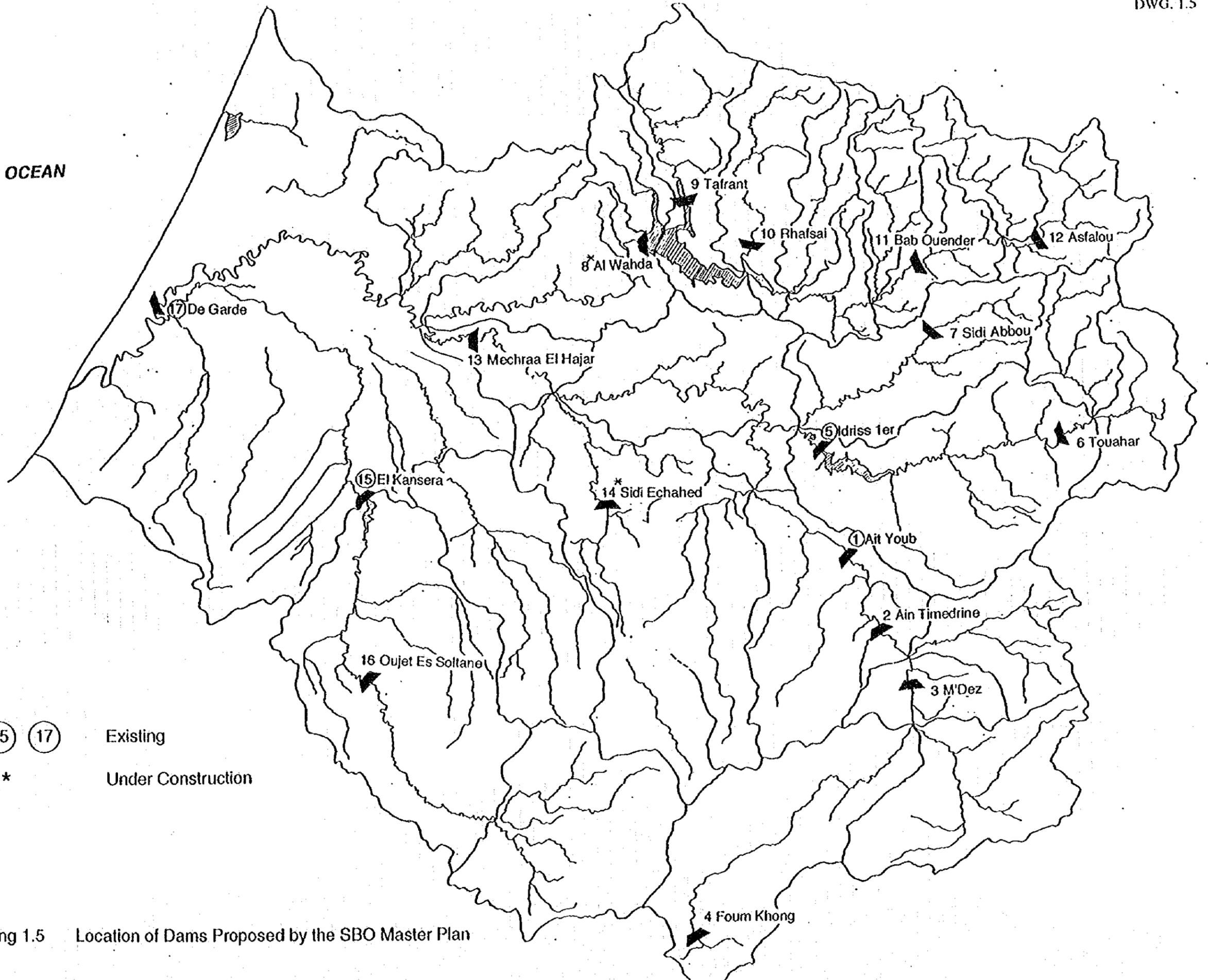
LEGEND

	Boundary of Study Area		Stream Gauging Station
	Boundary of Sub-basin		Reservoir Area
	River		

Source : AH

Drawing 1.4 Location of Stream Gauging Stations

ATLANTIC OCEAN



Note :

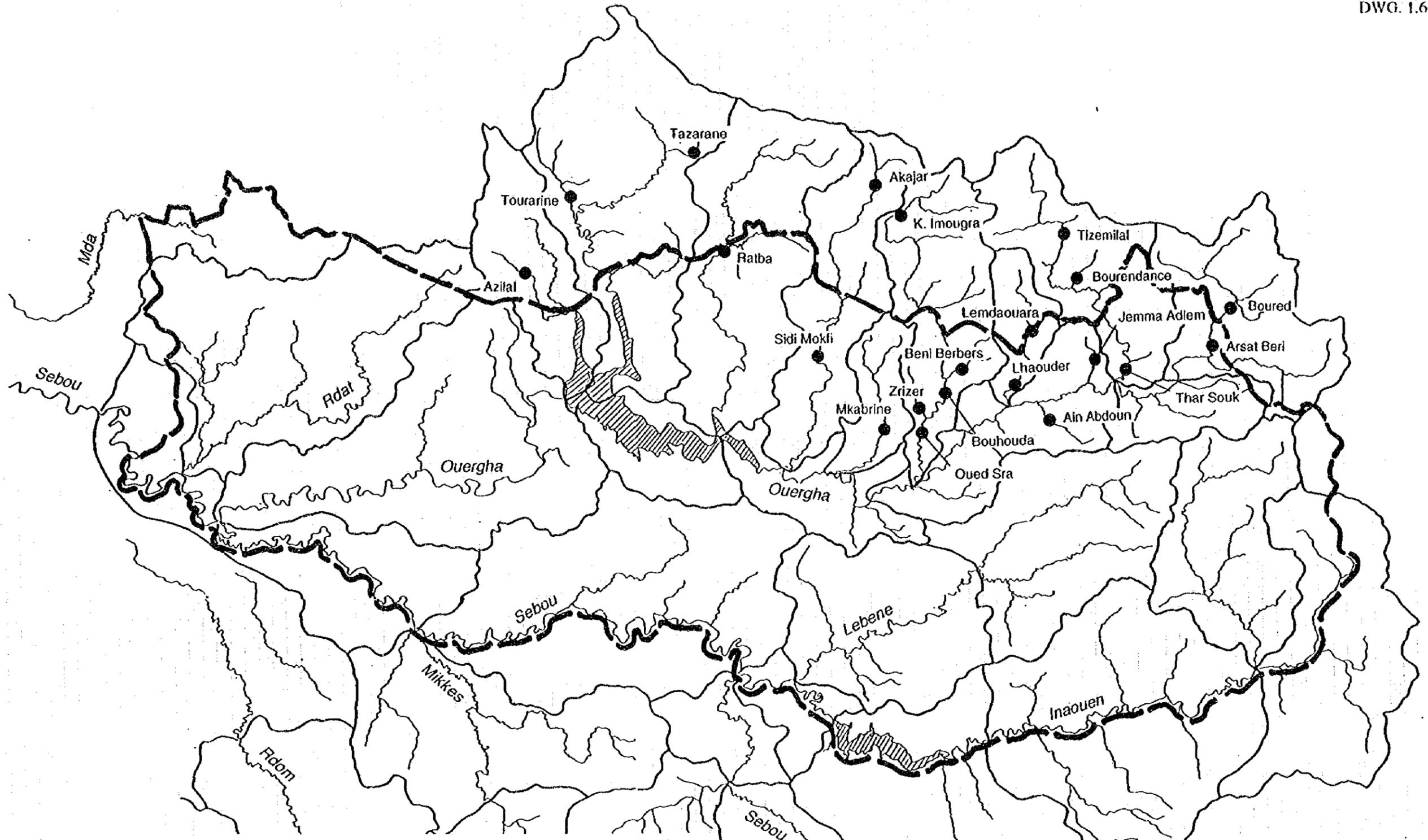
① ⑤ ⑮ ⑰

Existing

8* 14*

Under Construction

Drawing 1.5 Location of Dams Proposed by the SBO Master Plan

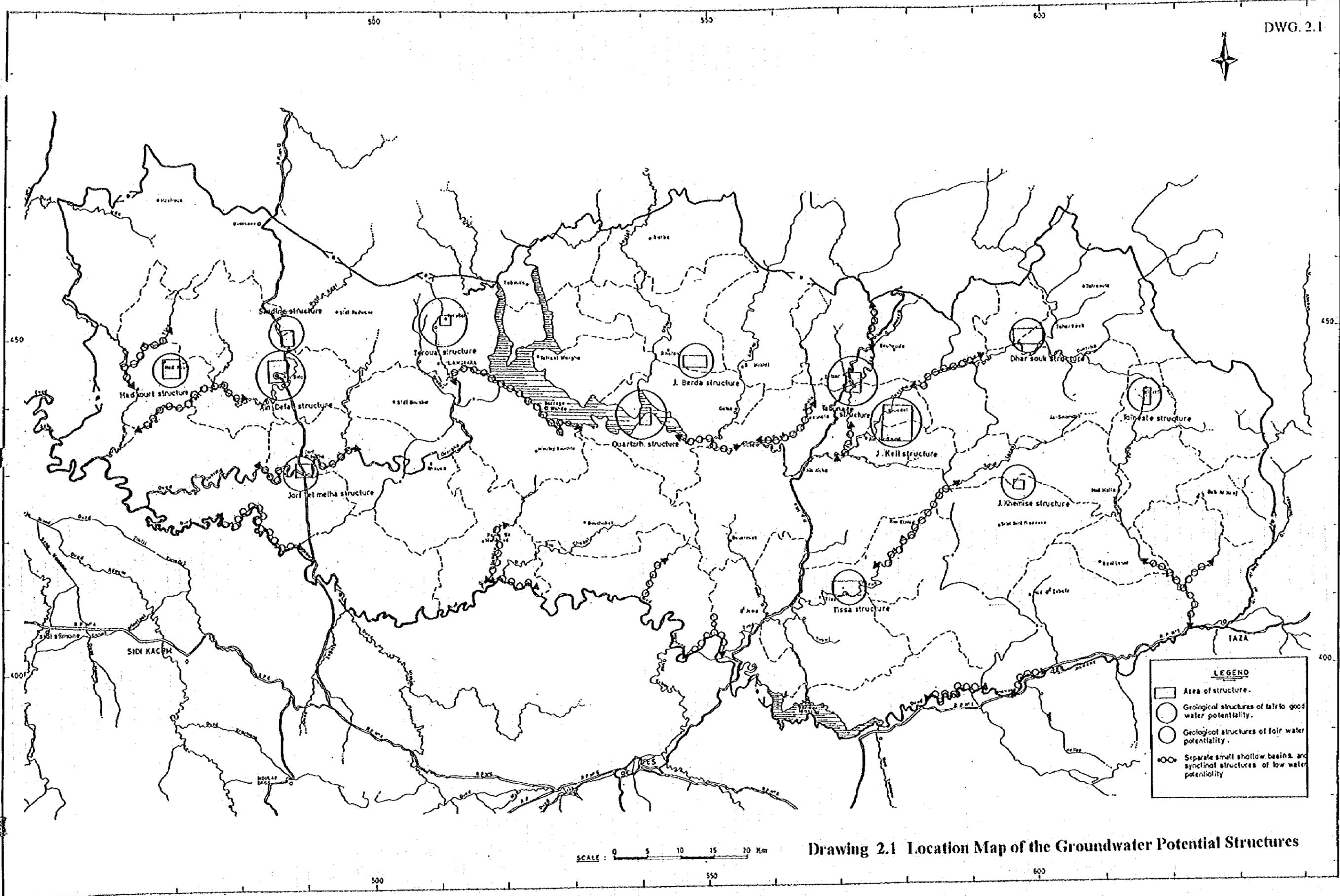


LEGEND

	Boundary of Study Area		Dam Site
	Boundary of Sub-basin		Reservoir Area
	River		

Source : AH

Drawing 1.6 Location of Medium Scale Dam Sites



Drawing 2.1 Location Map of the Groundwater Potential Structures

SCALE : 0 5 10 15 20 Km

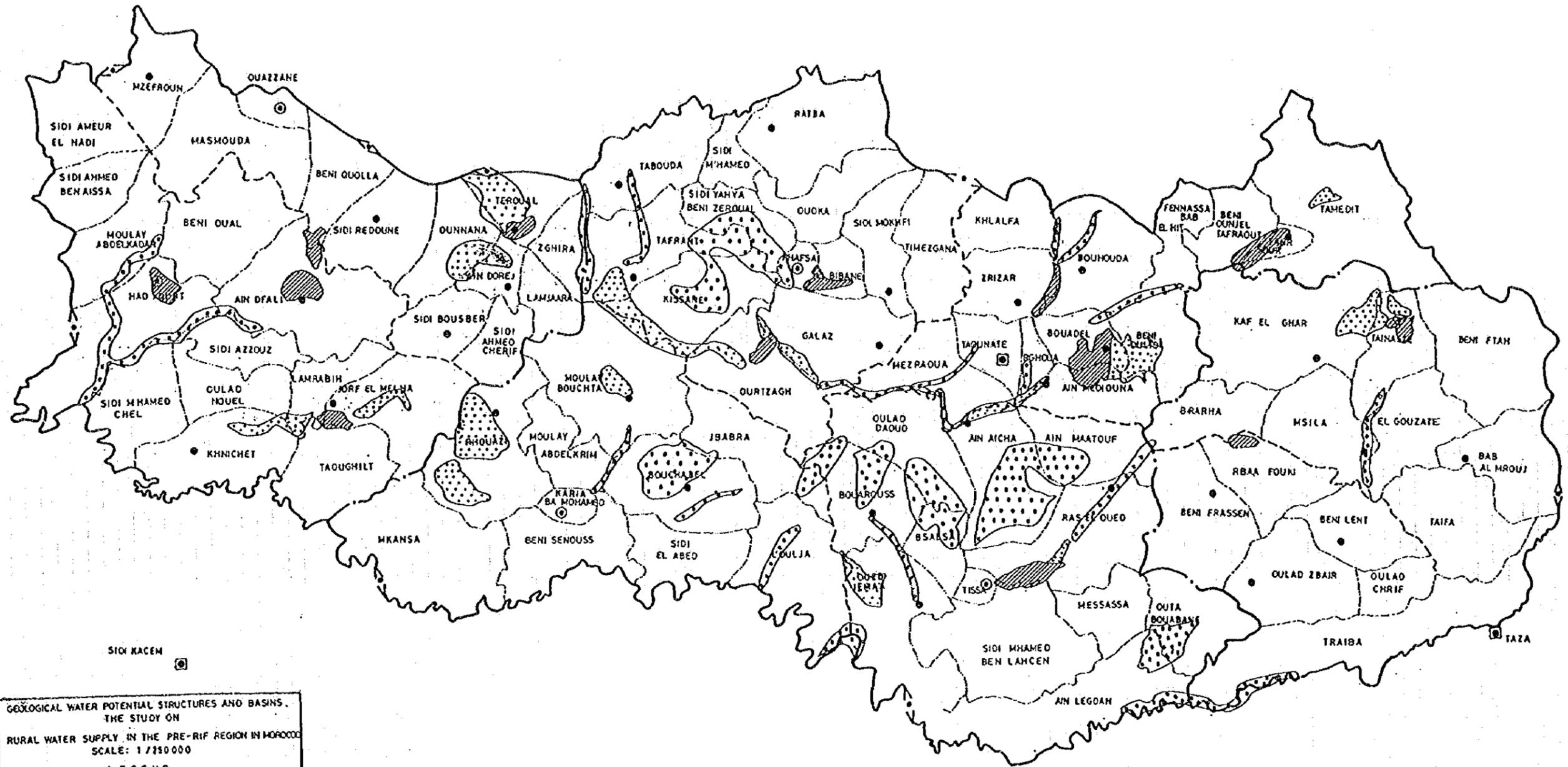


LEGEND

- BOUNDARY OF THE STUDY AREA.
- - - BOUNDARY OF PROVINCE.
- - - BOUNDARY OF CIRCLE.
- - - BOUNDARY OF COMMUNE
- DUGHOLE (Total n° 355)
- ▲ SPRING (Total n° 523)

SCALE : 0 5 10 15 20 Km

Drawing 2.2 Location Map of Existing Dugholes and Springs



GEOLOGICAL WATER POTENTIAL STRUCTURES AND BASINS.
THE STUDY ON
RURAL WATER SUPPLY IN THE PRE-RIF REGION IN MOROCCO
SCALE: 1 / 150 000

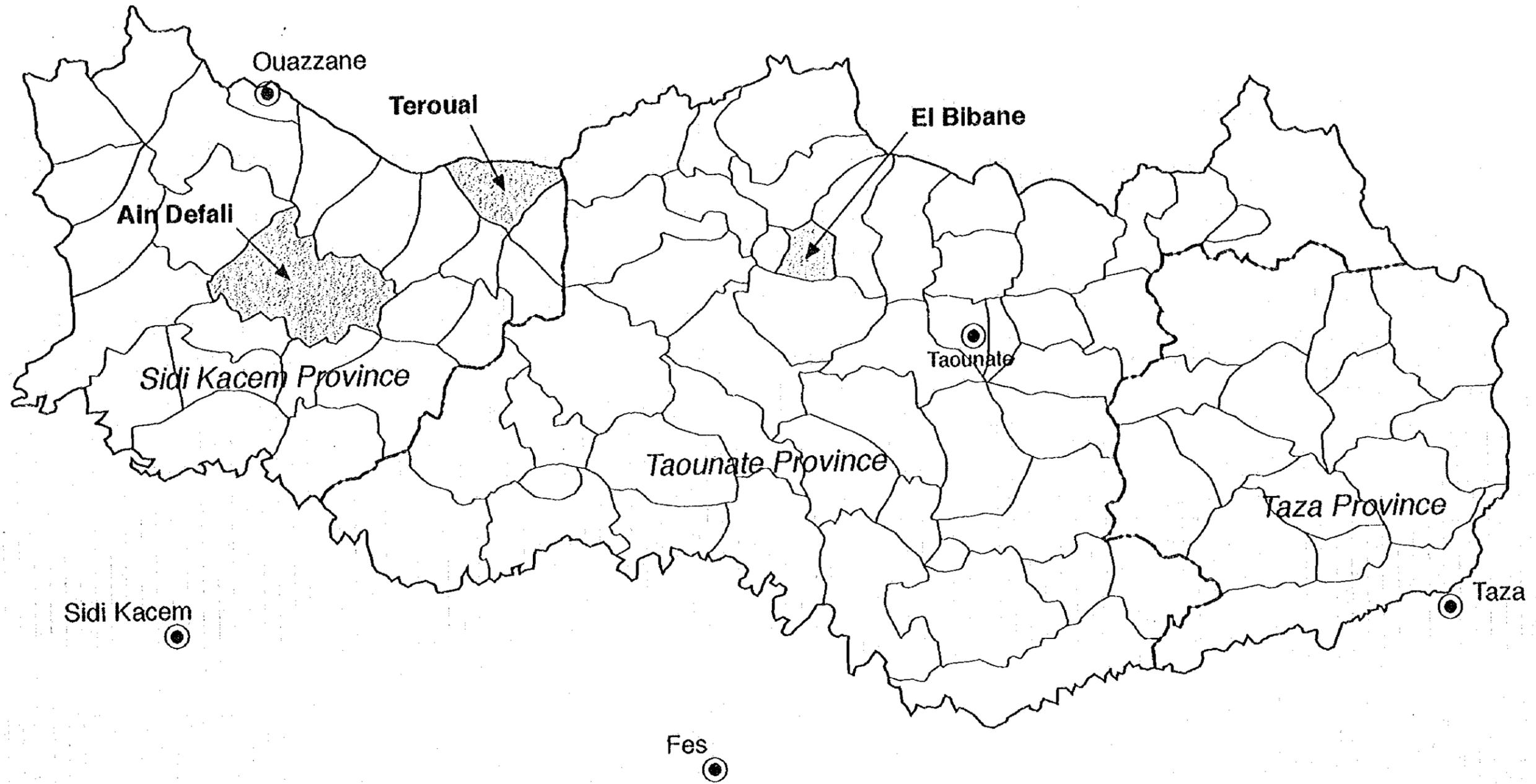
LEGEND

-  Geological structure of fair to good water potentiality.
-  Geological structure of low to fair water potentiality.
-  Shallow small basins and synclinal structure of low water potentiality.

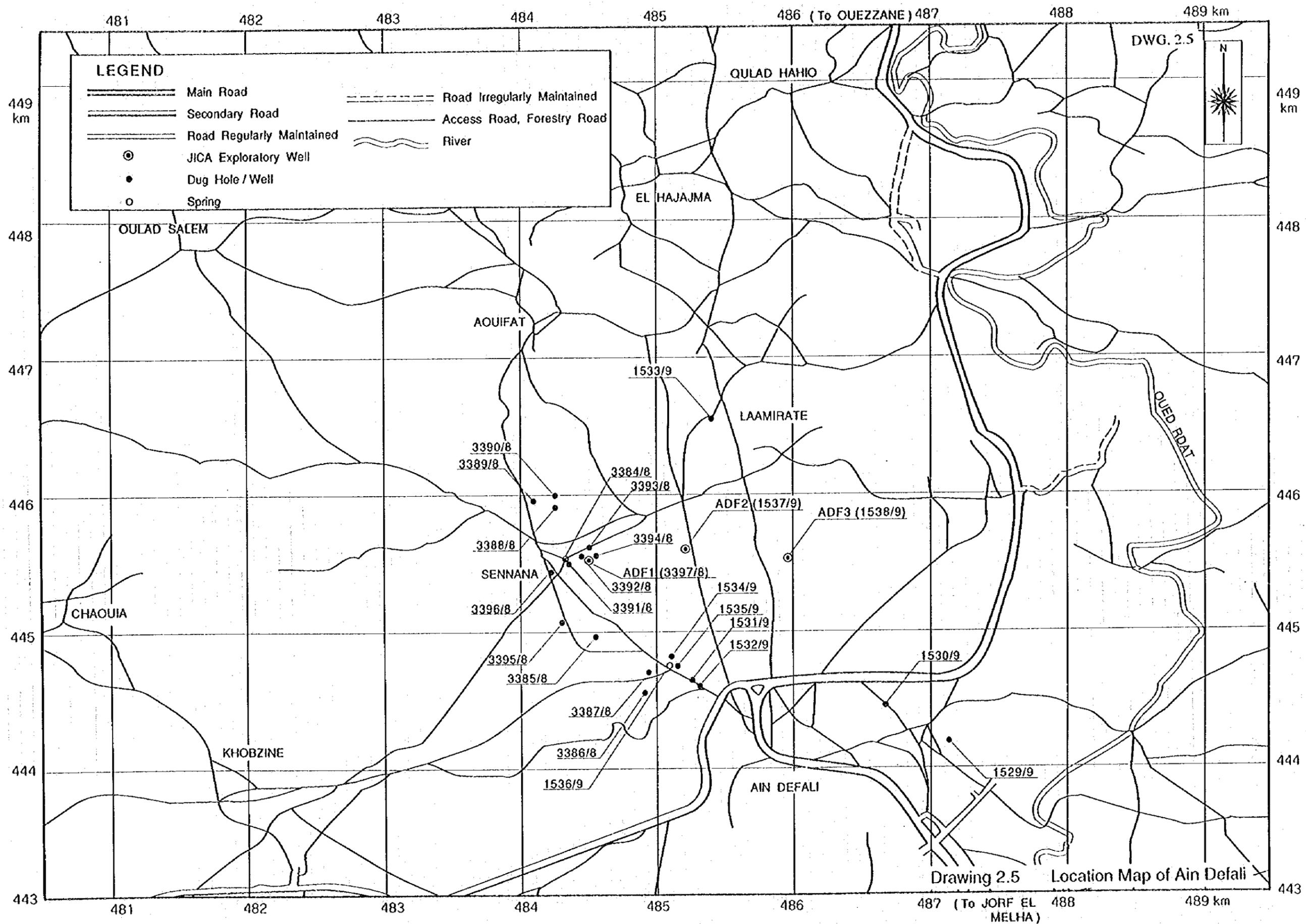
Remaining areas bear separate patches of very low ground water accumulations.

SCALE: 0 5 10 15 20 Km

Drawing 2.3 Location Map of Additional Groundwater Potential Structures



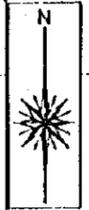
Drawing 2.4 Location of Model Areas



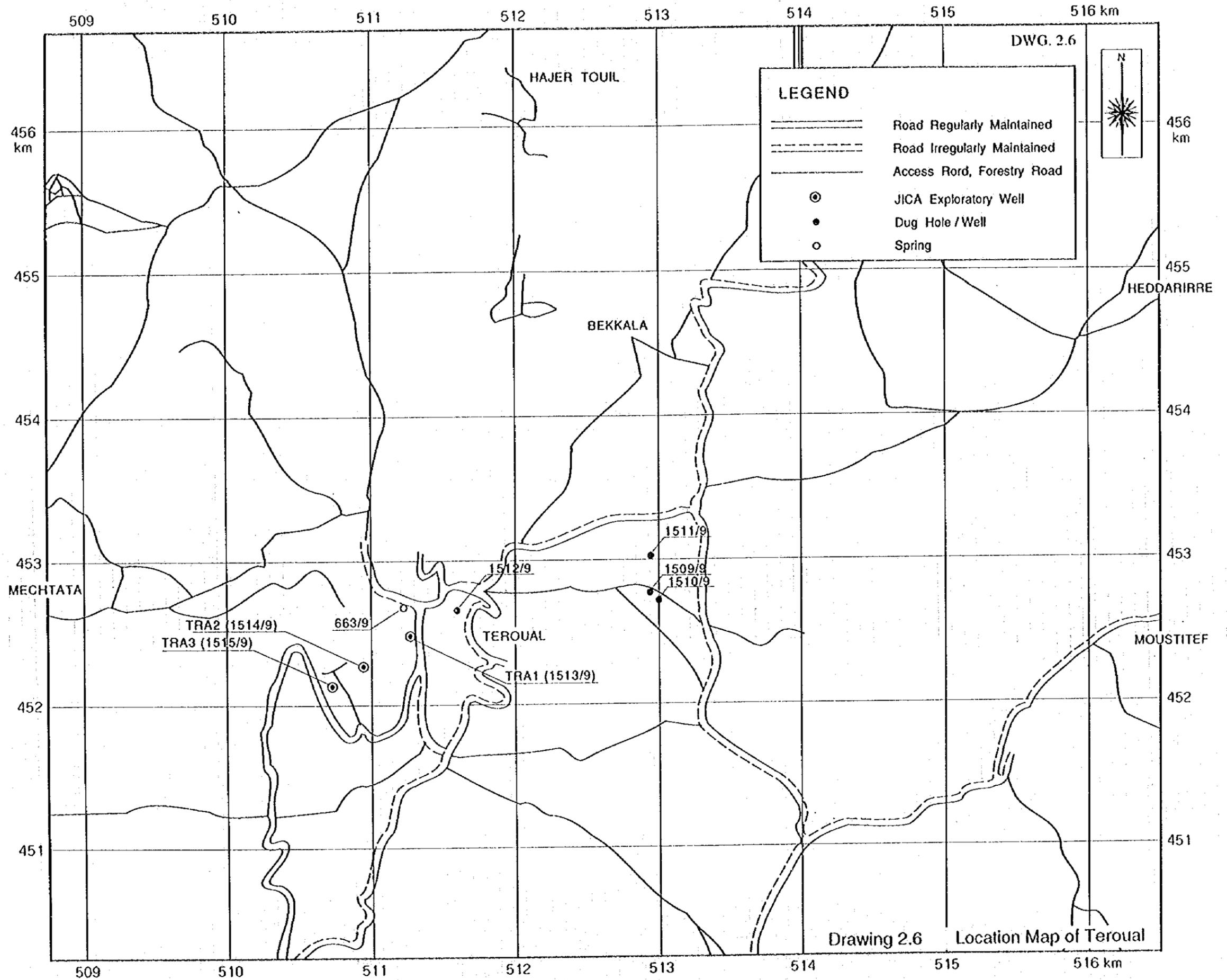
LEGEND

	Main Road		Road Irregularly Maintained
	Secondary Road		Access Road, Forestry Road
	Road Regularly Maintained		River
	JICA Exploratory Well		
	Dug Hole / Well		
	Spring		

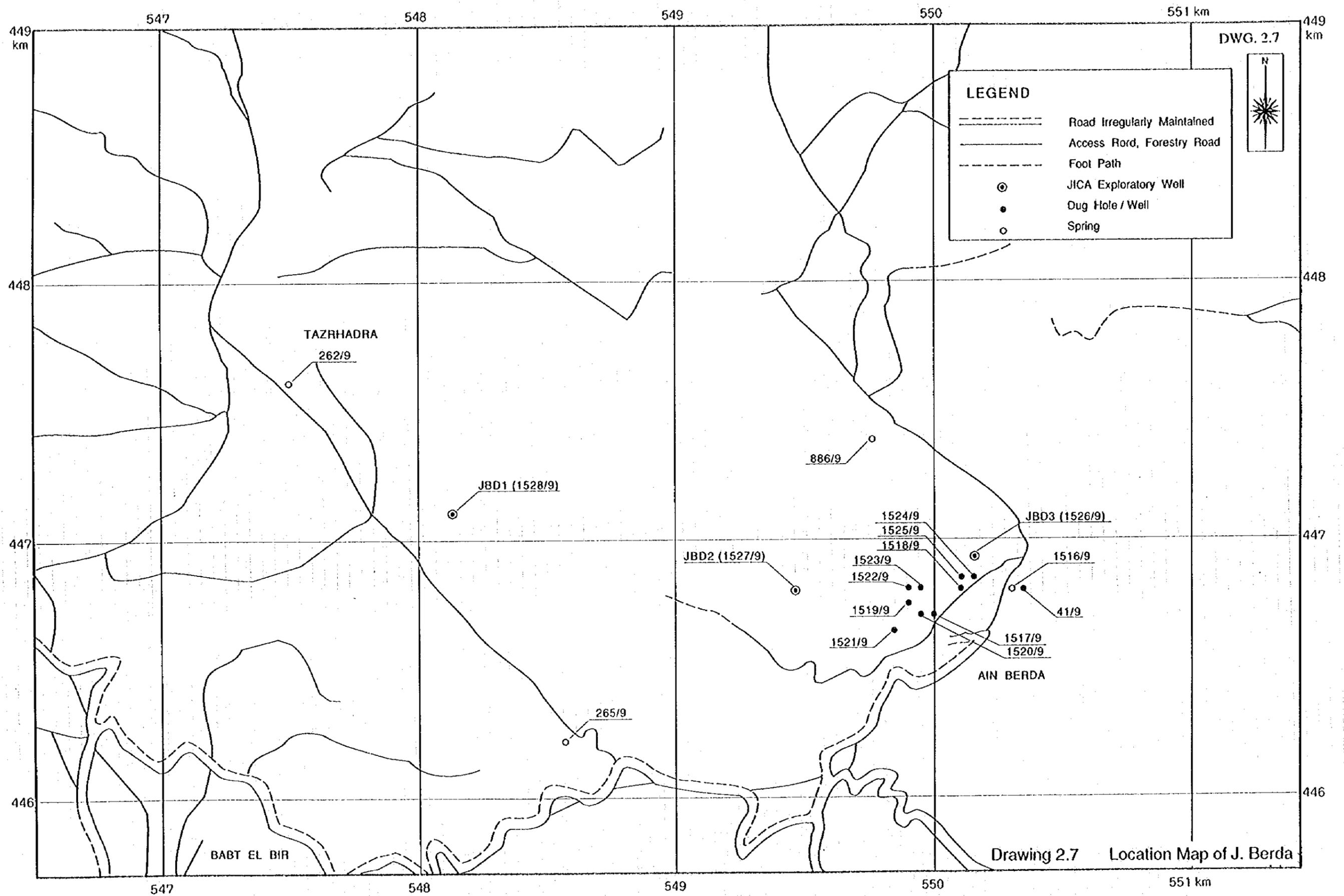
DWG. 2.5



Drawing 2.5 Location Map of Ain Defali
 (To JORF EL MELHA)

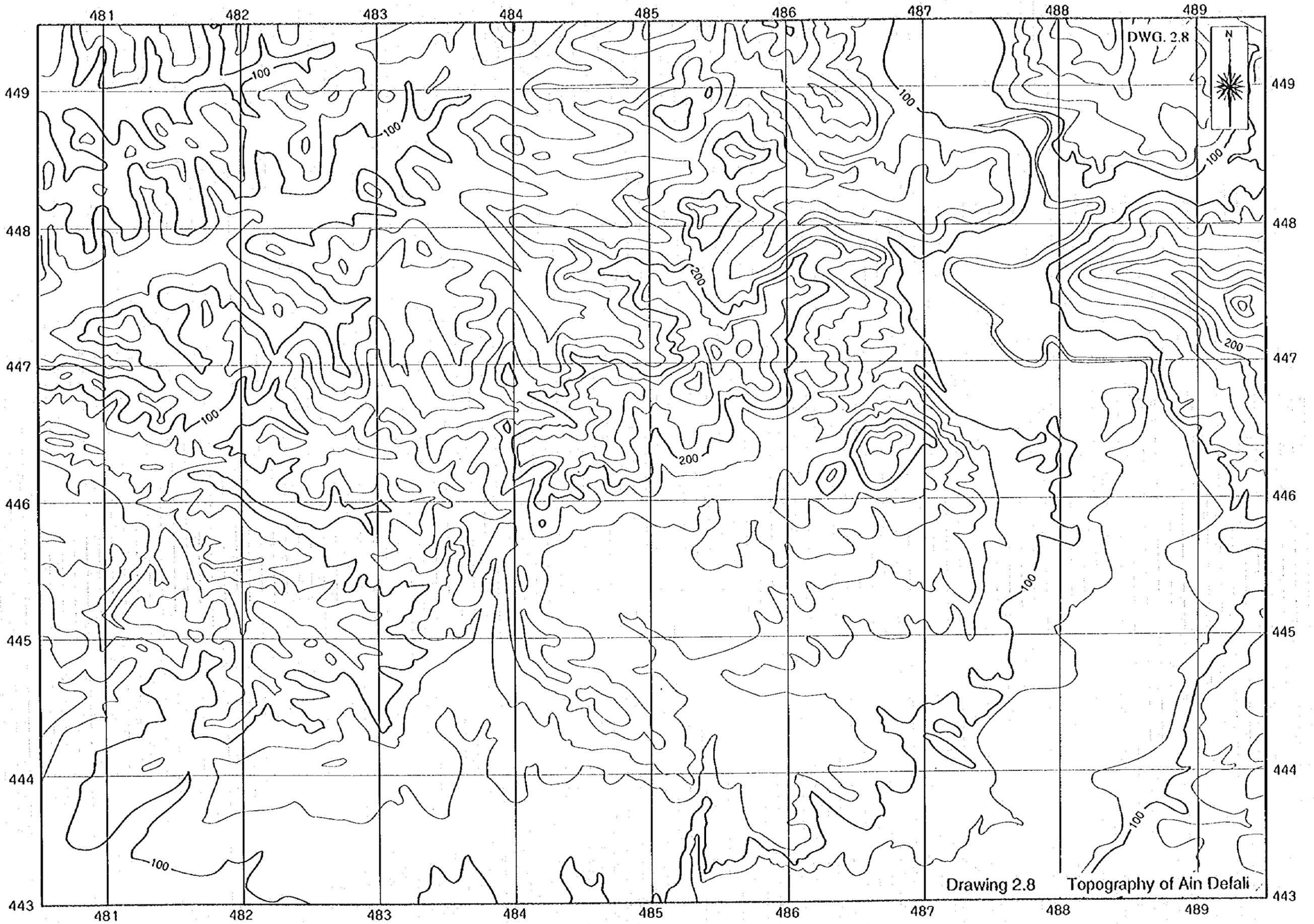


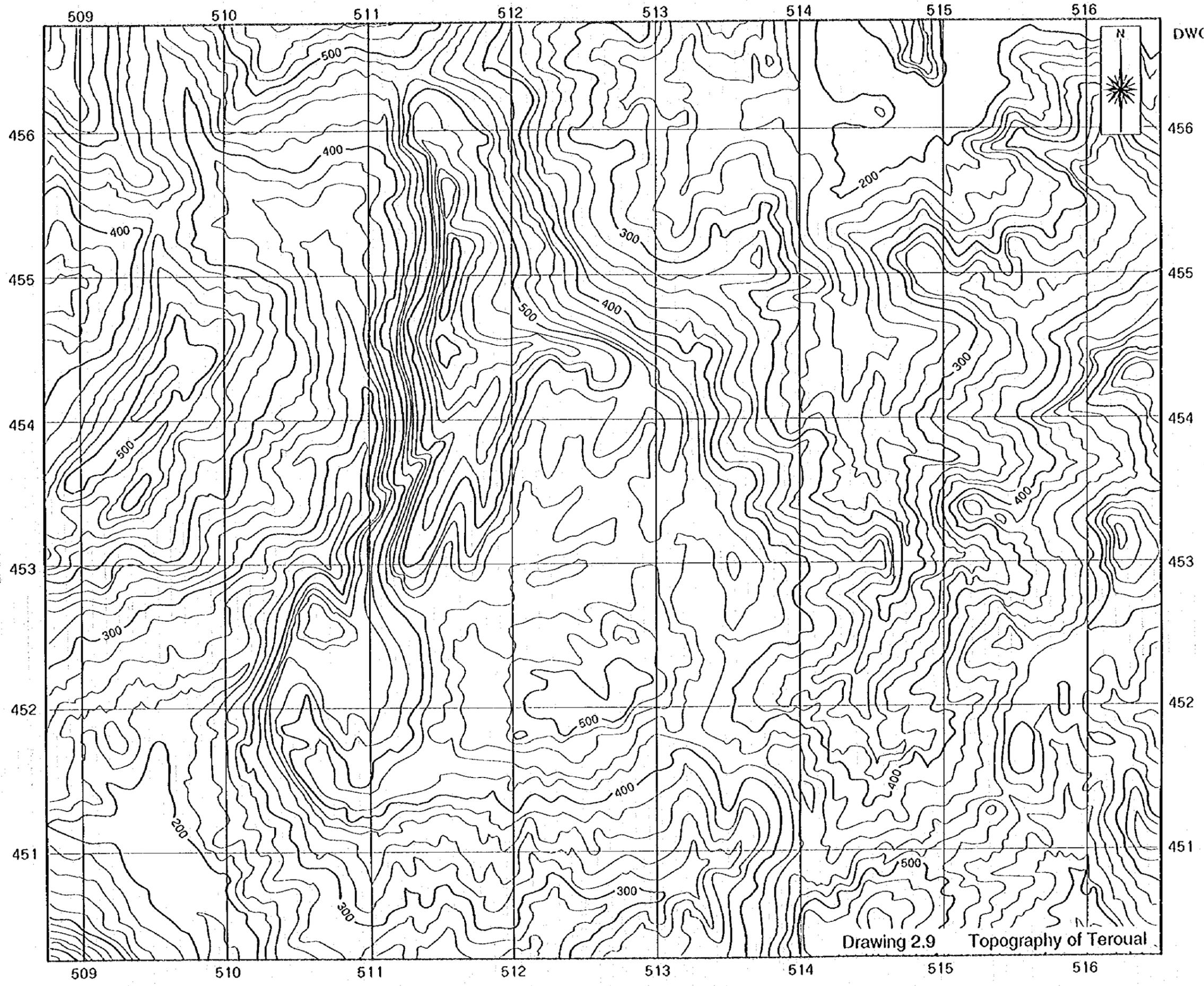
Drawing 2.6 Location Map of Teroual



Drawing 2.7 Location Map of J. Berda

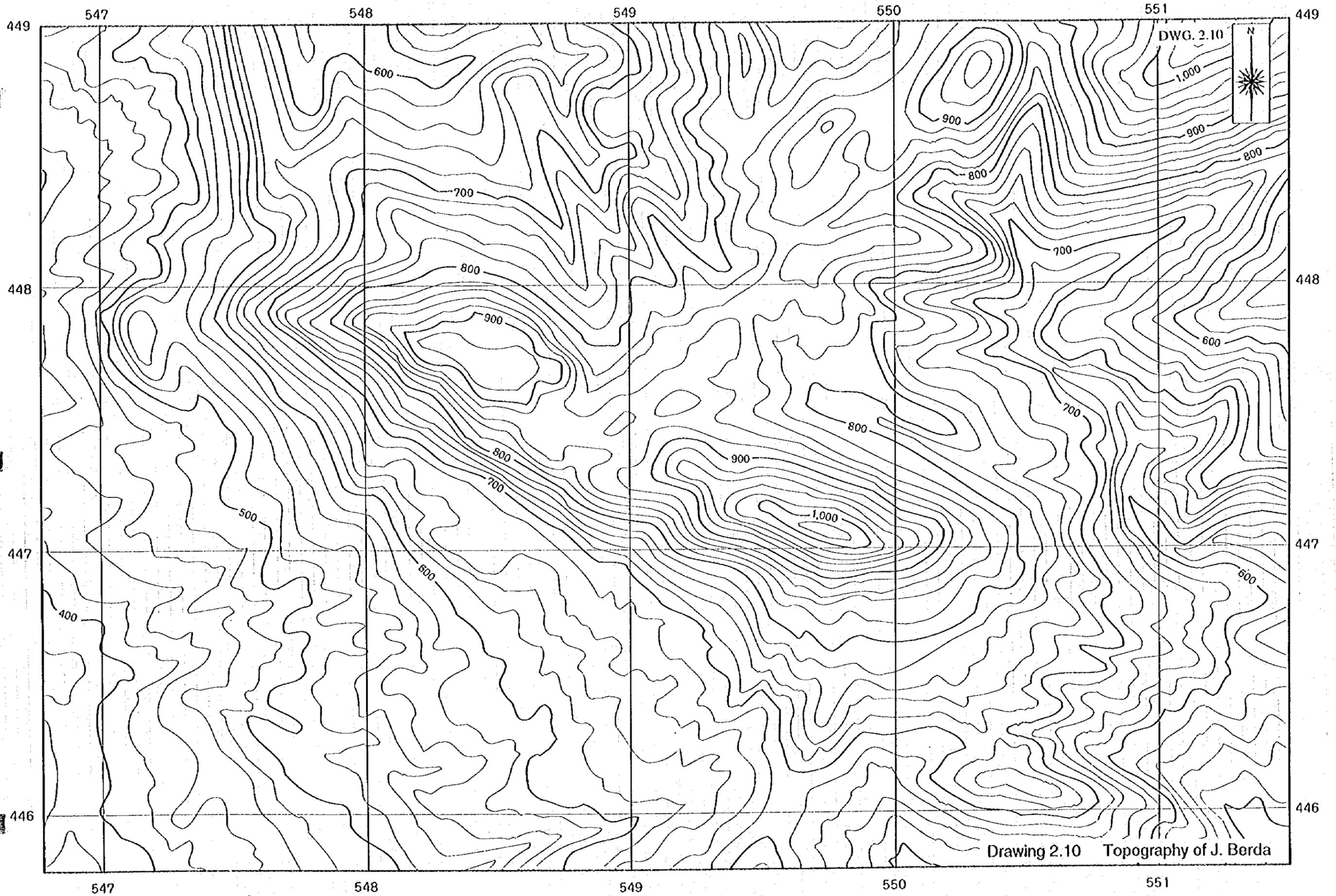
DWG. 2.7



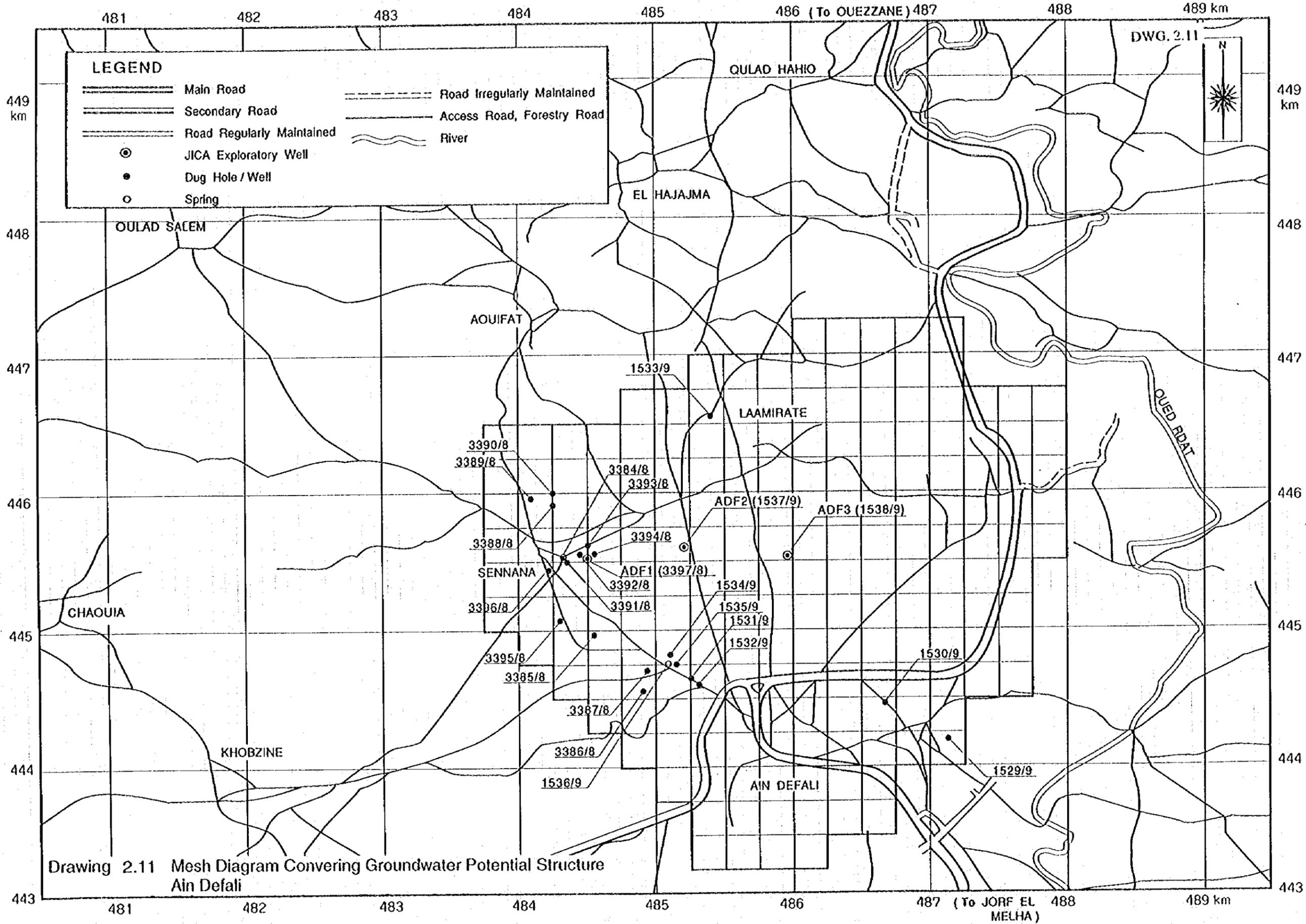


DWG. 2.9

Drawing 2.9 Topography of Teroual



Drawing 2.10 Topography of J. Berda



Drawing 2.11 Mesh Diagram Covering Groundwater Potential Structure
Ain Defali

DWG. 2.11



449 km
448
447
446
445
444
443

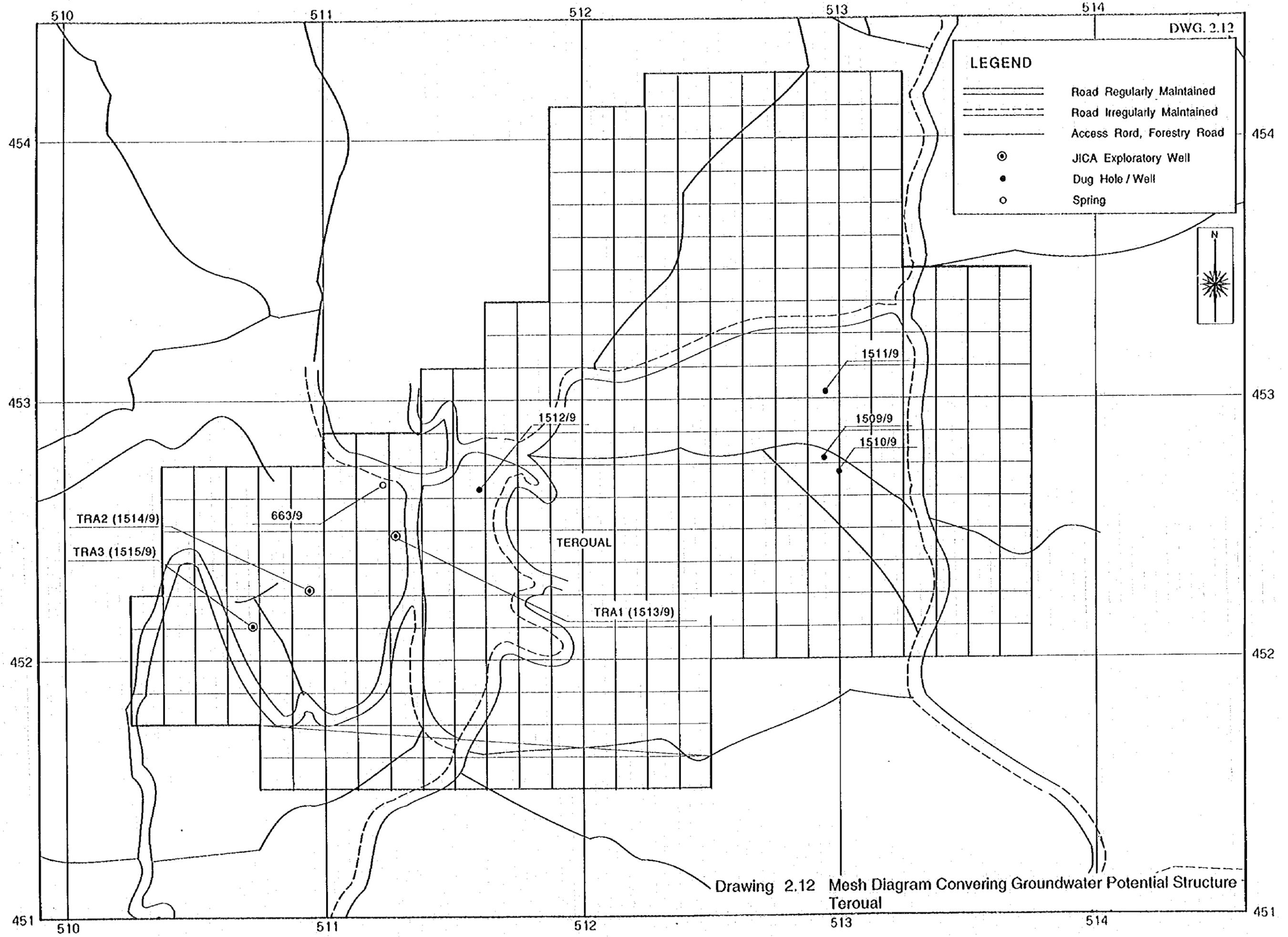
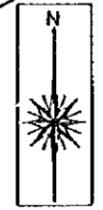
449 km
448
447
446
445
444
443

481 482 483 484 485 486 (To OUEZZANE) 487 488 489 km

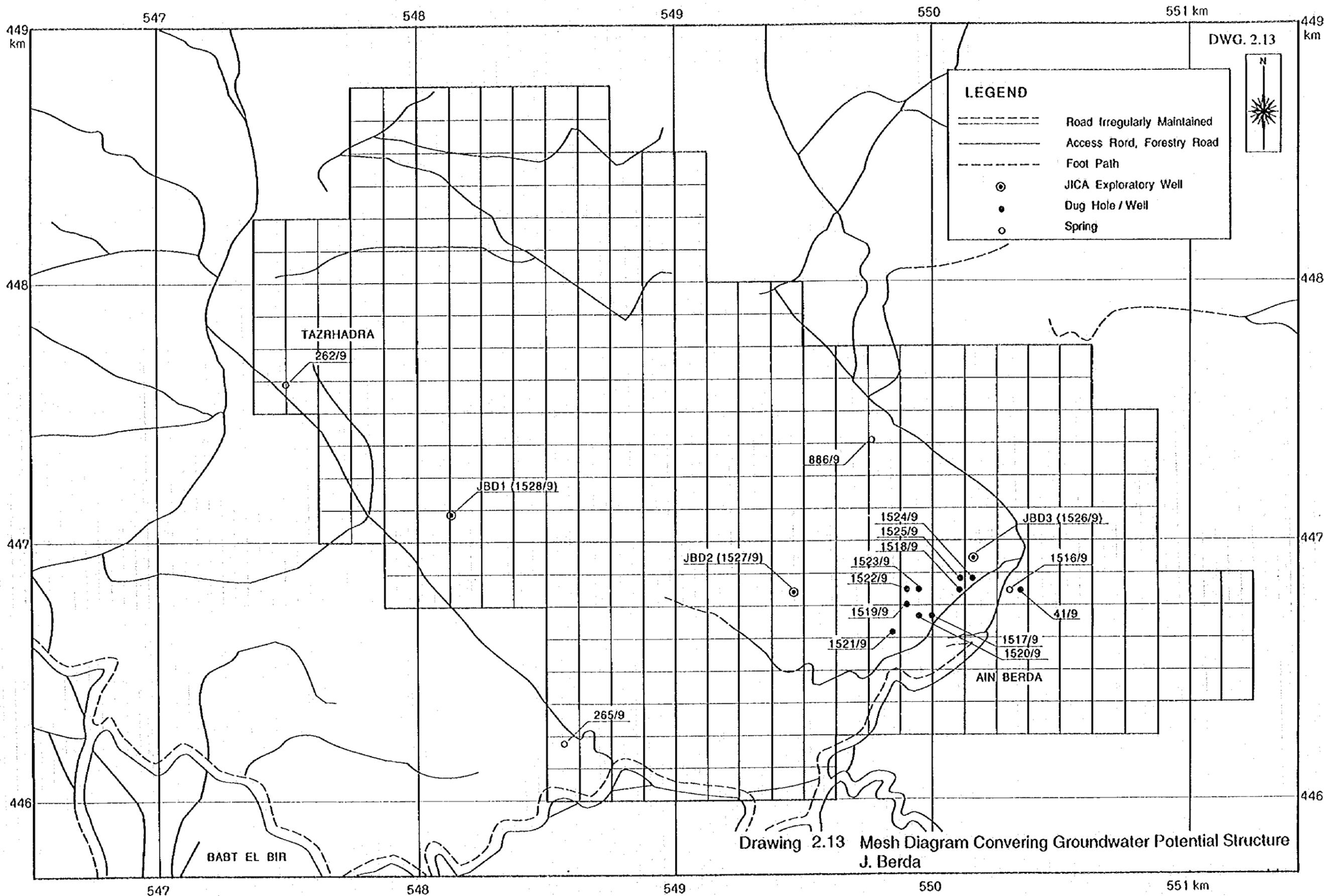
481 482 483 484 485 486 487 (To JORF EL MELHA) 488 489 km

LEGEND

- ==== Road Regularly Maintained
- - - - Road Irregularly Maintained
- _____ Access Road, Forestry Road
- ⊙ JICA Exploratory Well
- Dug Hole / Well
- Spring



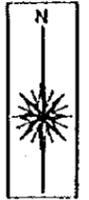
Drawing 2.12 Mesh Diagram Covering Groundwater Potential Structure Teroual



DWG. 2.13

LEGEND

- Road Irregularly Maintained
- Access Road, Forestry Road
- - - Foot Path
- ⊙ JICA Exploratory Well
- Dug Hole / Well
- Spring



TAZRHADRA

262/9

JBD1 (1528/9)

JBD2 (1527/9)

886/9

1524/9

1525/9

1518/9

1523/9

1522/9

1519/9

1521/9

JBD3 (1526/9)

1516/9

41/9

1517/9

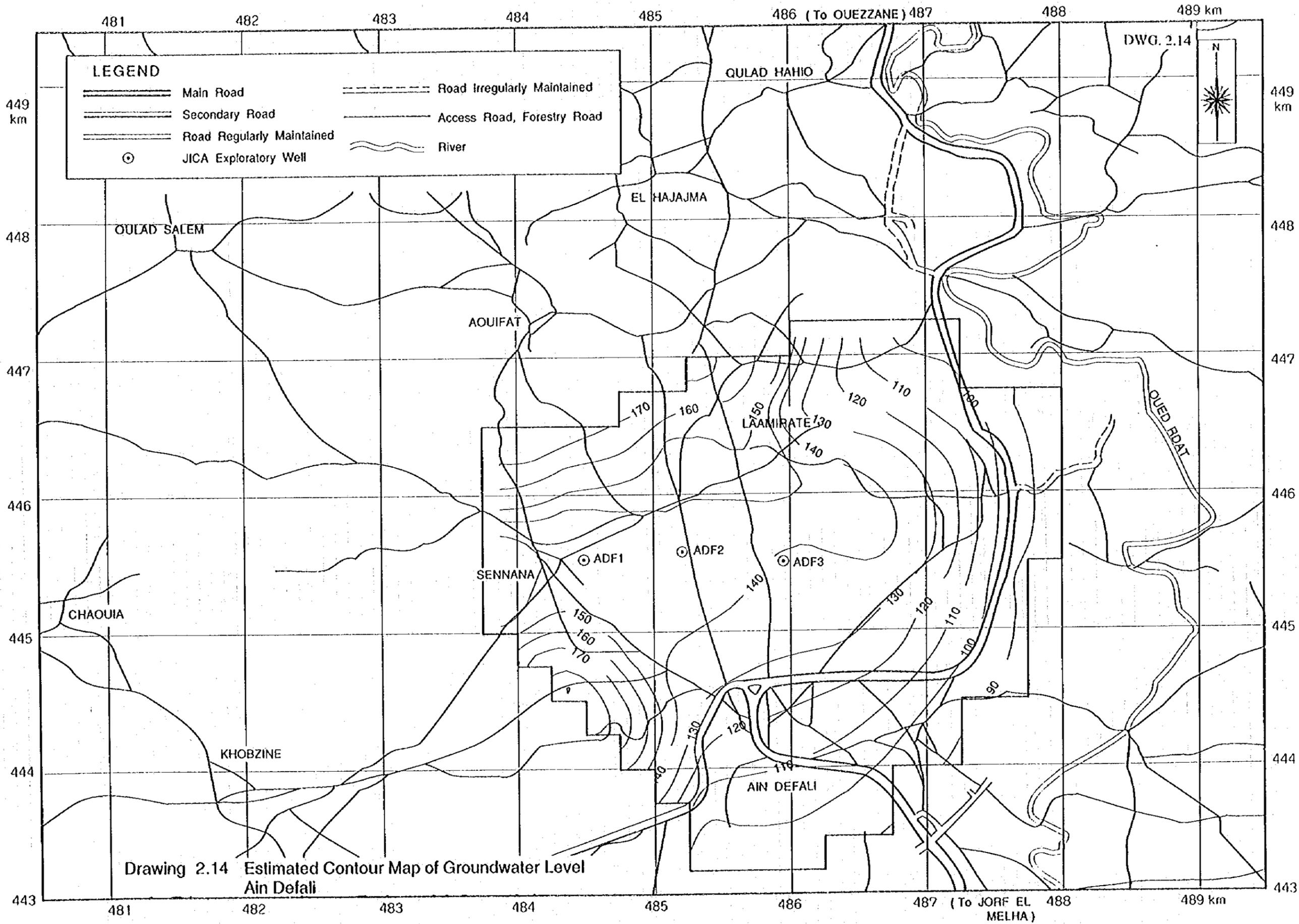
1520/9

AIN BERDA

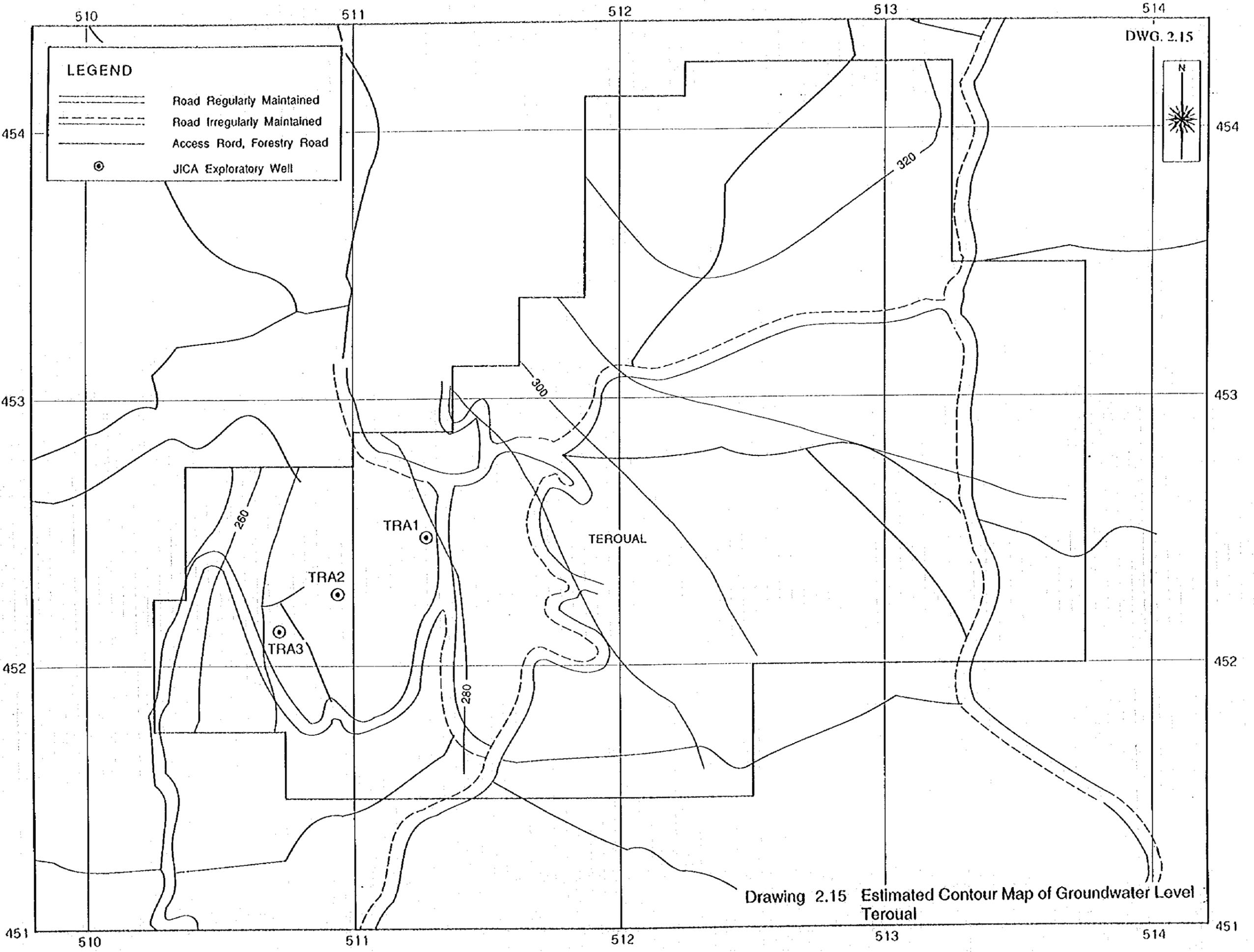
265/9

BABT EL BIR

Drawing 2.13 Mesh Diagram Covering Groundwater Potential Structure J. Berda

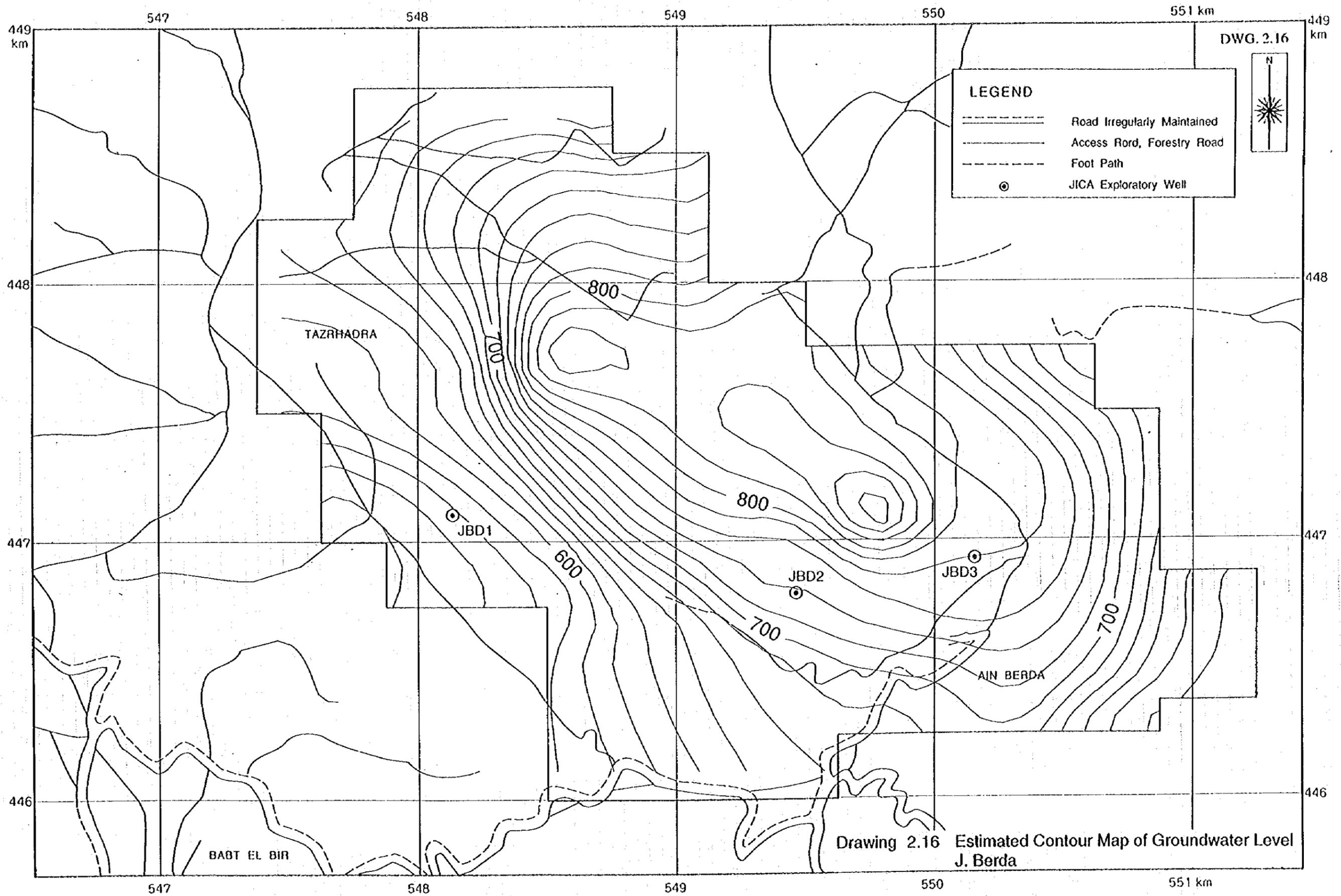


Drawing 2.14 Estimated Contour Map of Groundwater Level
Ain Defali

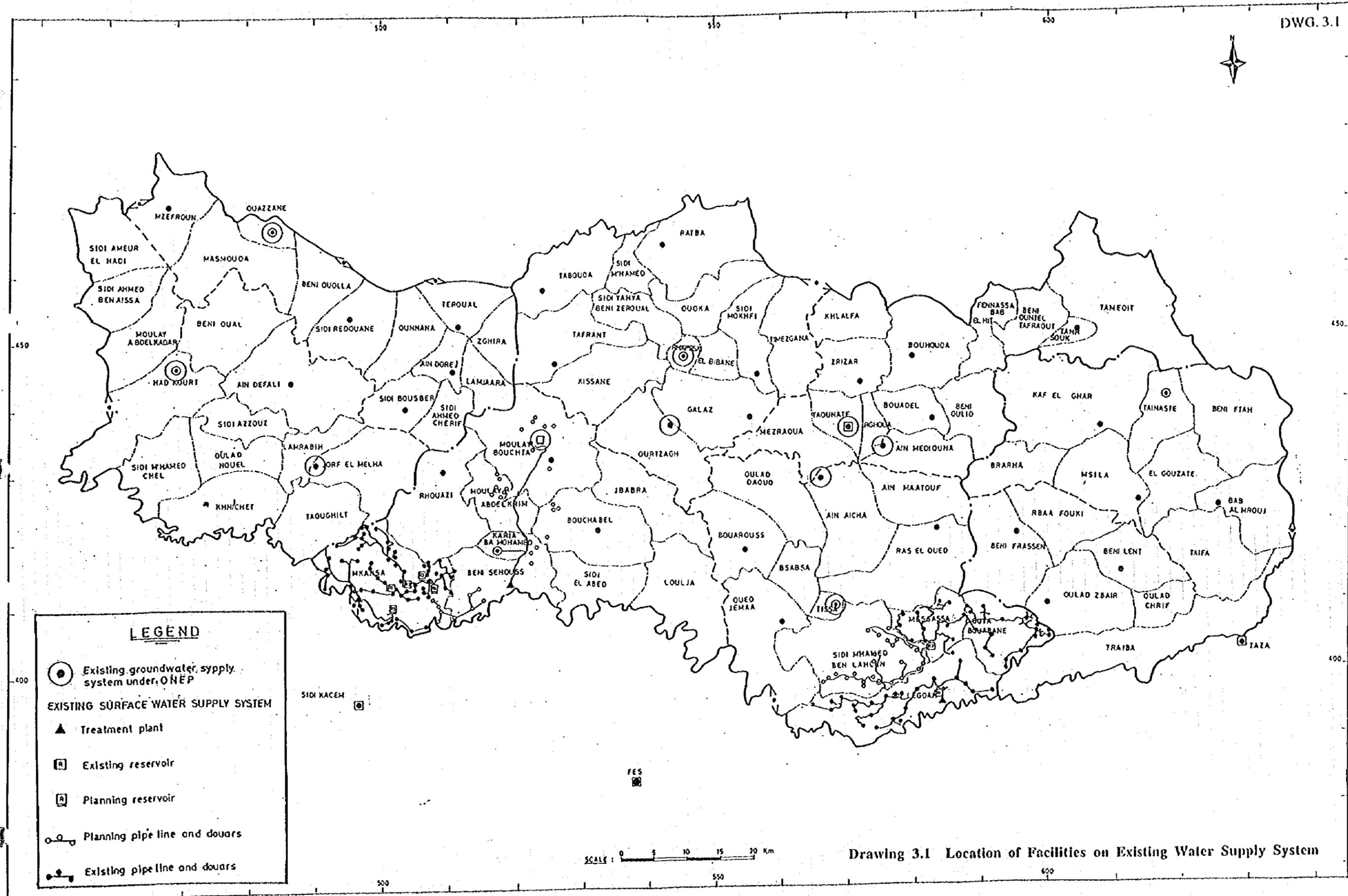


Drawing 2.15 Estimated Contour Map of Groundwater Level Teroual

DWG. 2.15

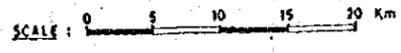


Drawing 2.16 Estimated Contour Map of Groundwater Level J. Berda



LEGEND

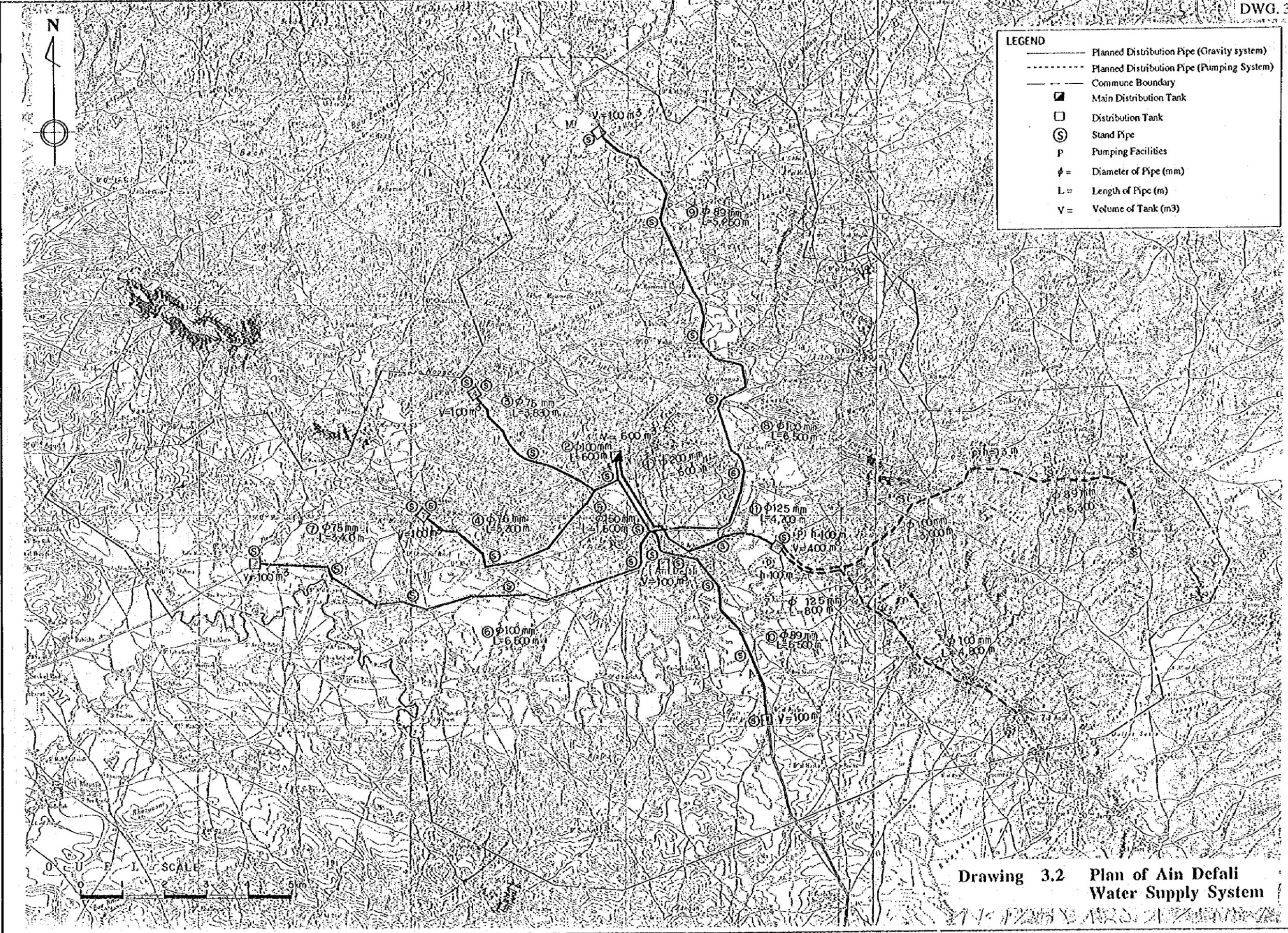
- ⊙ Existing groundwater supply system under ONEP
- EXISTING SURFACE WATER SUPPLY SYSTEM**
- ▲ Treatment plant
- ◻ Existing reservoir
- ◻ Planning reservoir
- Planning pipe line and douars
- Existing pipeline and douars



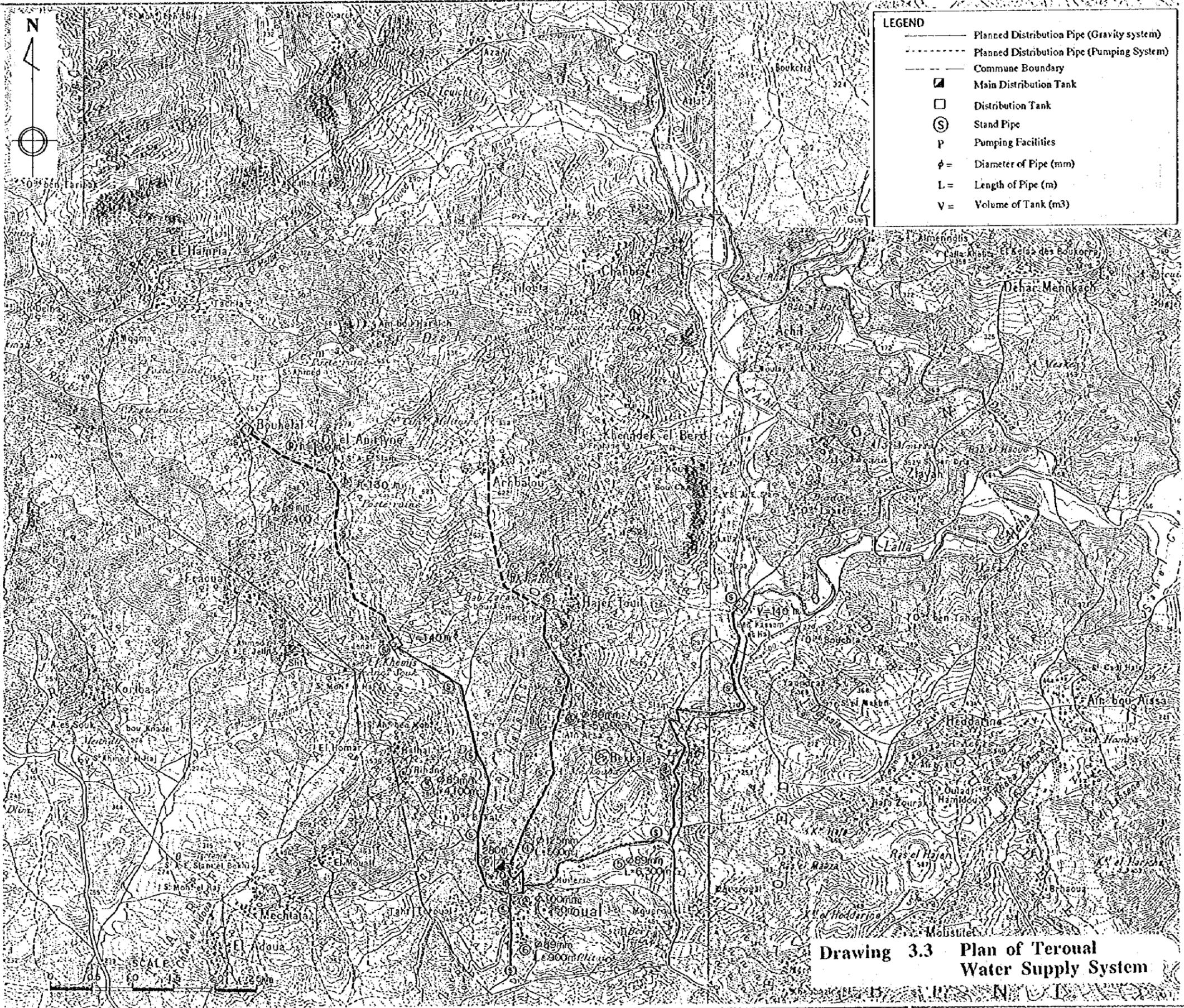
Drawing 3.1 Location of Facilities on Existing Water Supply System

LEGEND

- Planned Distribution Pipe (Gravity system)
- - - - - Planned Distribution Pipe (Pumping System)
- Commune Boundary
- Main Distribution Tank
- Distribution Tank
- ⊙ Stand Pipe
- P Pumping Facilities
- φ = Diameter of Pipe (mm)
- L = Length of Pipe (m)
- V = Volume of Tank (m³)



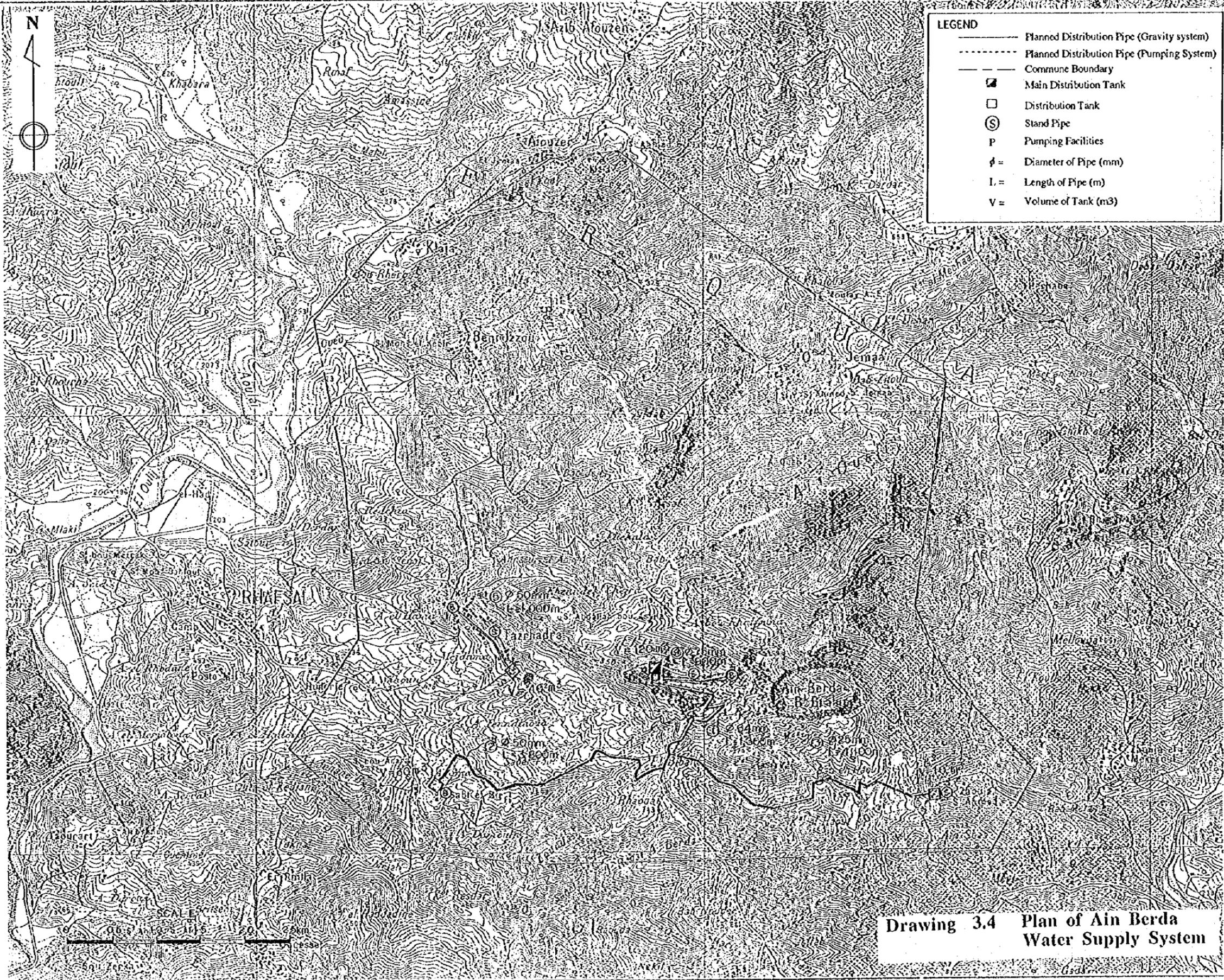
Drawing 3.2 Plan of Ain Defali Water Supply System



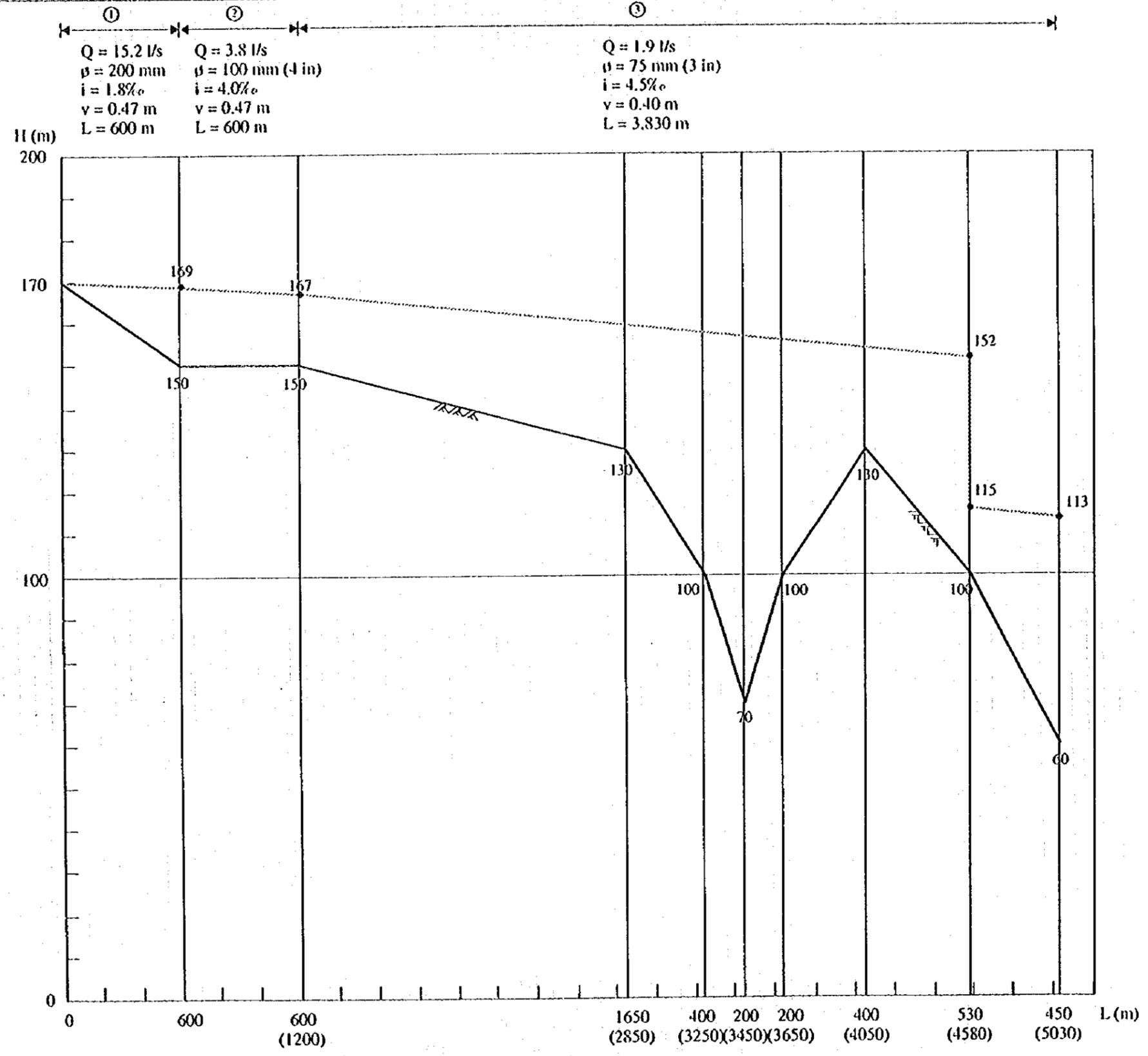
LEGEND

—————	Planned Distribution Pipe (Gravity system)
- - - - -	Planned Distribution Pipe (Pumping System)
- - - - -	Commune Boundary
■	Main Distribution Tank
□	Distribution Tank
⊙	Stand Pipe
P	Pumping Facilities
φ =	Diameter of Pipe (mm)
L =	Length of Pipe (m)
V =	Volume of Tank (m ³)

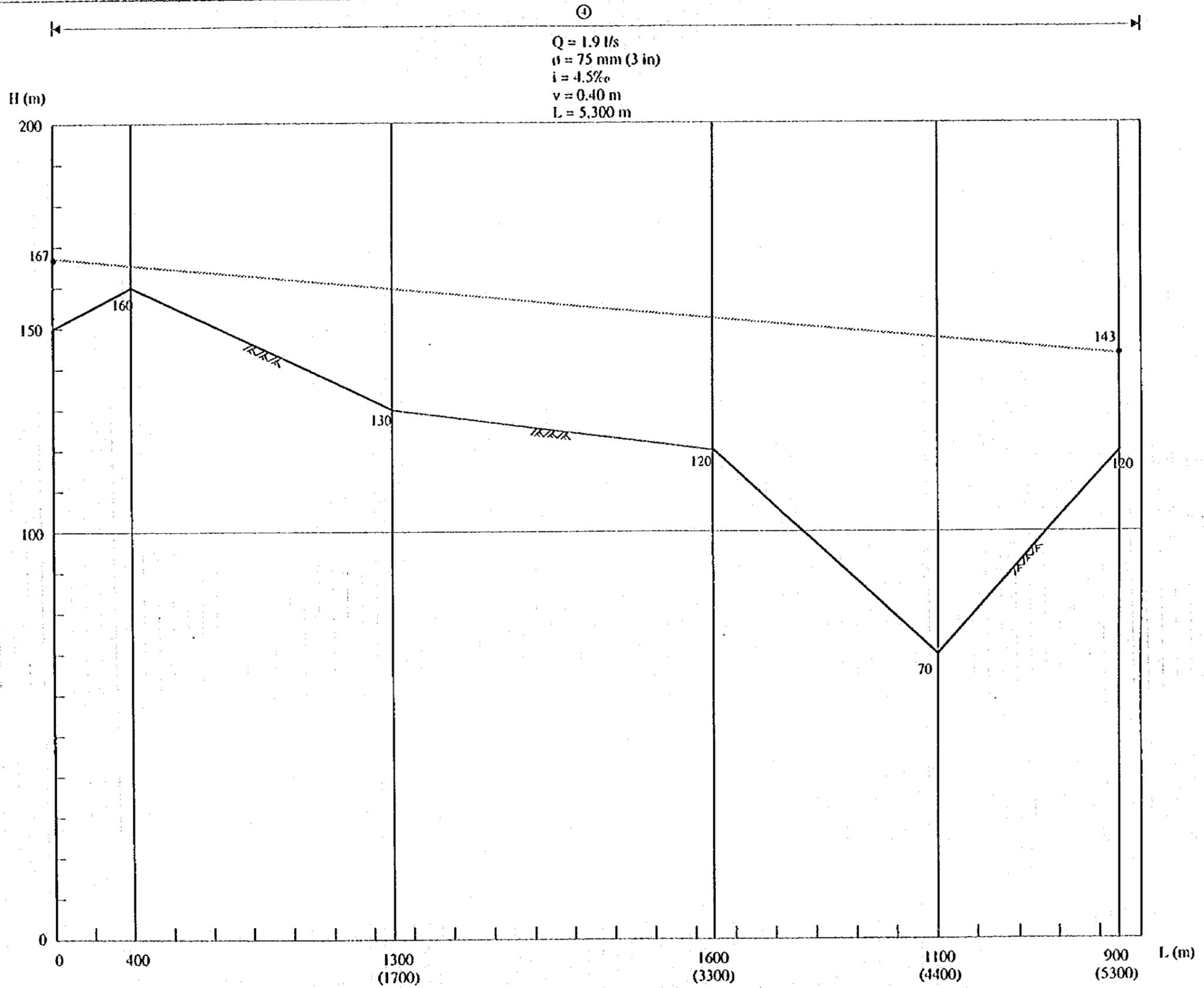
Drawing 3.3 Plan of Teroul Water Supply System



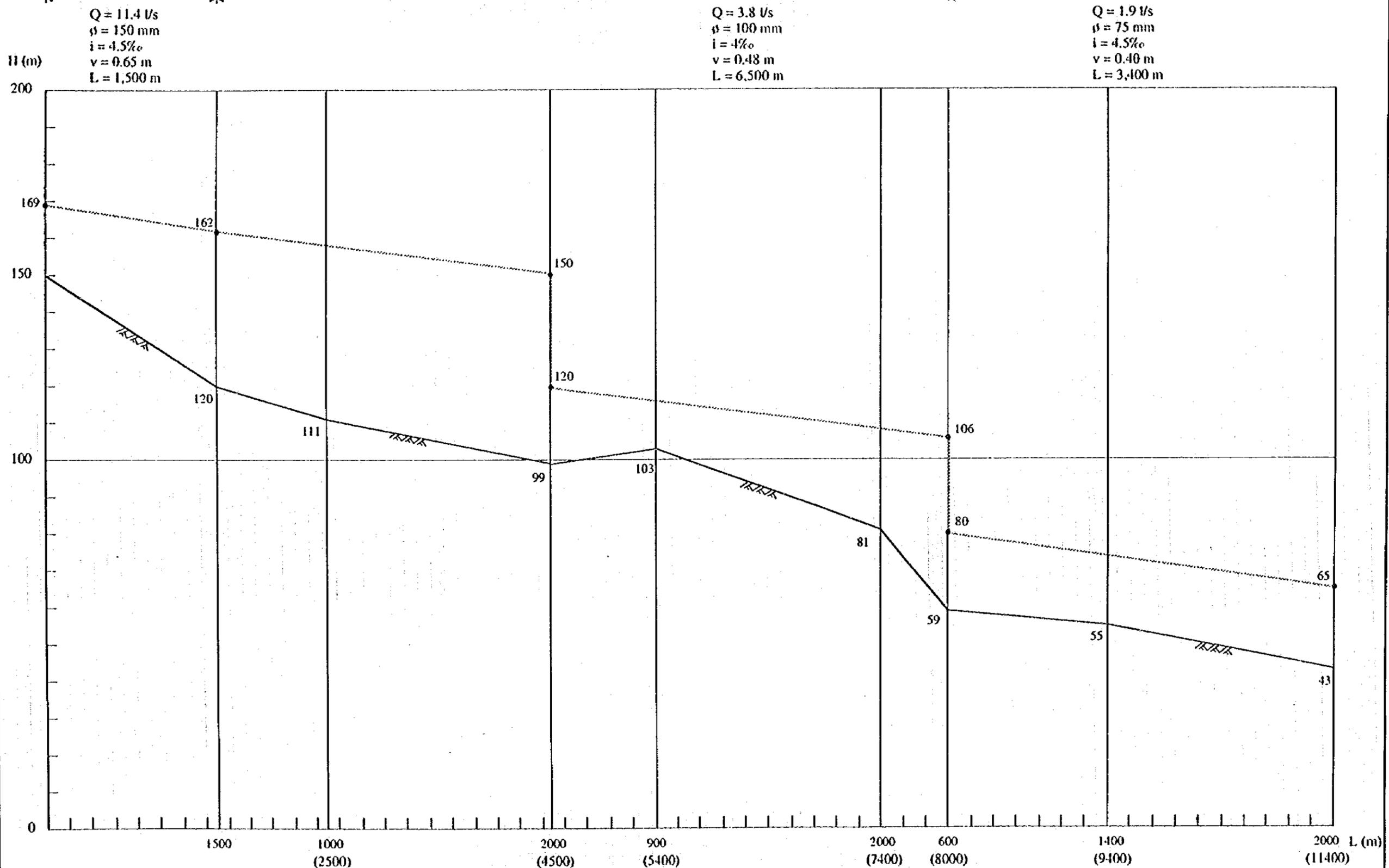
Drawing 3.4 Plan of Ain Berda Water Supply System



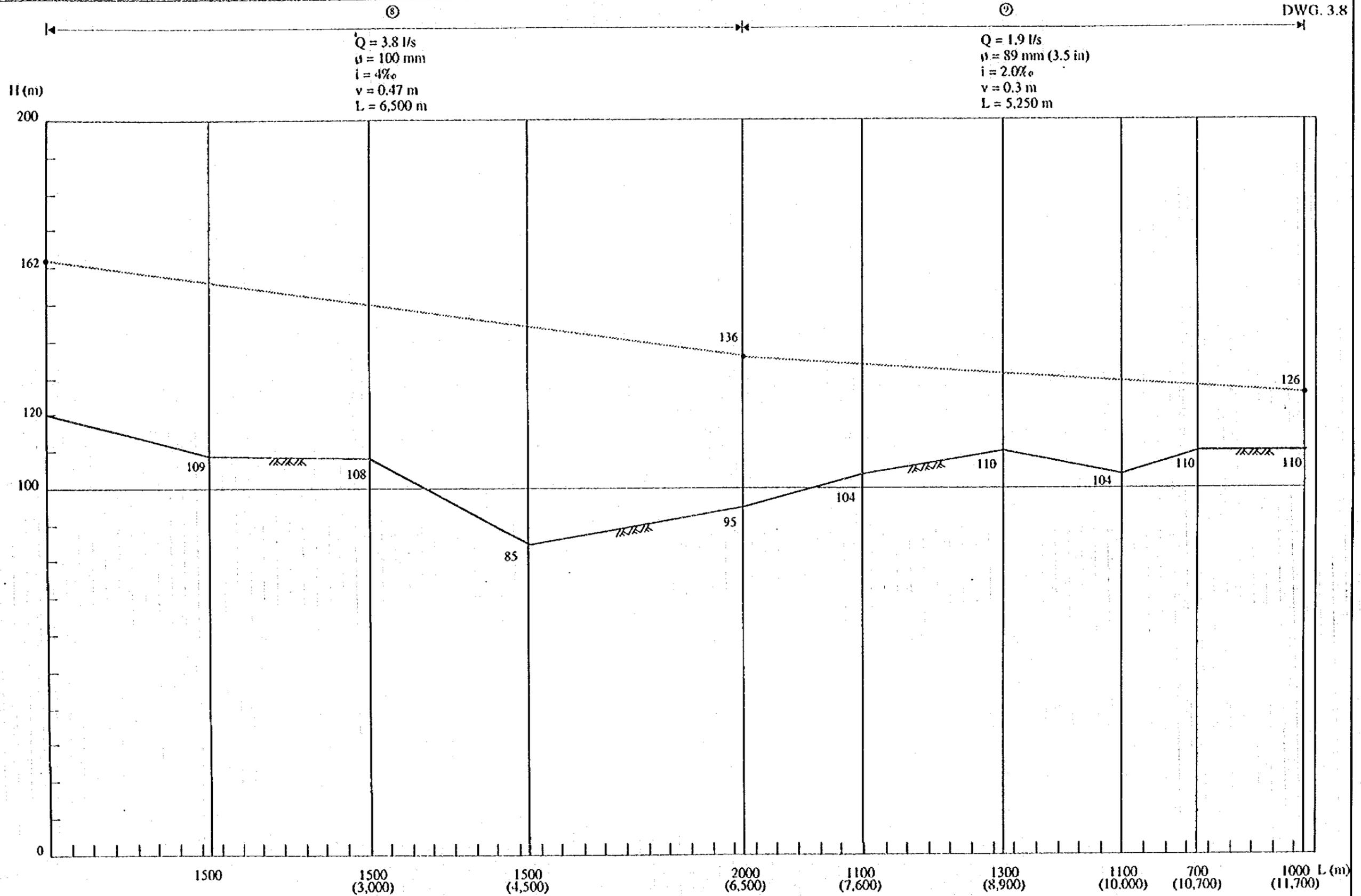
Drawing 3.5 Hydraulic Profile (Ain Defali) (1/6)



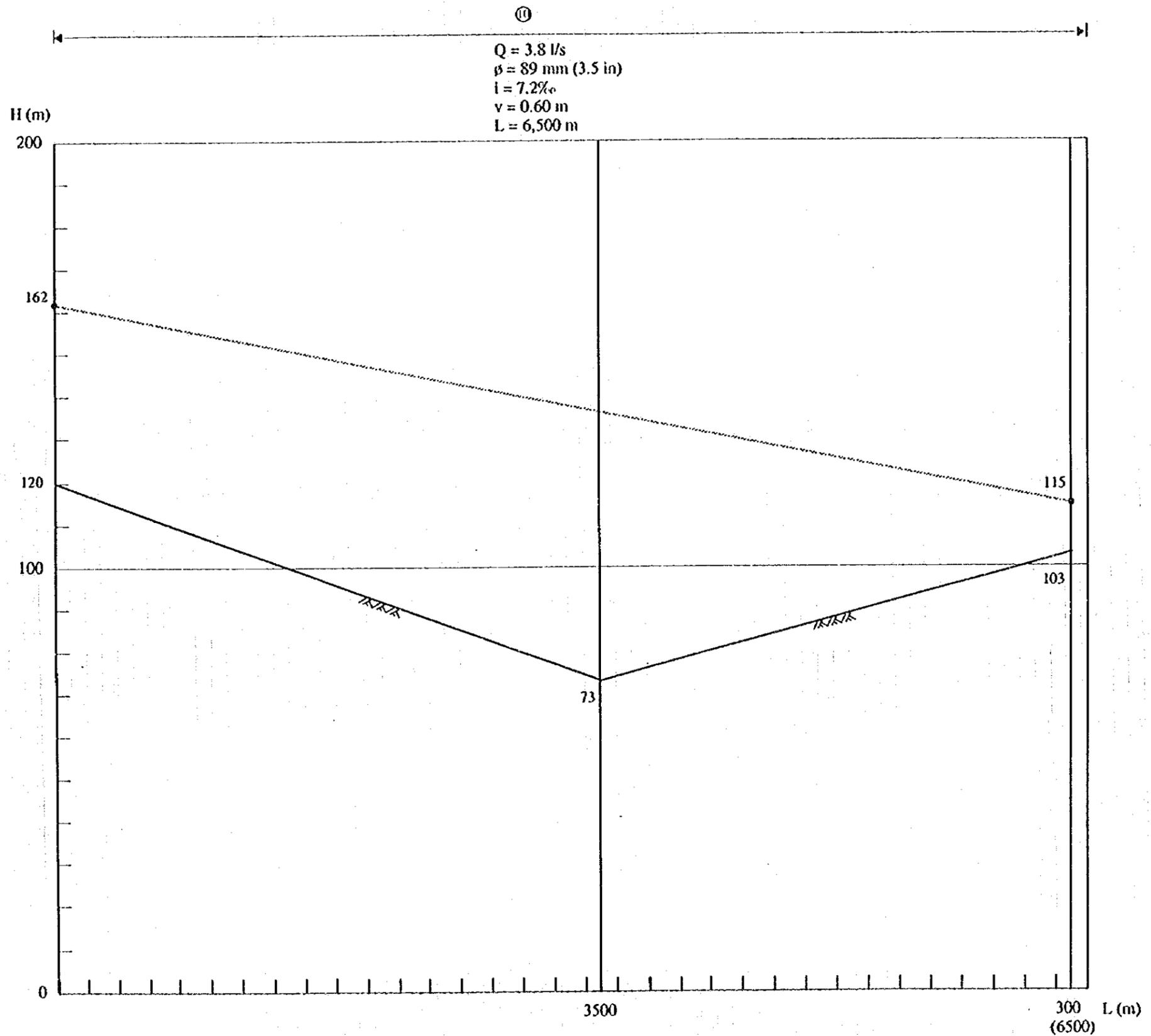
Drawing 3.6 Hydraulic Profile (Ain Defali) (2/6)



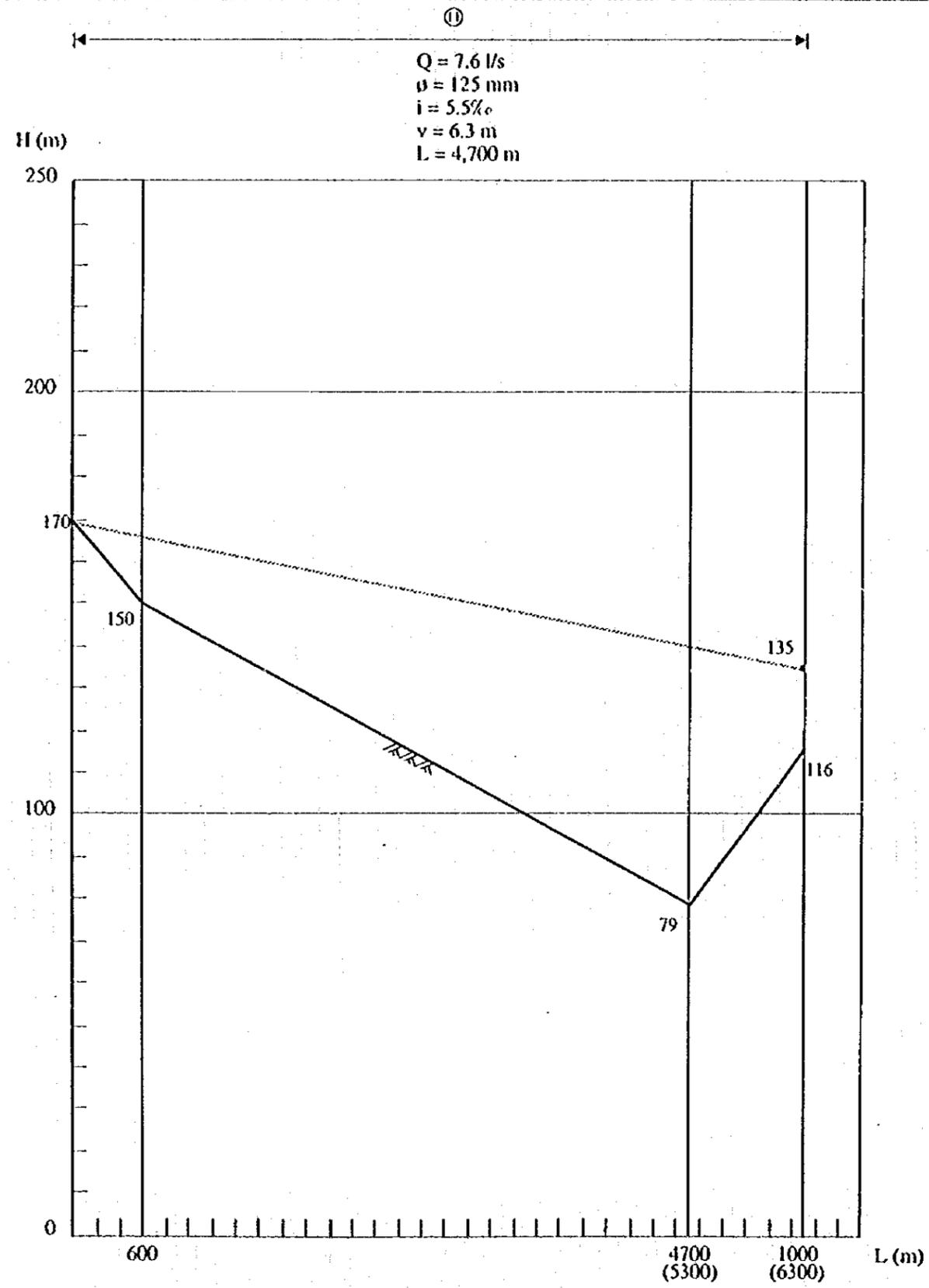
Drawing 3.7 Hydraulic Profile (Ain Defali) (3/6)



Drawing 3.8 Hydraulic Profile (Ain Defali) (4/6)

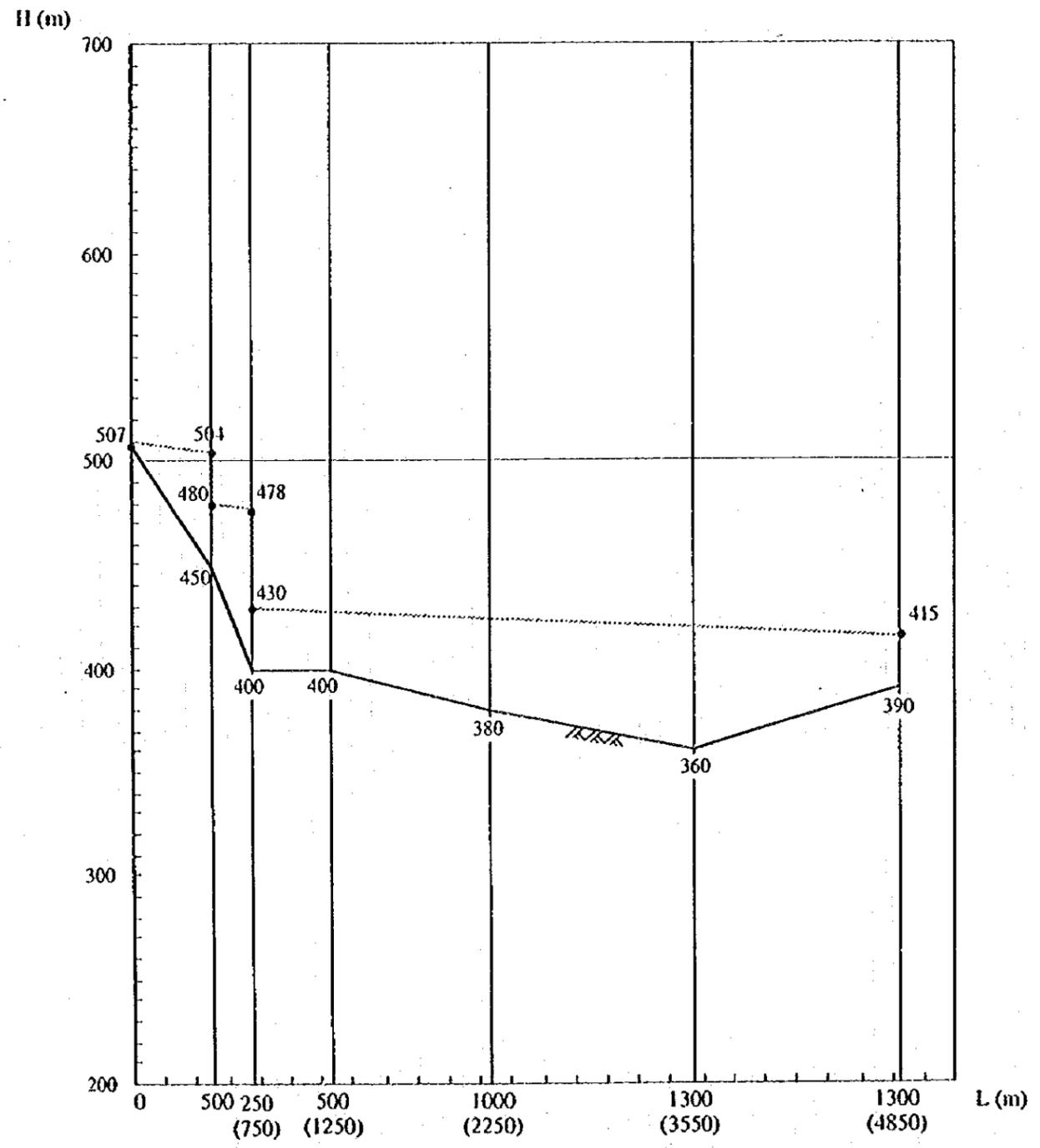


Drawing 3.9 Hydraulic Profile (Ain Defali) (5/6)

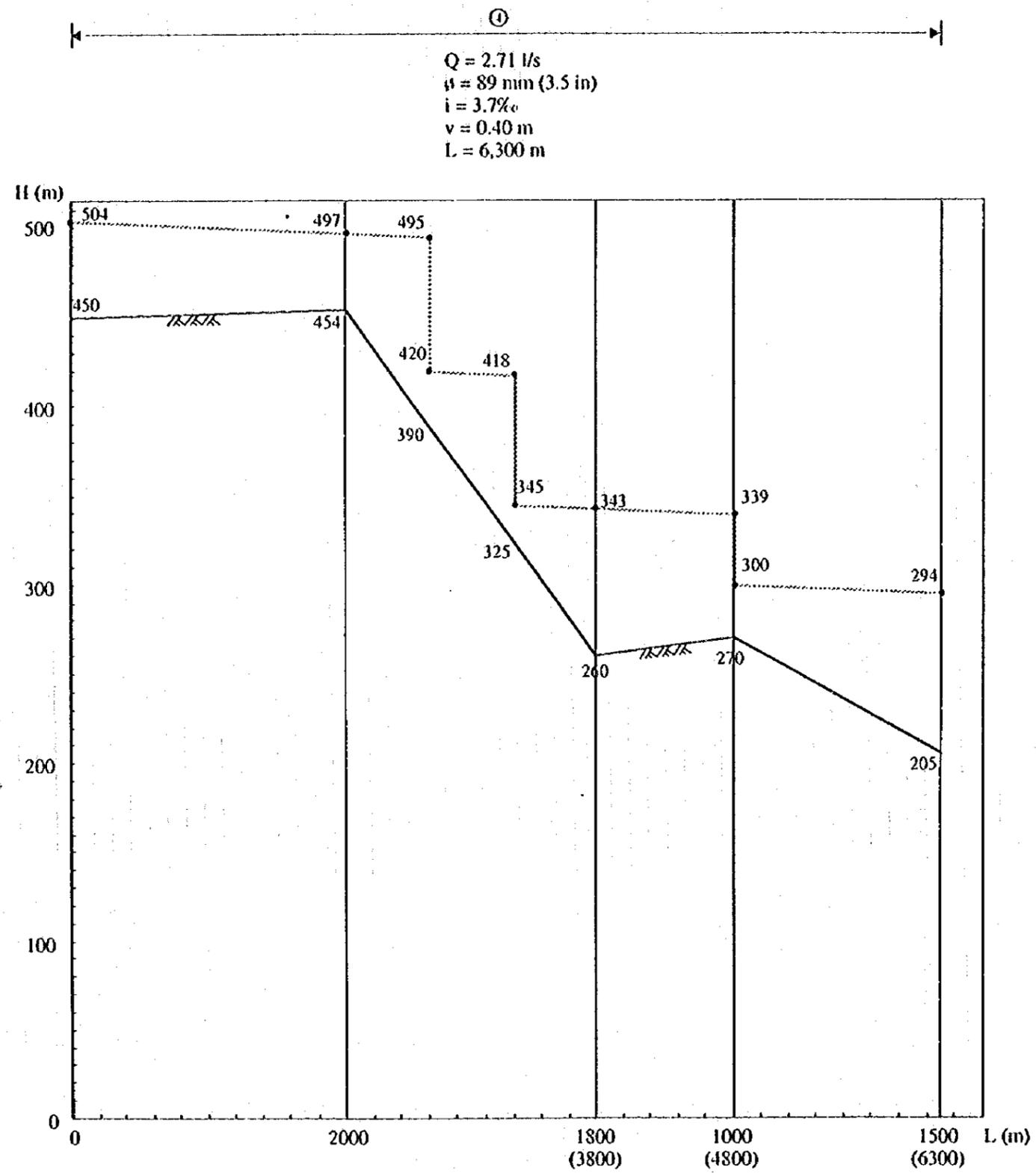


Drawing 3.10 Hydraulic Profile (Ain Defali) (6/6)

①	②	③
Q = 8.12 l/s	Q = 5.41 l/s	Q = 2.71 l/s
ϕ = 125 mm	ϕ = 100 mm	ϕ = 89 mm (3.5 in)
i = 6.3‰	i = 8.5‰	i = 3.7‰
v = 0.68 m	v = 0.70 m	v = 0.40 m
L = 500 m	L = 250 m	L = 4,100 m

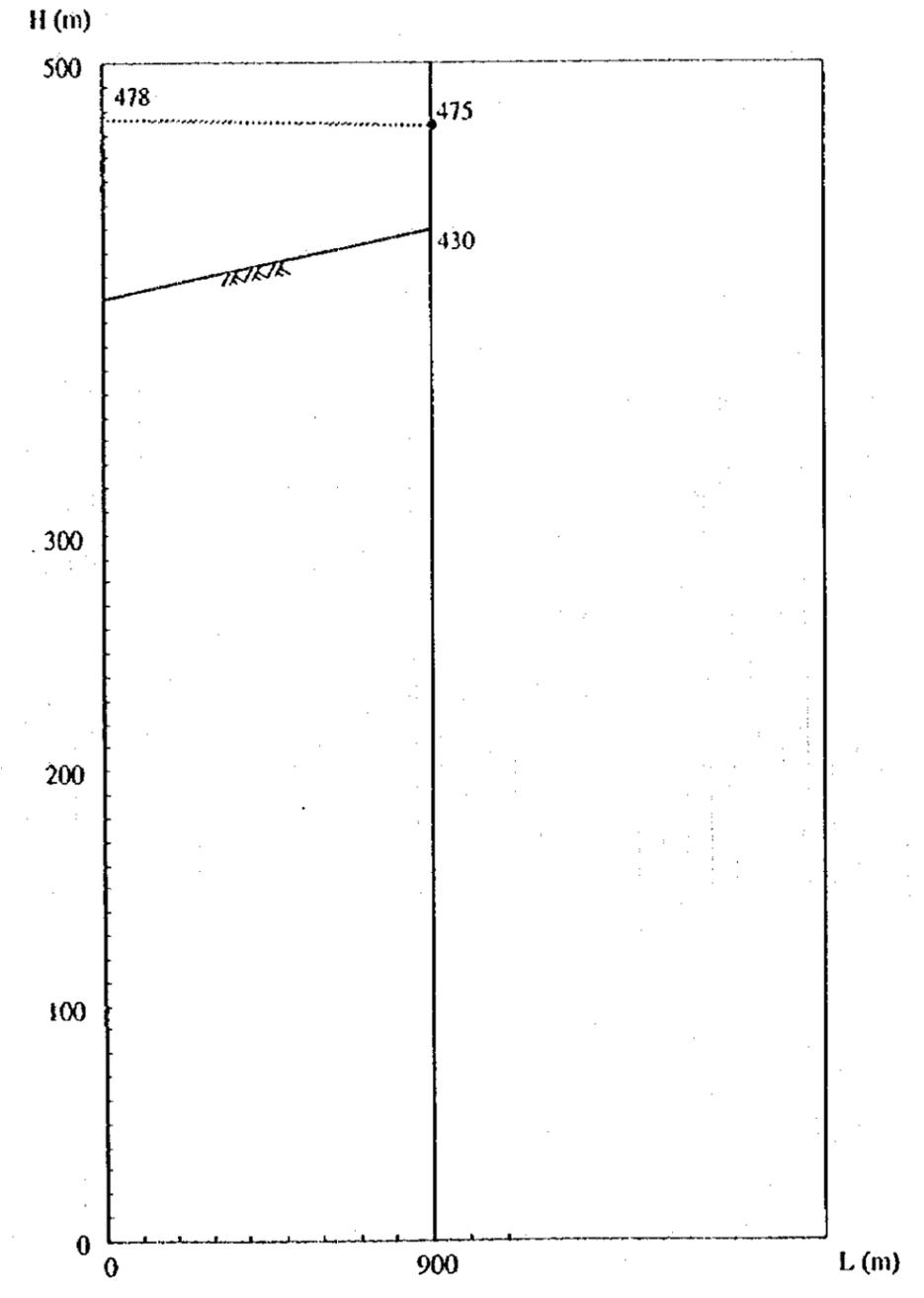


Drawing 3.11 Hydraulic Profile (Teroual) (1/3)

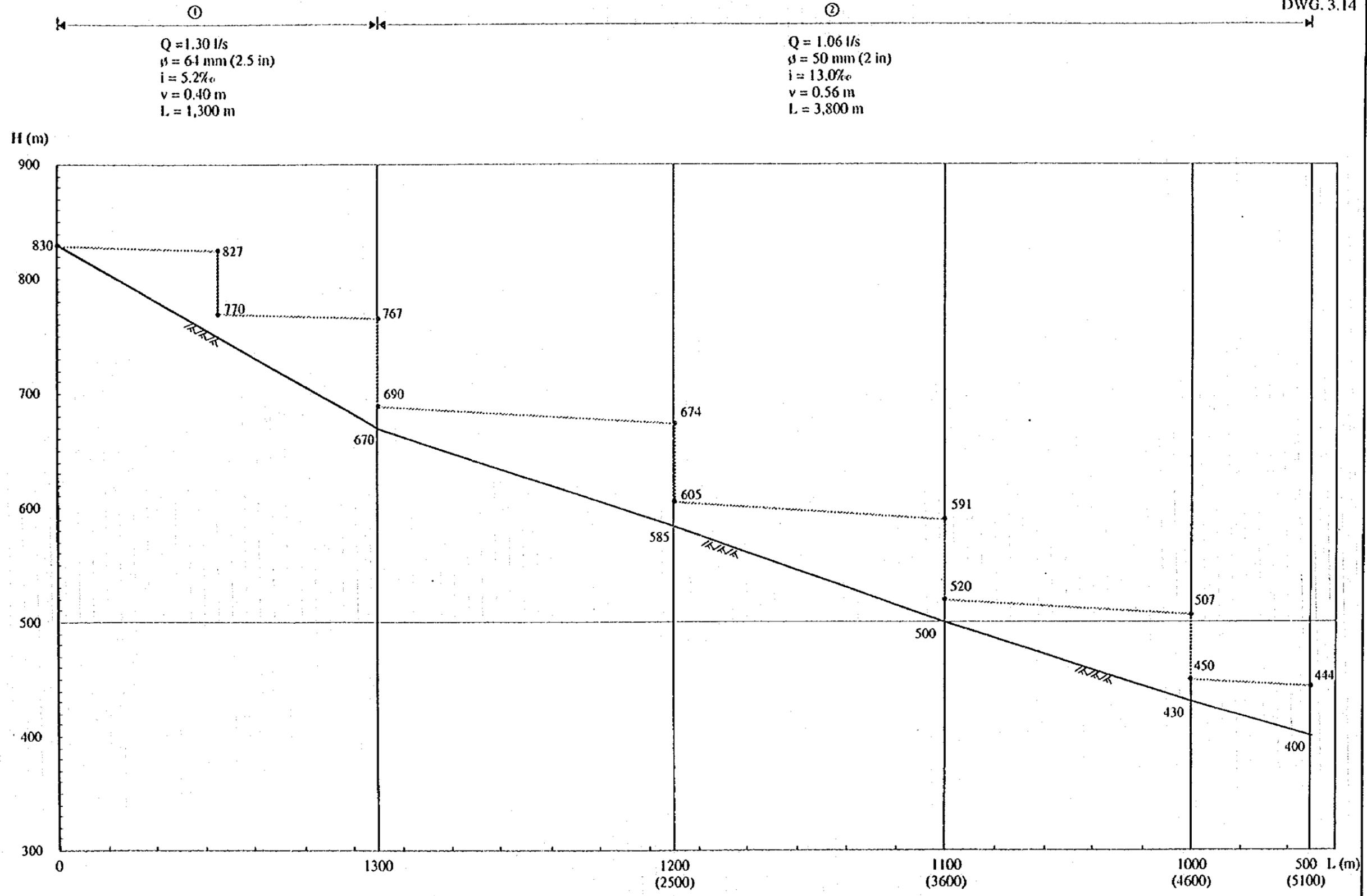


Drawing 3.12 Hydraulic Profile (Teroual) (2/3)

③
Q = 2.71 l/s
ϕ = 89 mm (3.5 in)
i = 3.7‰
v = 0.40 m
L = 900 m



Drawing 3.13 Hydraulic Profile (Teroual) (3/3)

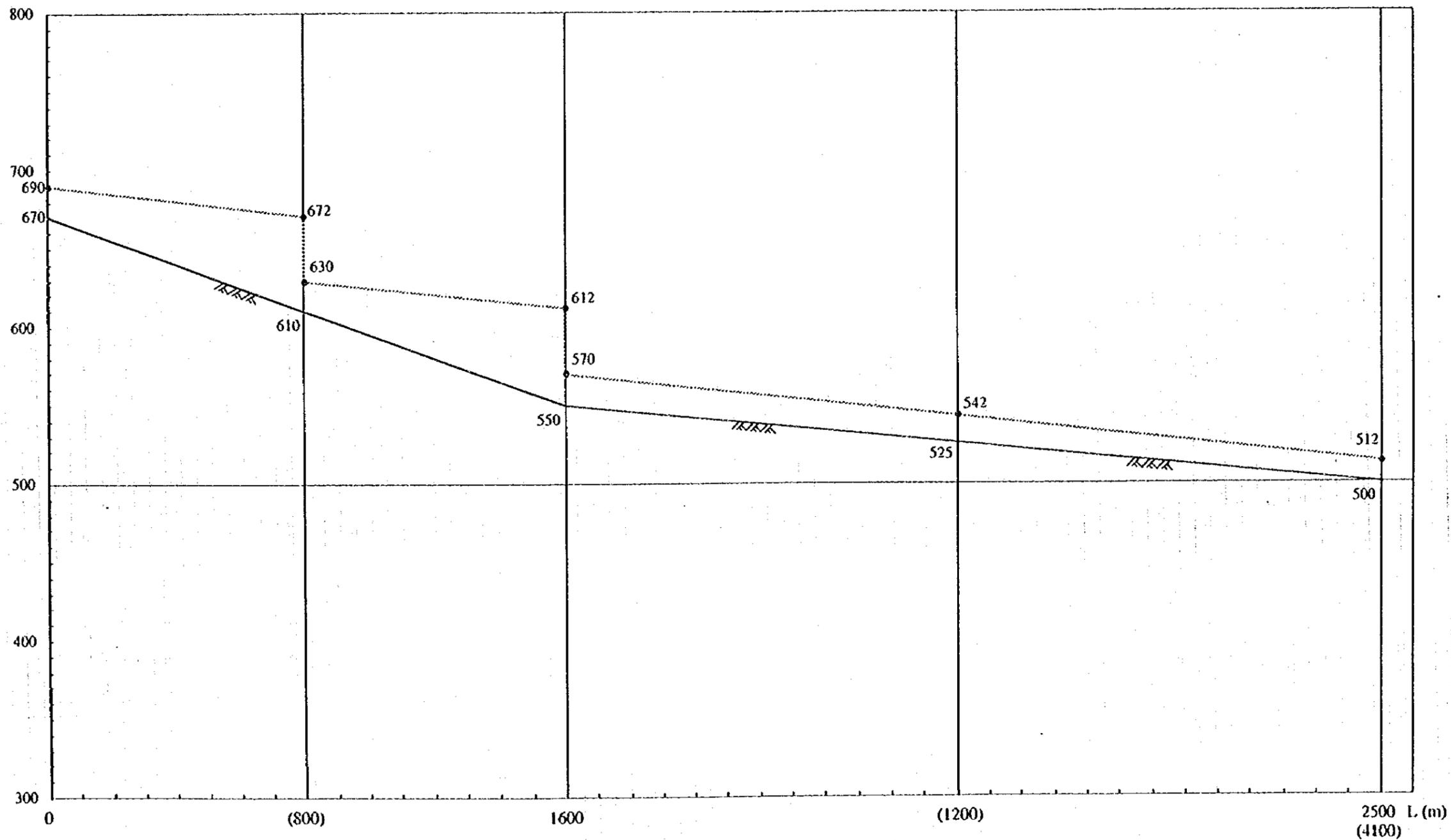


Drawing 3.14 Hydraulic Profile (Ain Berda) (1/4)

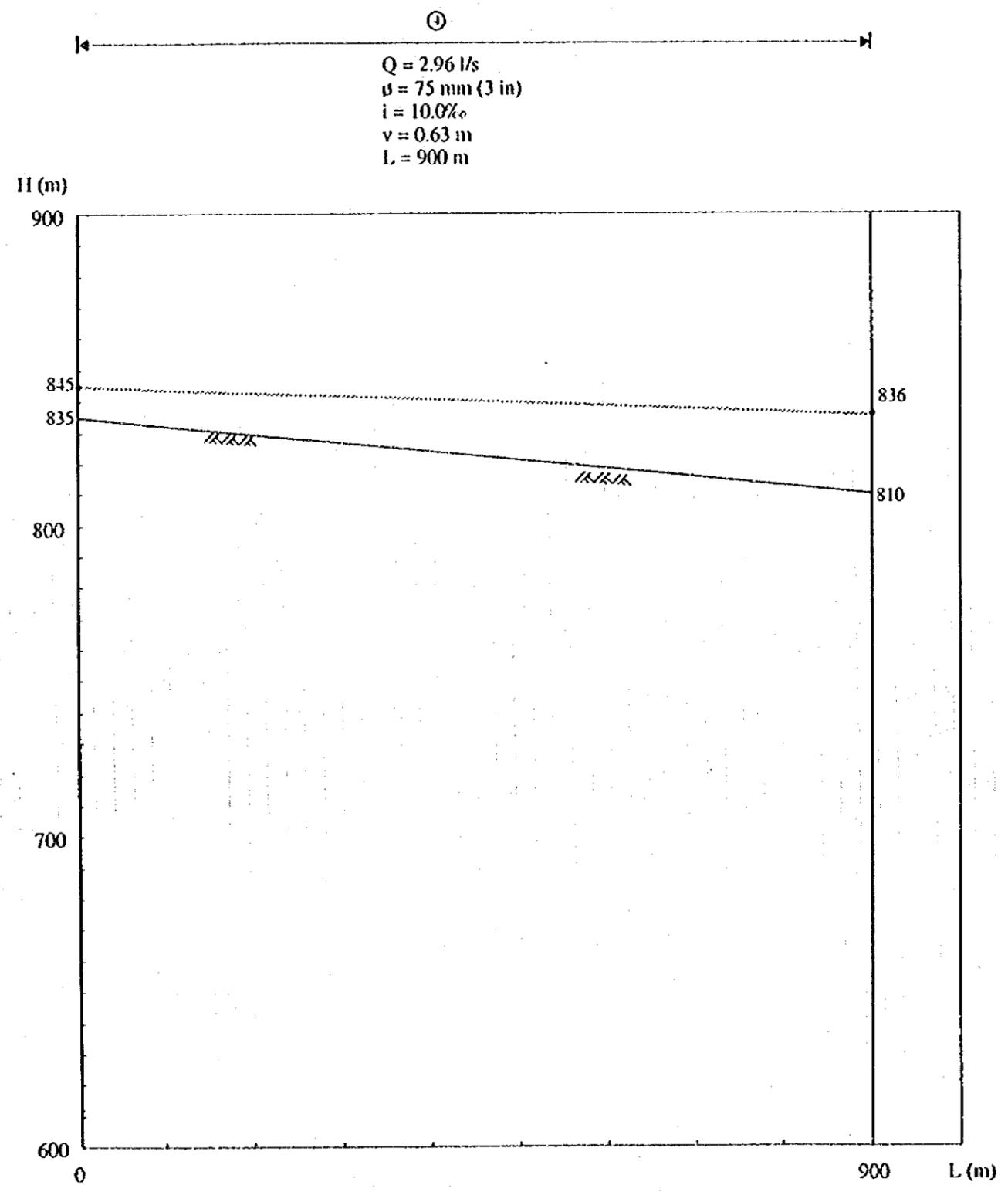
③

$Q = 0.24 \text{ l/s}$
 $\phi = 25 \text{ mm (1 in)}$
 $i = 23.0\text{‰}$
 $v = 0.49 \text{ m}$
 $L = 4,100 \text{ m}$

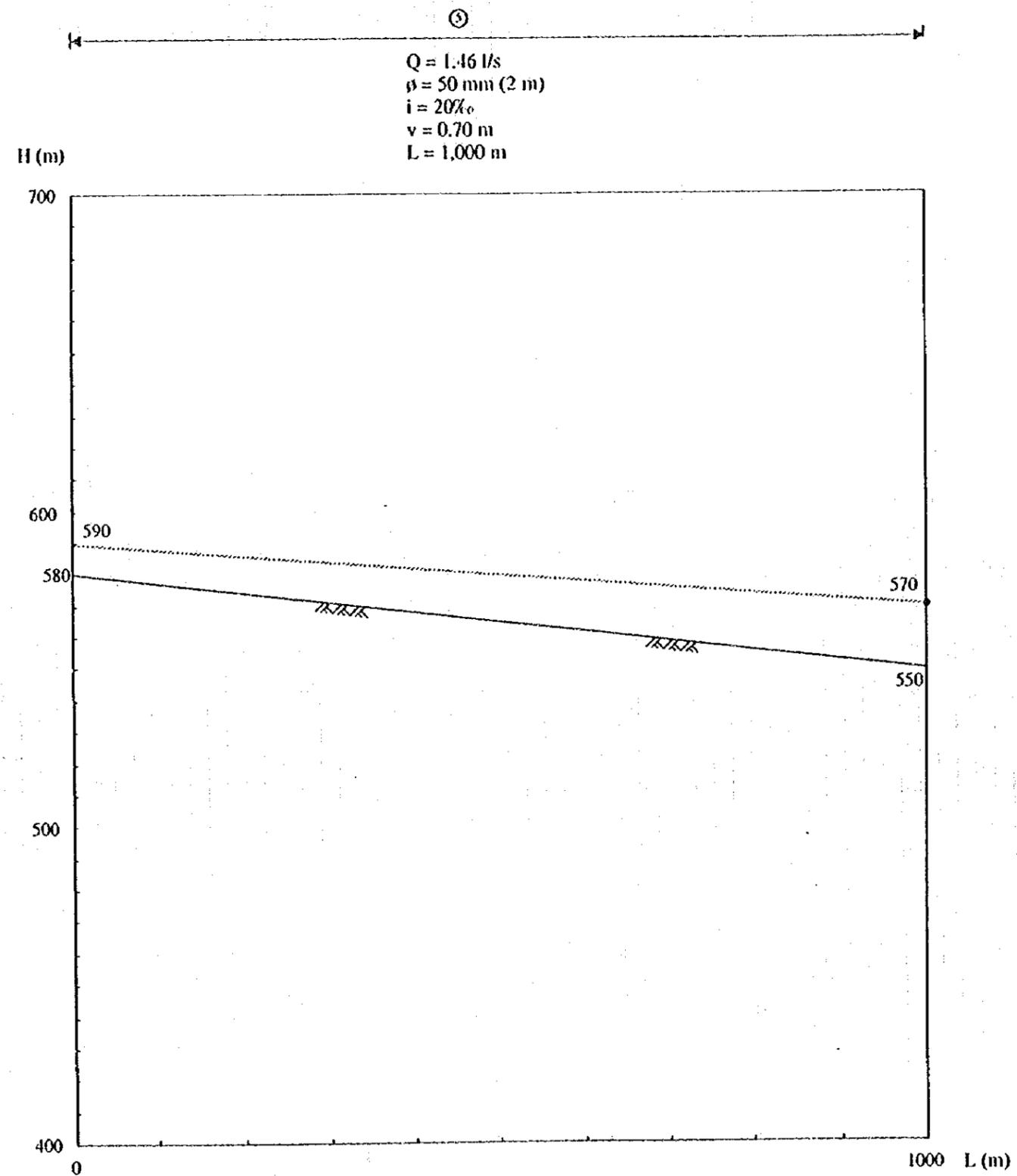
H (m)



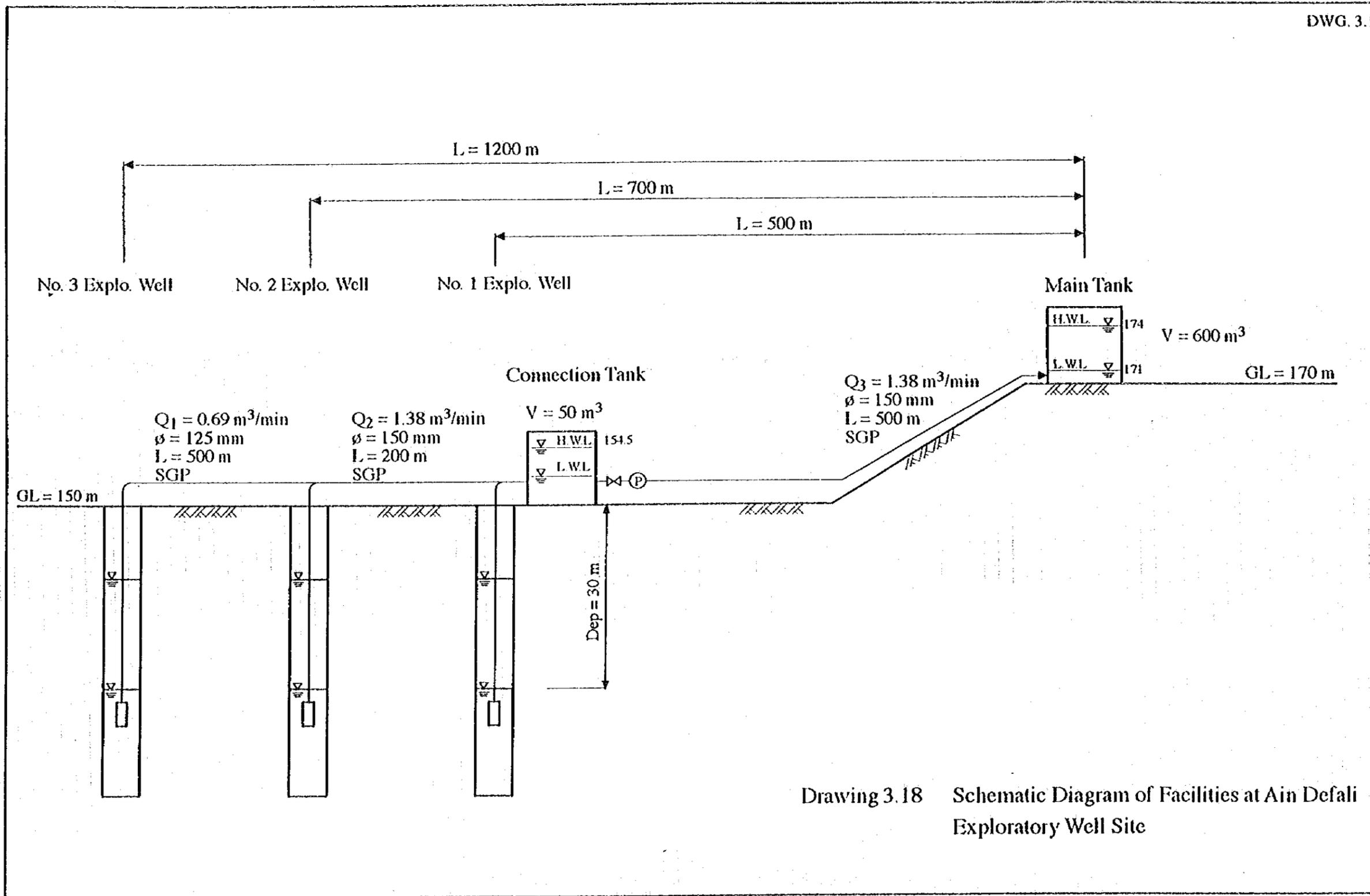
Drawing 3.15 Hydraulic Profile (Ain Berda) (2/4)



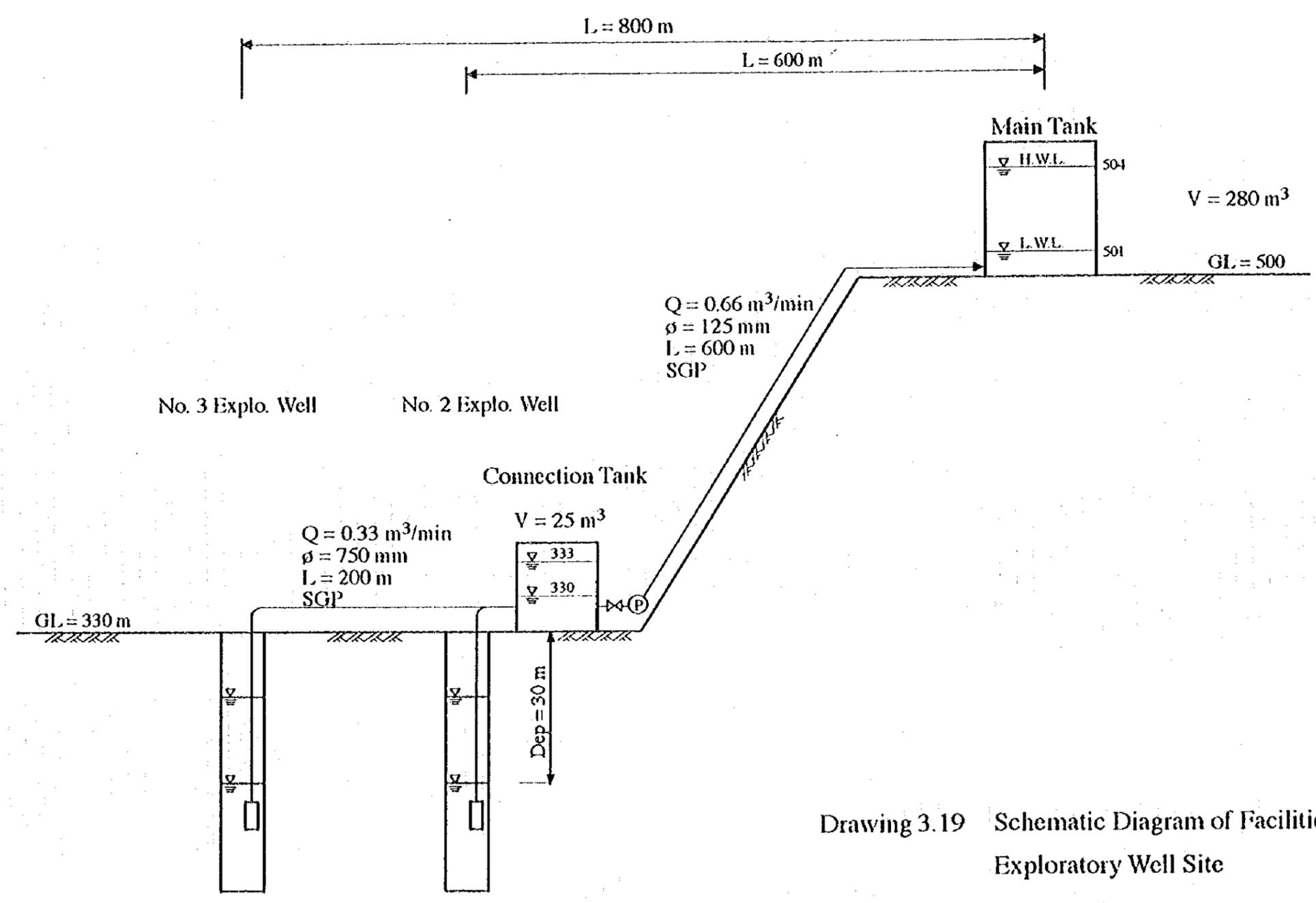
Drawing 3.16 Hydraulic Profile (Ain Berda) (3/4)



Drawing 3.17 Hydraulic Profile (Ain Berda) (4/4)



Drawing 3.18 Schematic Diagram of Facilities at Ain Defali Exploratory Well Site



Drawing 3.19 Schematic Diagram of Facilities at Teroual Exploratory Well Site