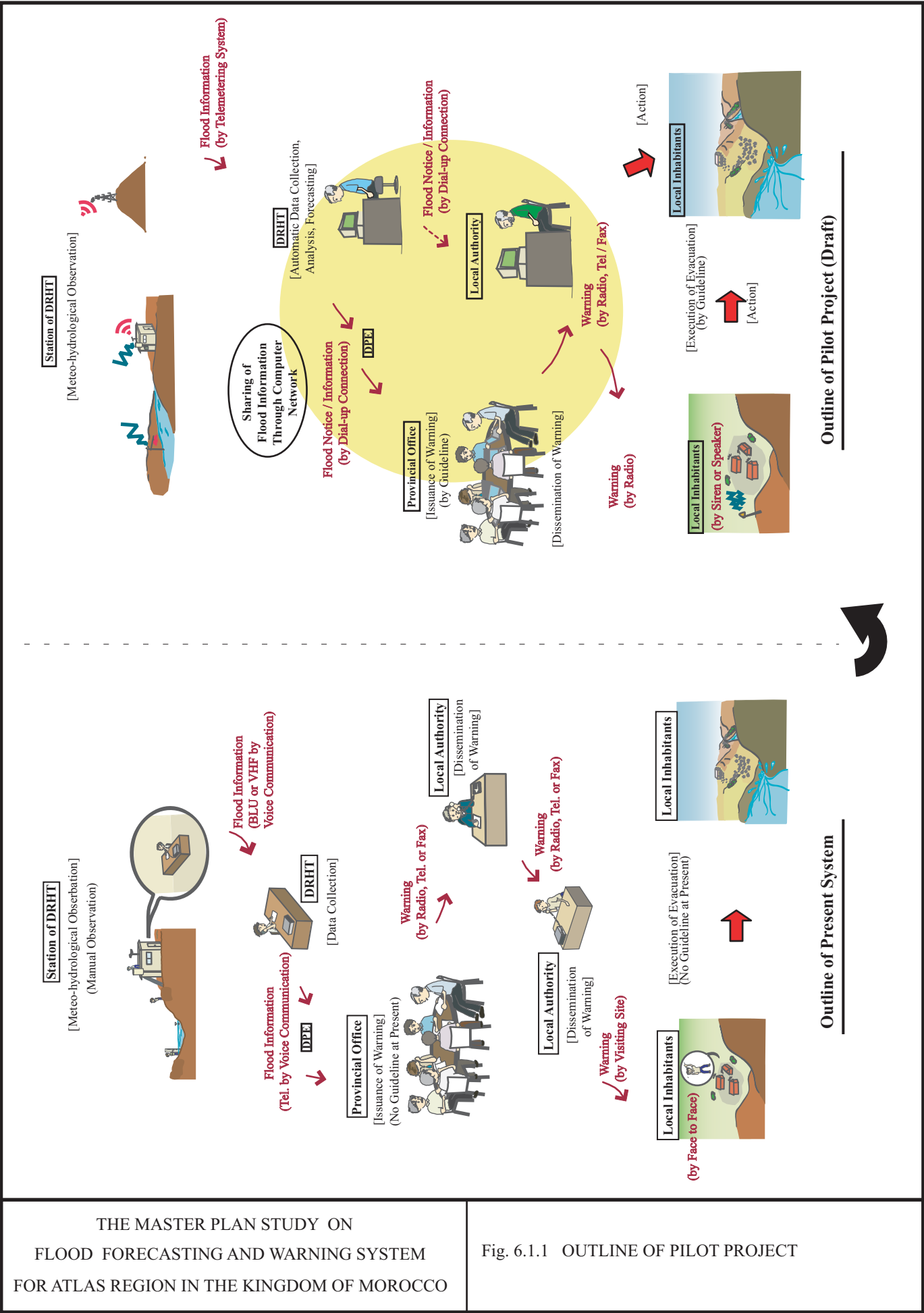
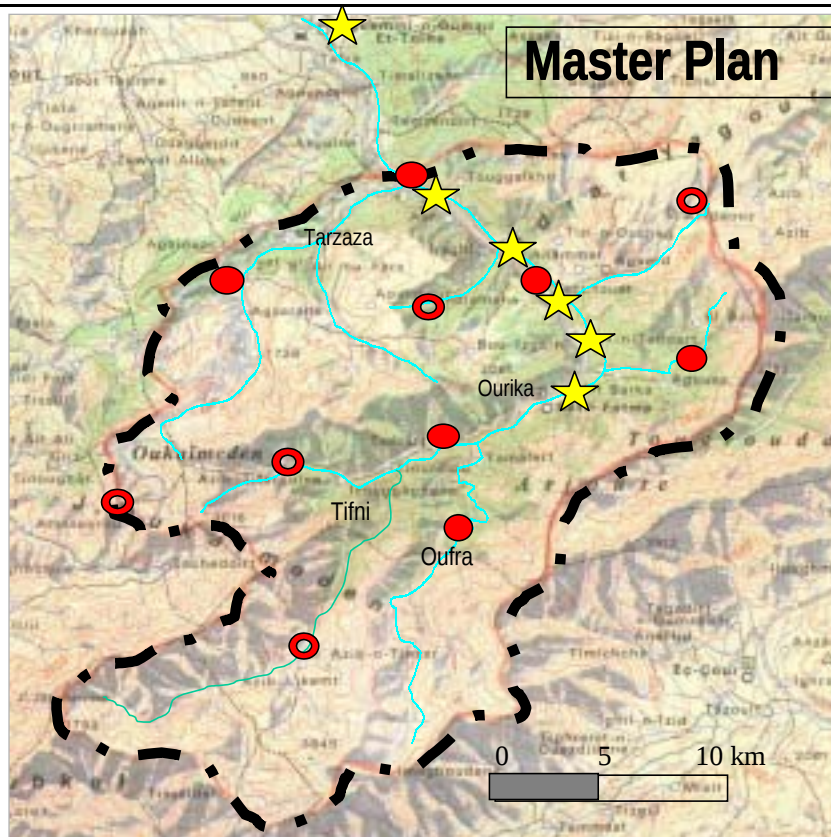
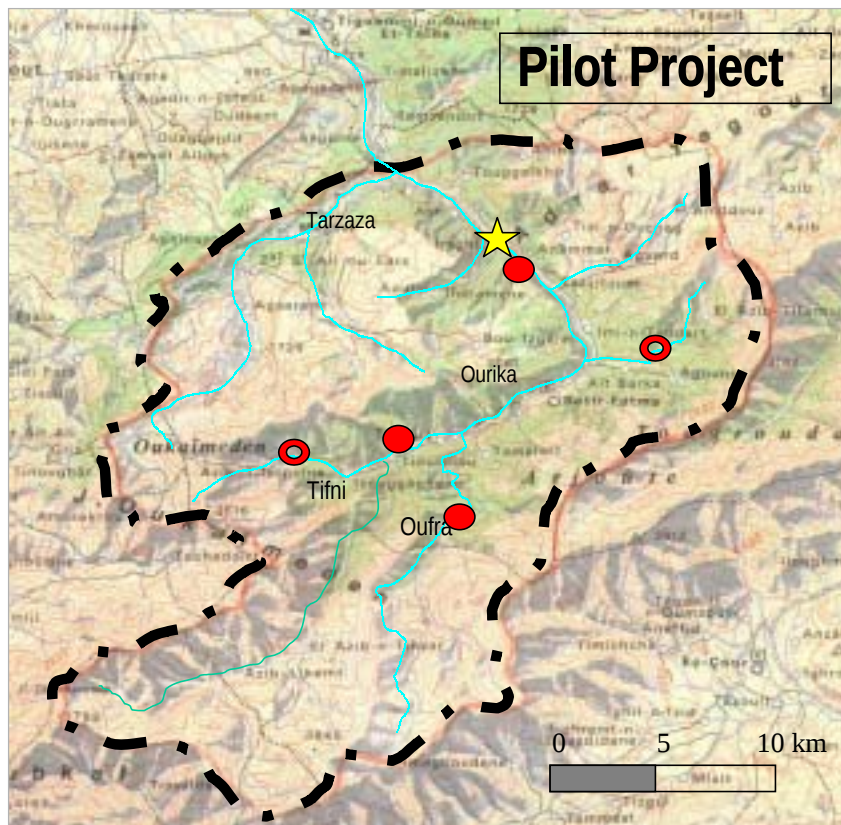






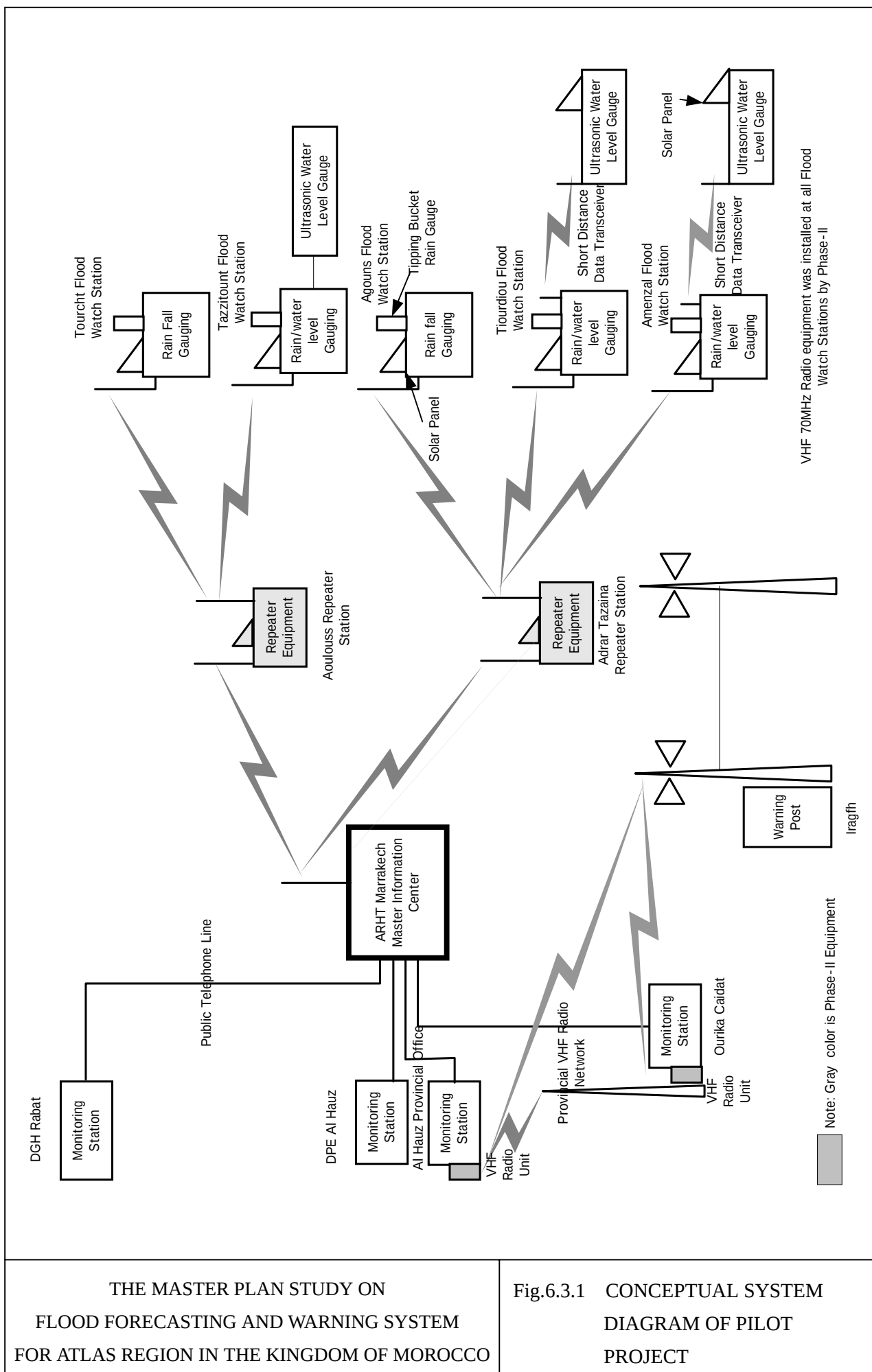
Legend

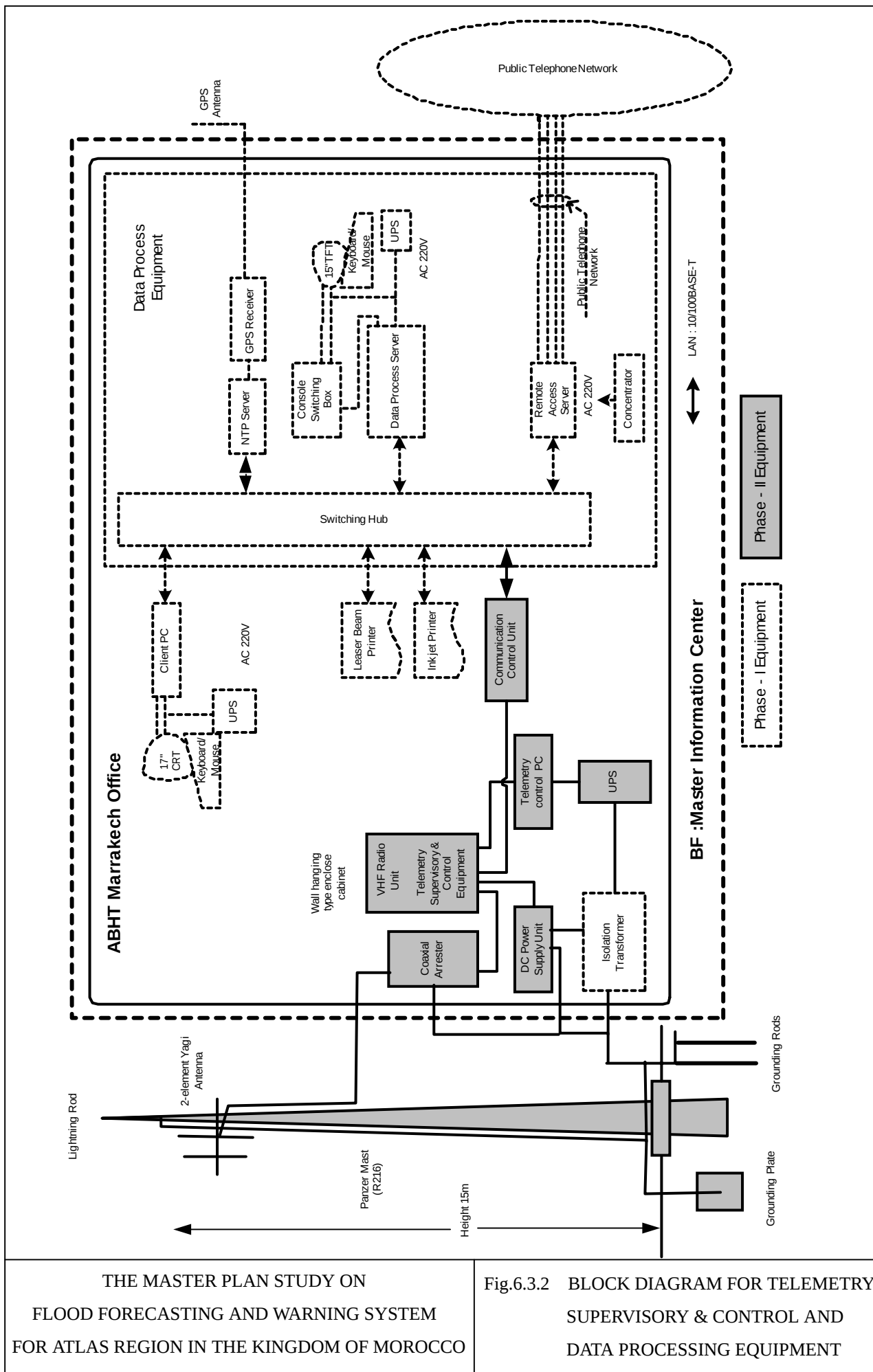
-  Flood Watch Station (Rain gauge)
-  Flood Watch Station (Rain & Water Level gauges)
-  Warning Post



THE MASTER PLAN STUDY ON
FLOOD FORECASTING AND WARNING SYSTEM
FOR ATLAS REGION IN THE KINGDOM OF MOROCCO

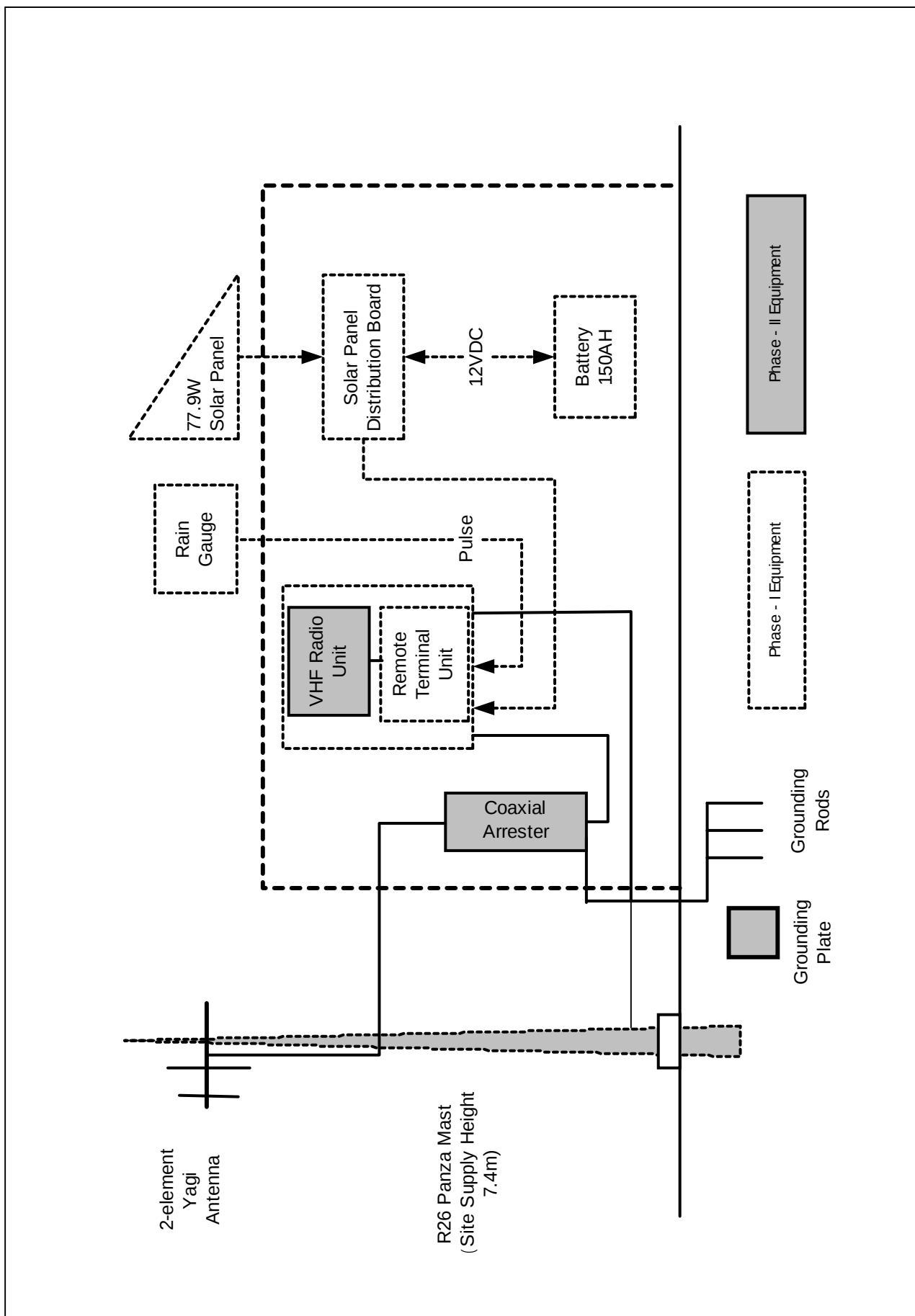
Fig. 6.2.1 COMPARISON OF MASTER PLAN AND
PILOT PROJECT IN NUMBER OF
STATIONS AND WARNING POSTS IN
OURIKA RIVER BASIN





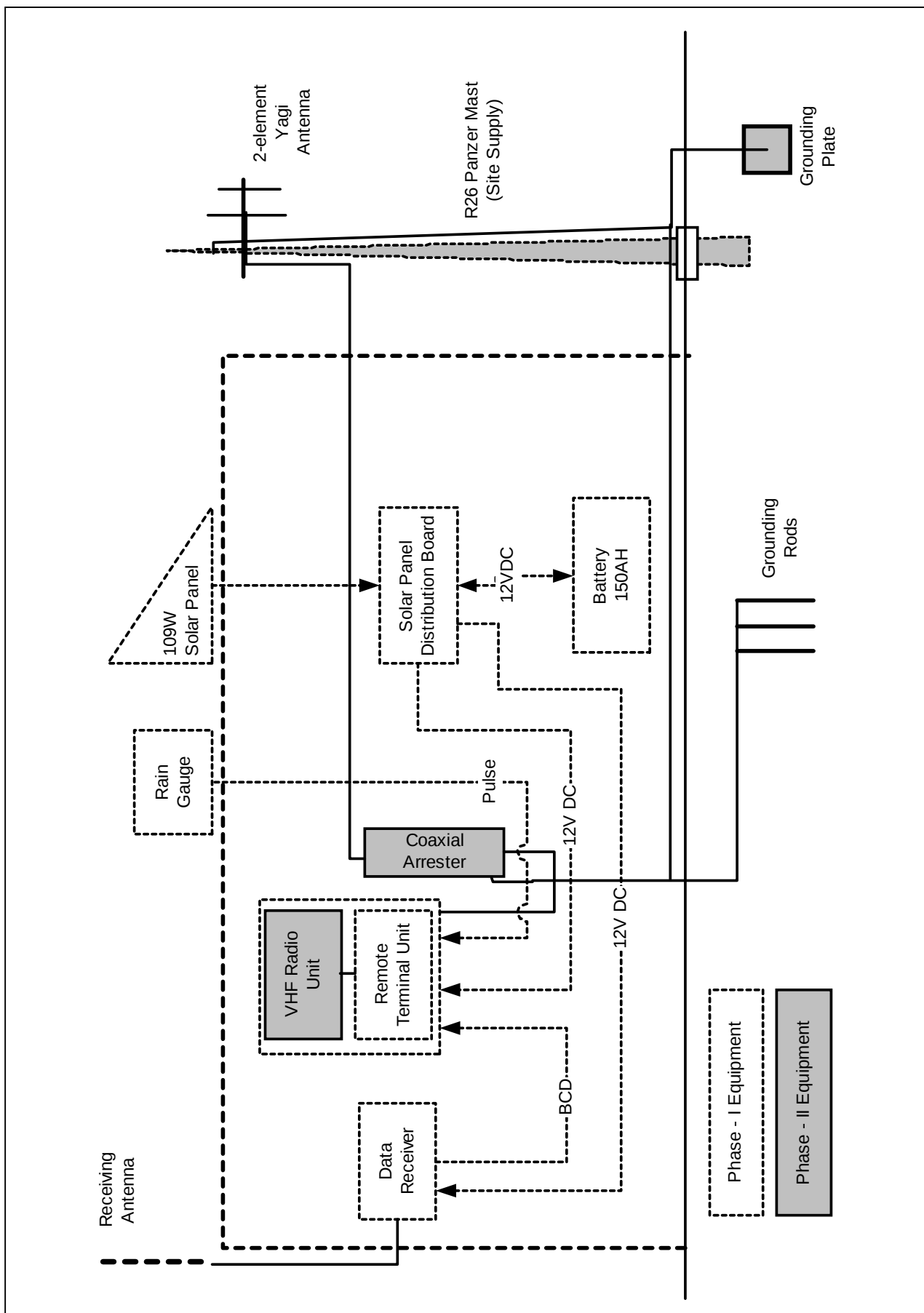
THE MASTER PLAN STUDY ON
FLOOD FORECASTING AND WARNING SYSTEM
FOR ATLAS REGION IN THE KINGDOM OF MOROCCO

Fig.6.3.2 BLOCK DIAGRAM FOR TELEMETRY
SUPERVISORY & CONTROL AND
DATA PROCESSING EQUIPMENT



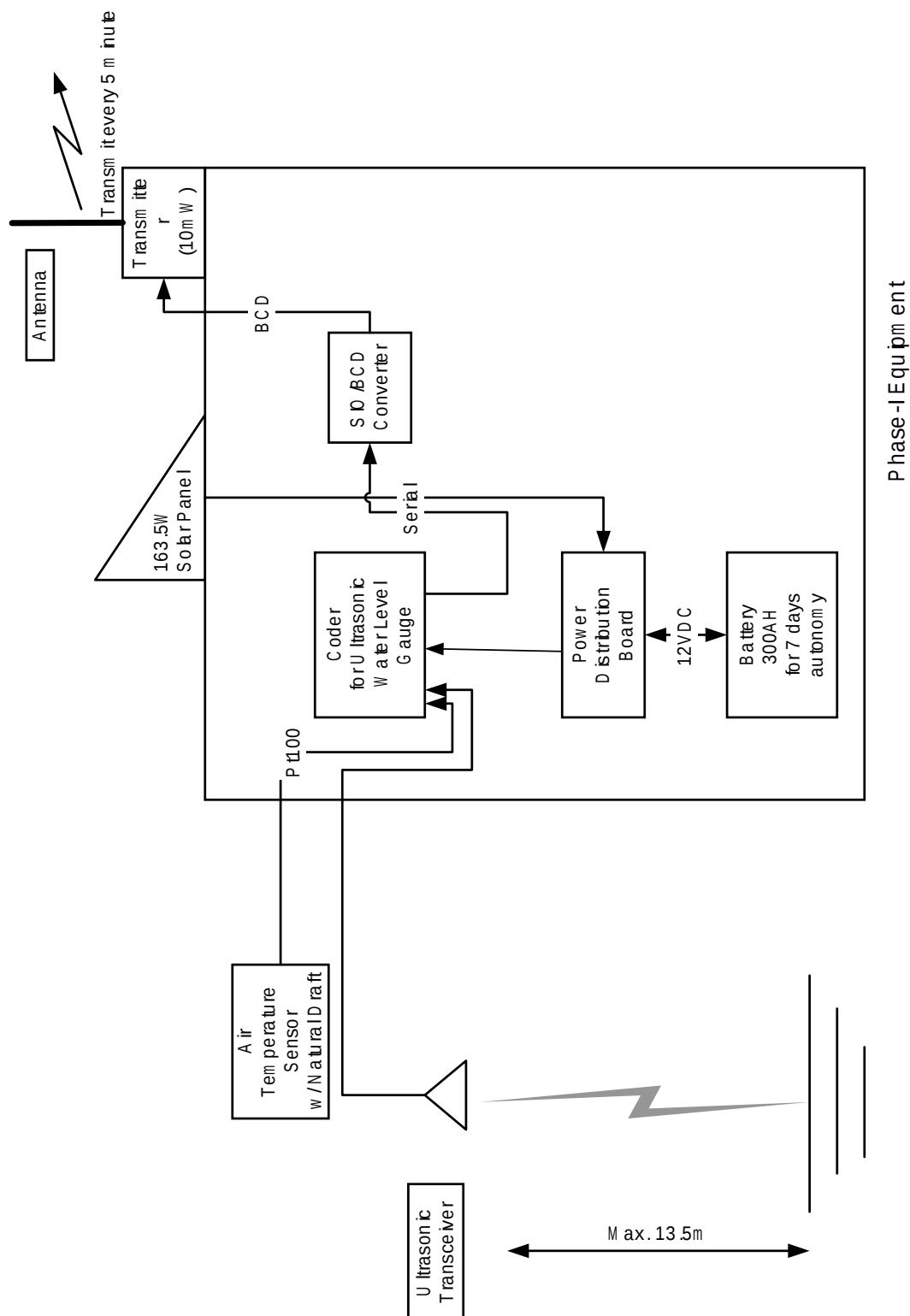
THE MASTER PLAN STUDY ON
FLOOD FORECASTING AND WARNING SYSTEM
FOR ATLAS REGION IN THE KINGDOM OF MOROCCO

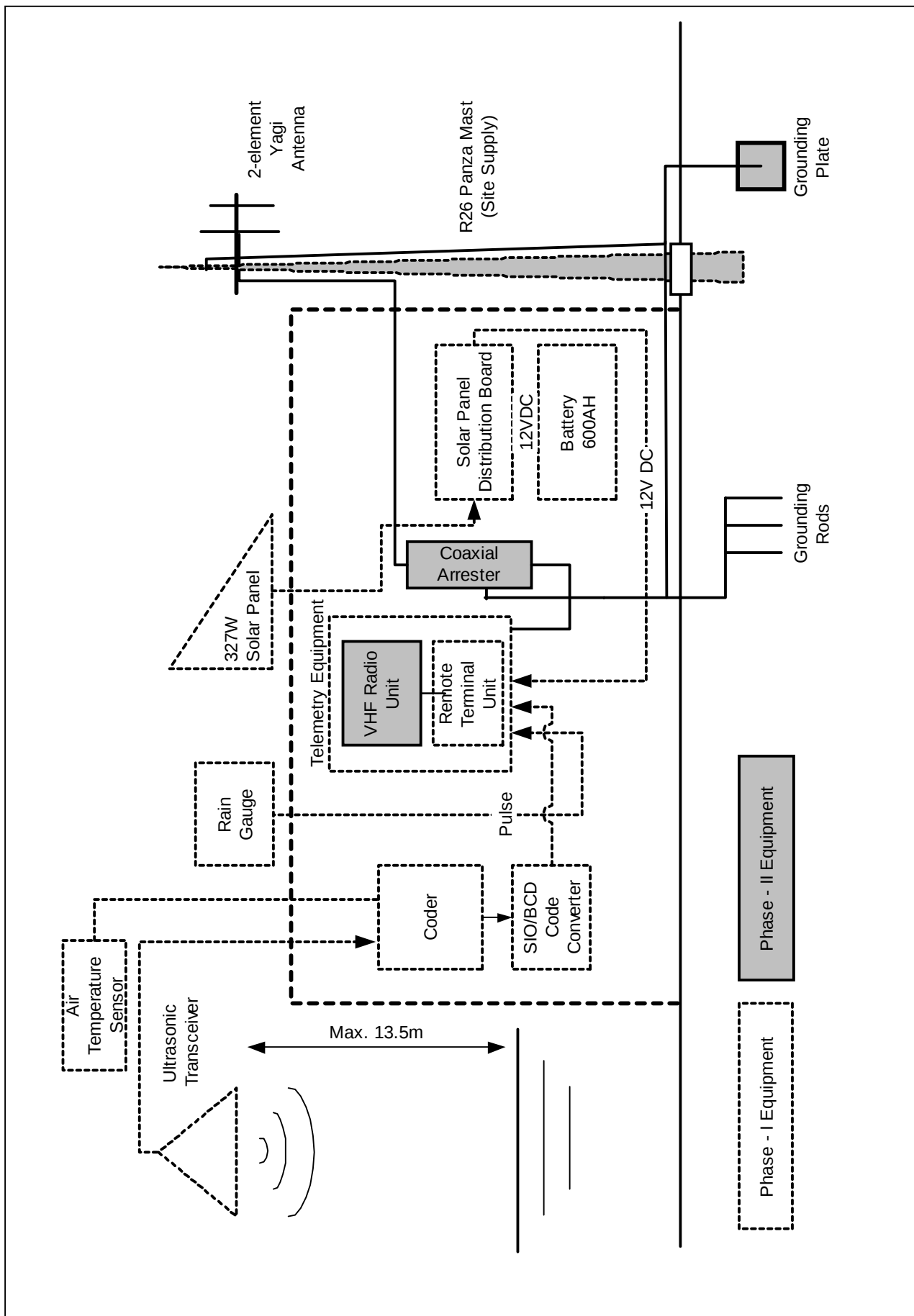
Fig.6.3.3(1/3) BLOCK DIAGRAM FOR FLOOD
WATCH STATION (RAINFALL
STATION: AGOUNS AND



THE MASTER PLAN STUDY ON
FLOOD FORECASTING AND WARNING SYSTEM
FOR ATLAS REGION IN THE KINGDOM OF MOROCCO

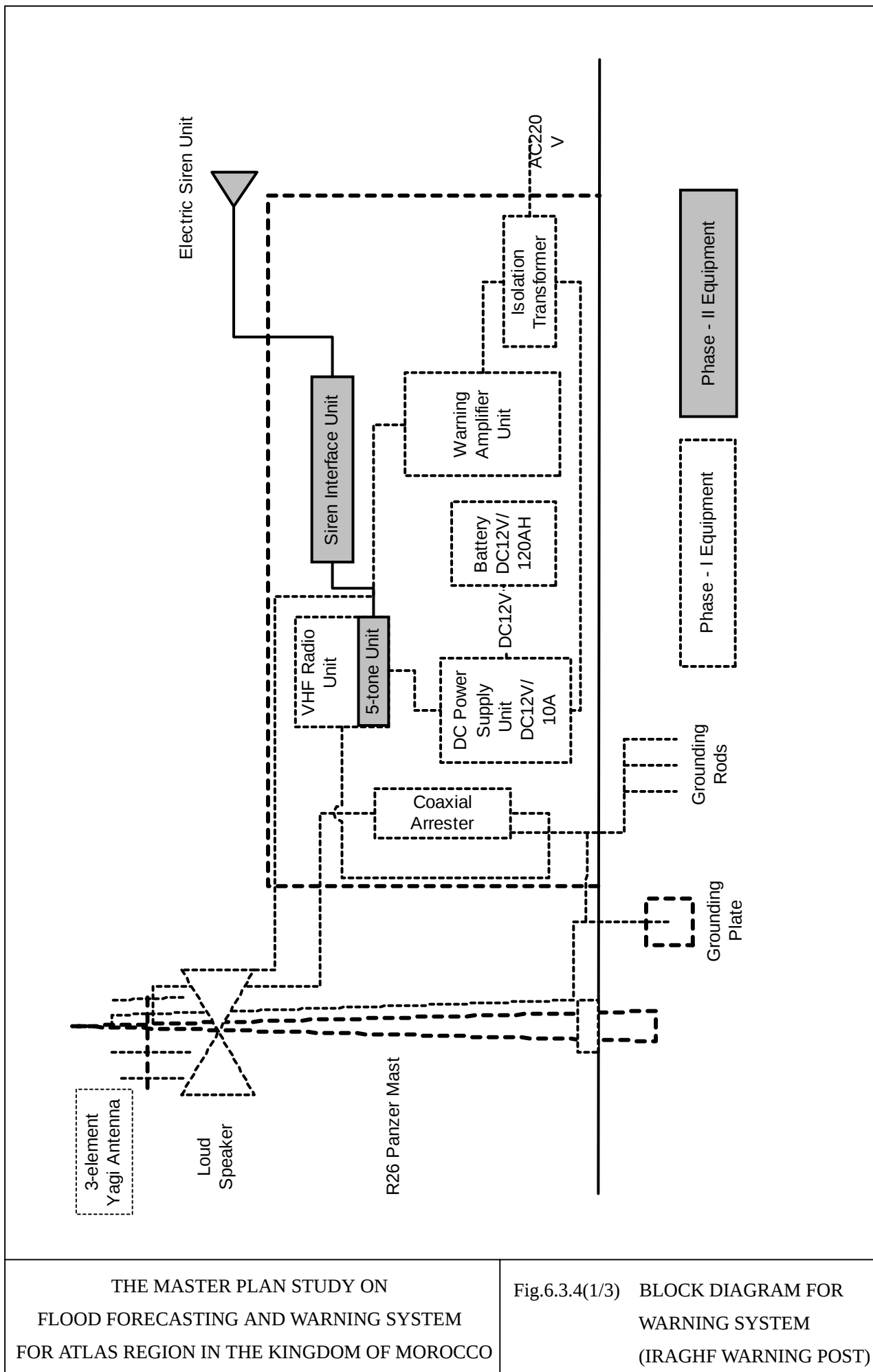
Fig.6.3.3(2/3) BLOCK DIAGRAM FOR FLOOD WATCH
STATION (RAINFALL AND WATER LEVEL
STATION: AMENZAL AND TIOURDIOU,
STATION SIDE)





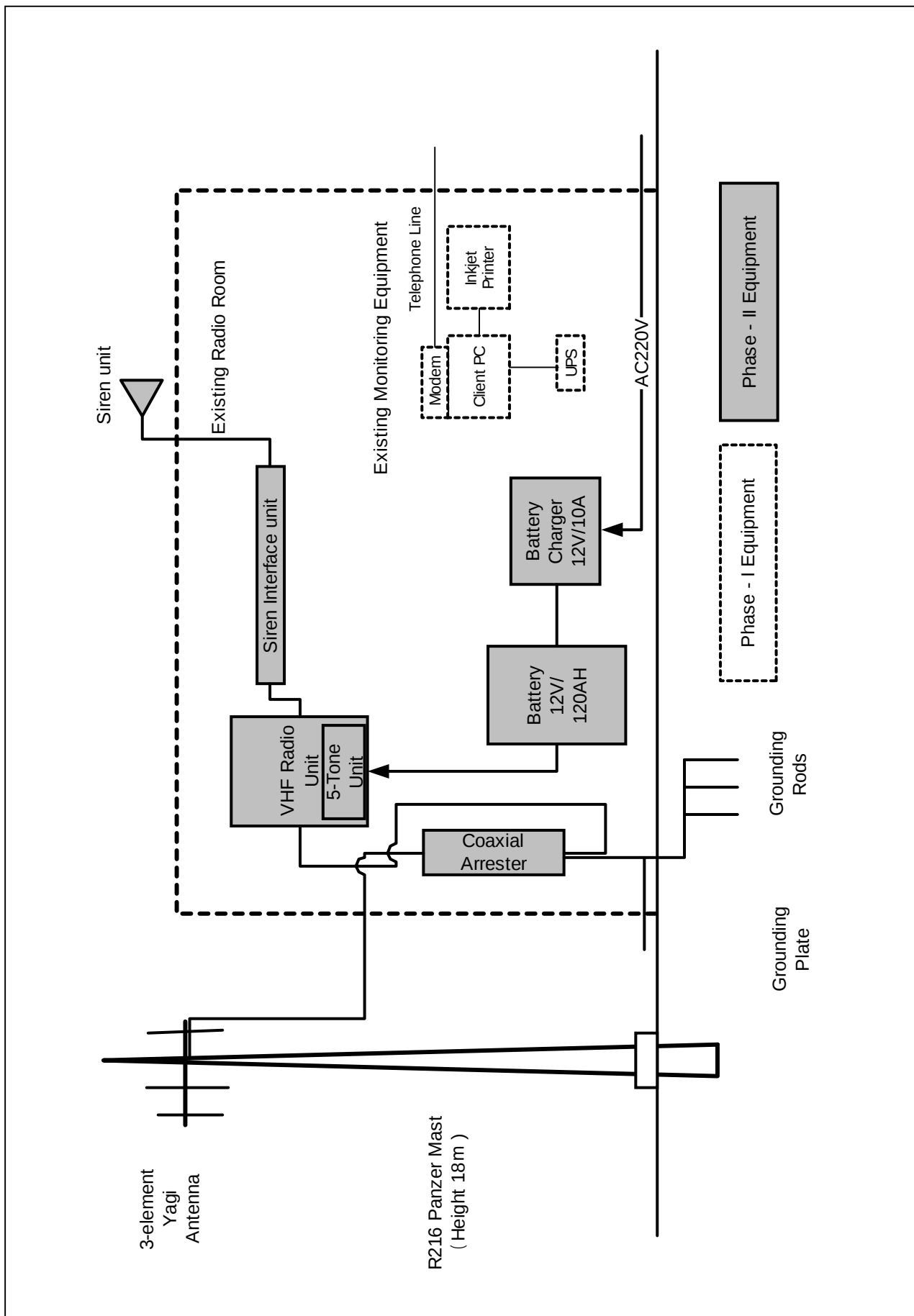
THE MASTER PLAN STUDY ON
FLOOD FORECASTING AND WARNING SYSTEM
FOR ATLAS REGION IN THE KINGDOM OF MOROCCO

Fig.6.3.3(4/4) BLOCK DIAGRAM FOR FLOOD WATCH
STATION (RAINFALL AND WATER LEVEL
STATION: TAZZITOUNT)

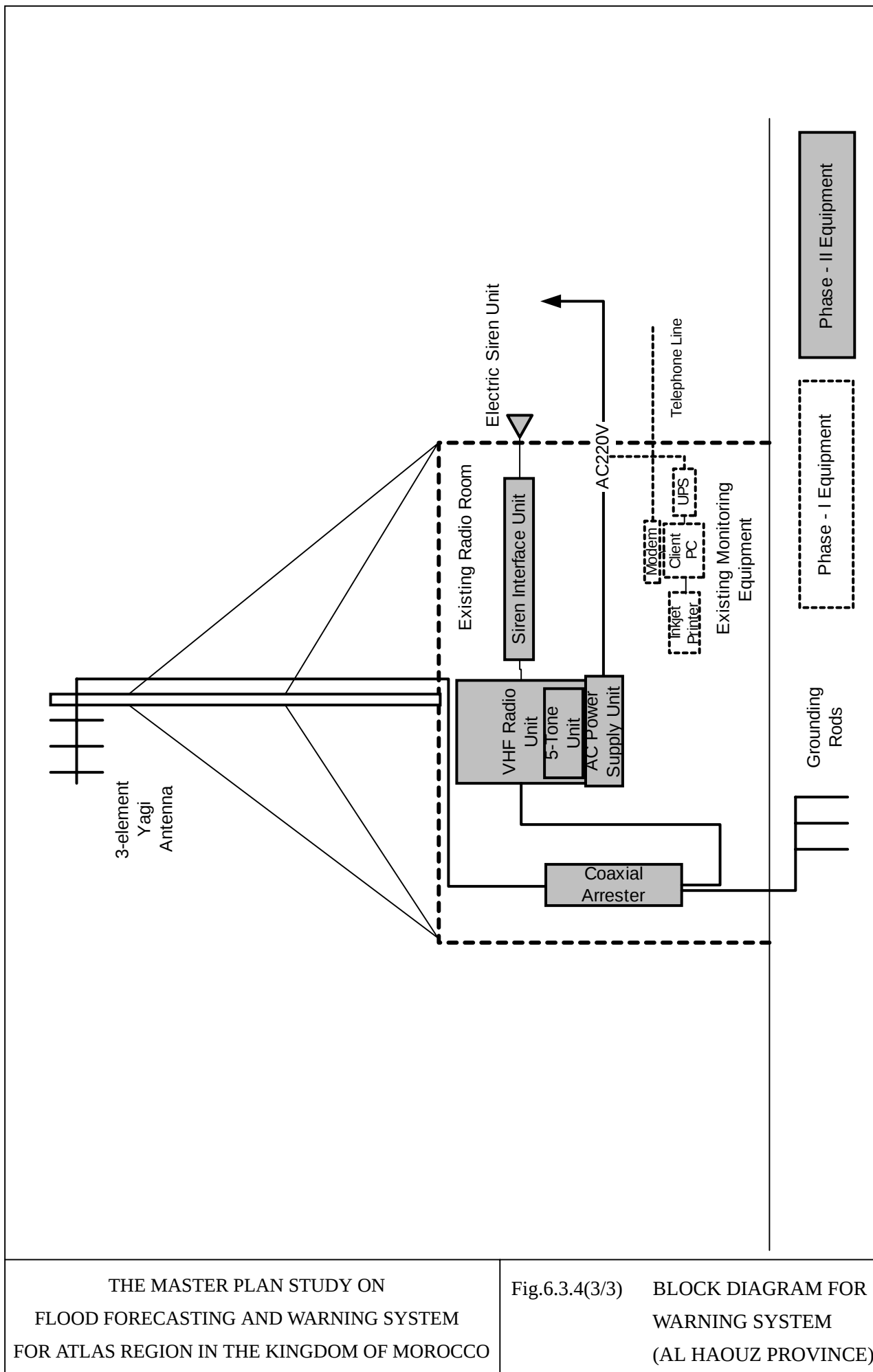


THE MASTER PLAN STUDY ON
FLOOD FORECASTING AND WARNING SYSTEM
FOR ATLAS REGION IN THE KINGDOM OF MOROCCO

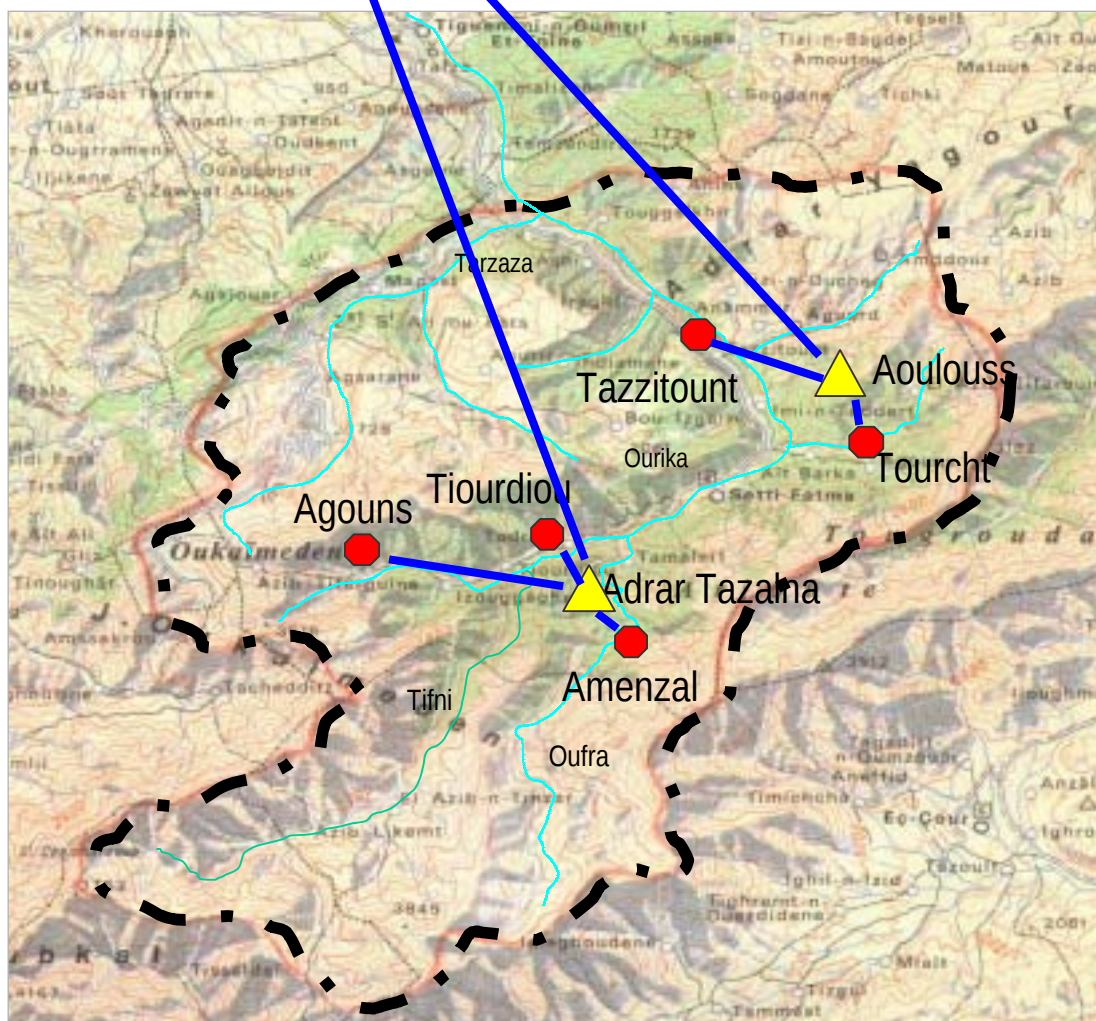
Fig.6.3.4(1/3) BLOCK DIAGRAM FOR
WARNING SYSTEM
(IRAGHF WARNING POST)



THE MASTER PLAN STUDY ON FLOOD FORECASTING AND WARNING SYSTEM FOR ATLAS REGION IN THE KINGDOM OF MOROCCO	Fig.6.3.4(2/3) BLOCK DIAGRAM FOR WARNING SYSTEM (OURIKA CAIDAT)
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DRHT Marrakech
(Master Information Center)



● Flood Watch Station

▲ Repeater Station

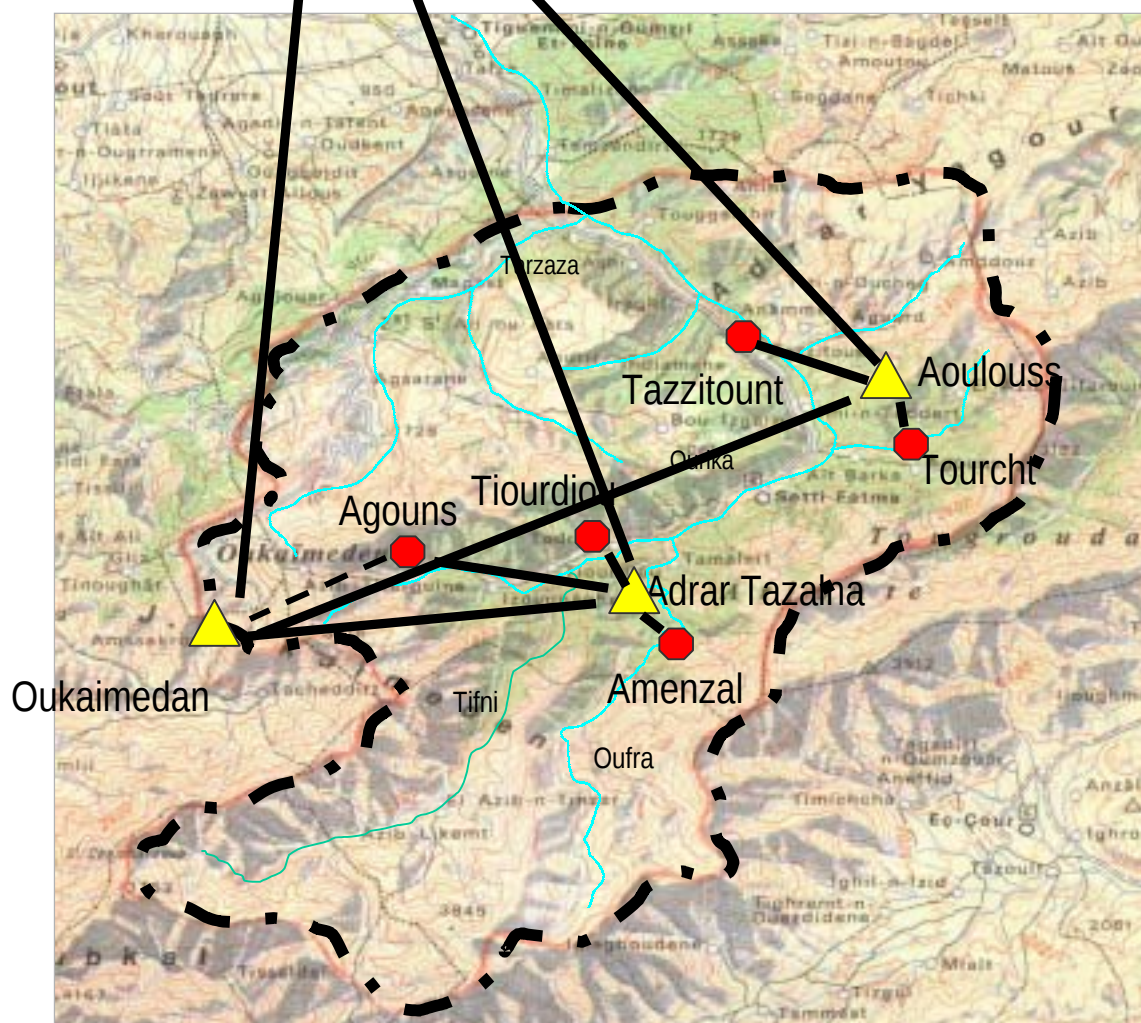
THE MASTER PLAN STUDY ON
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**Fig. 6.4.1 PROPOSED RADIO NETWORK FOR
TELEMETRY SYSTEM FOR PILOT
PROJECT PHASE II**



DRHT Marrakech
(Master Information Center)

Note: For some radio paths, the field propagation test was made for two or three cases, changing antenna type and location as shown in Table 7.1.3. This figure gives a case of the best result for a path.



Flood Watch Station



Candidate Site of
Repeater Station

Radio Propagation Condition by Field Test



Good



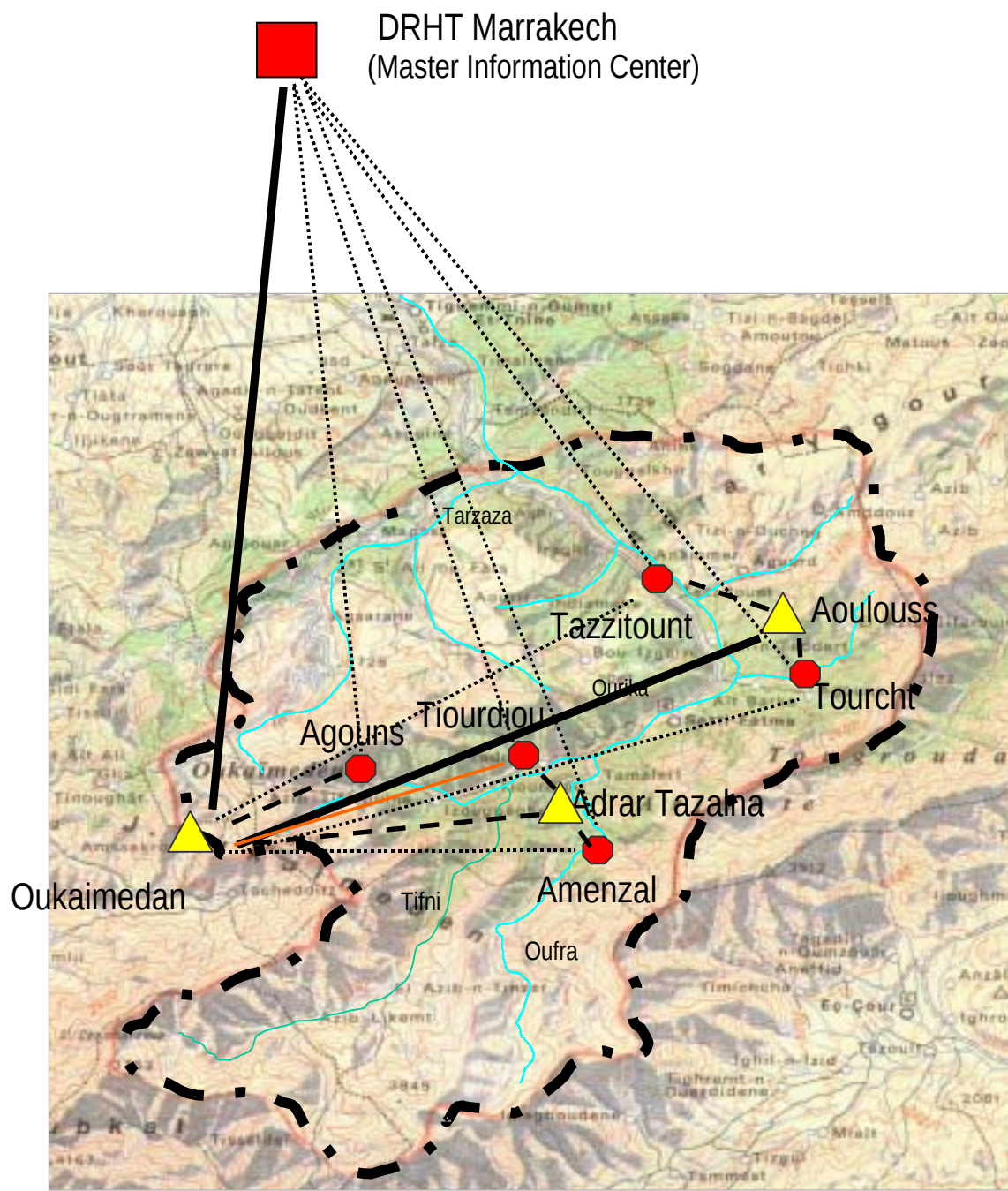
Fair



Inapplicable

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FOR ATLAS REGION IN THE KINGDOM OF MOROCCO

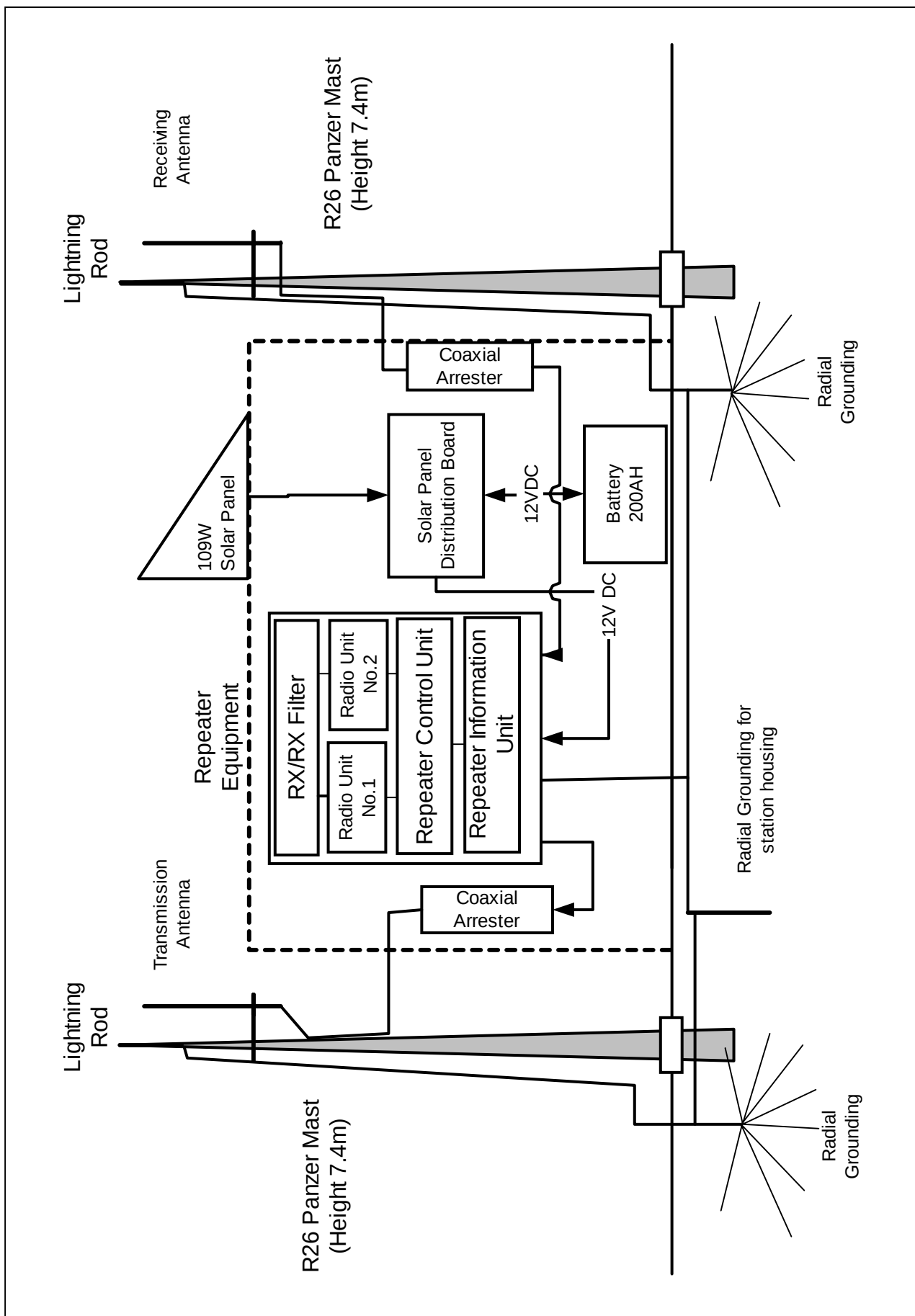
**Fig. 6.4.2 RESULTS OF RADIO PROPAGATION
TEST**

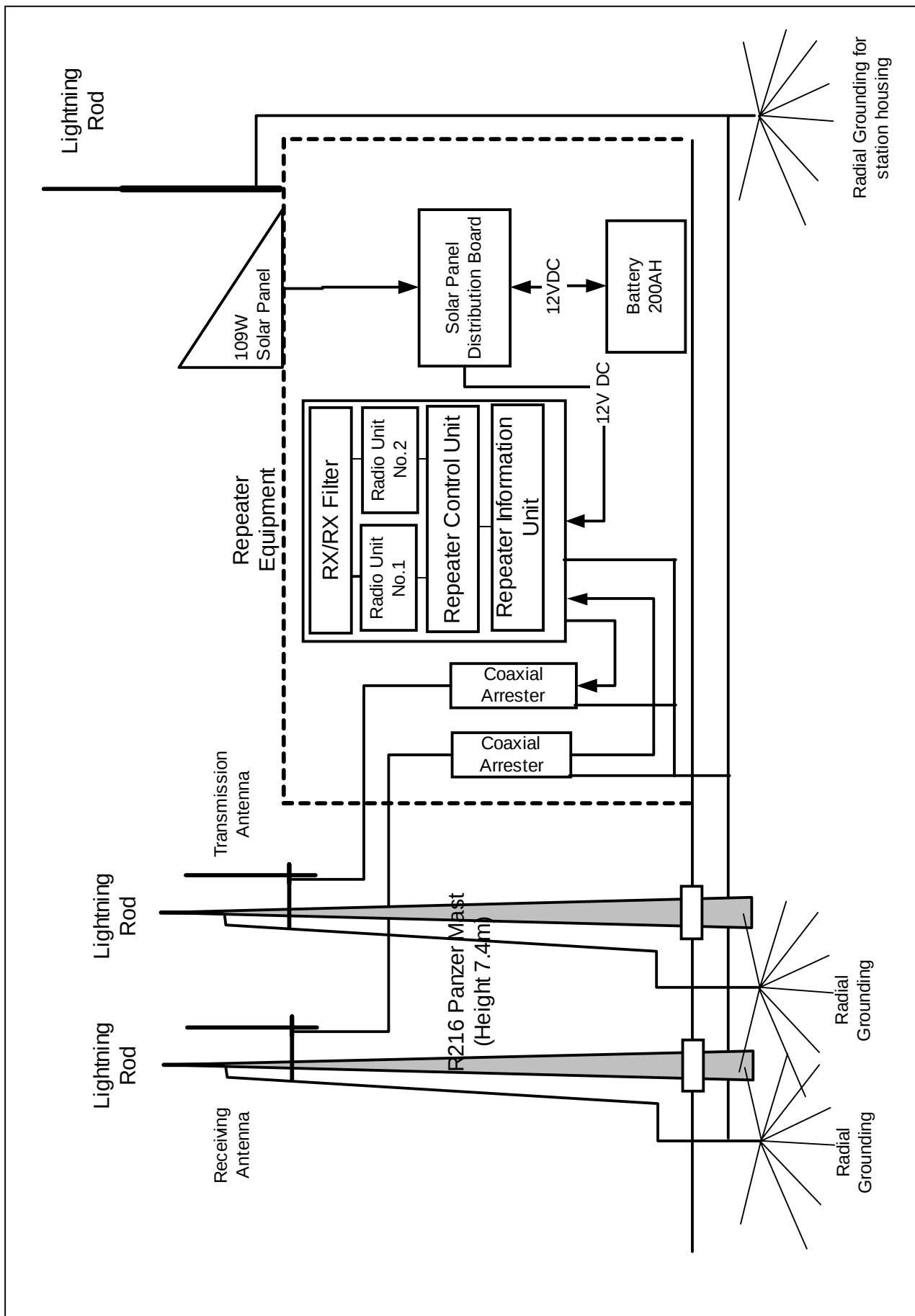


- | | |
|--|---|
| <p> Flood Watch Station</p> <p> Candidate Site of Repeater Station</p> | <p><u>Radio Propagation Condition by Calculation</u></p> <p> Good</p> <p> Fair</p> <p> Inapplicable</p> |
|--|---|

THE MASTER PLAN STUDY ON
FLOOD FORECASTING AND WARNING SYSTEM
FOR ATLAS REGION IN THE KINGDOM OF MOROCCO

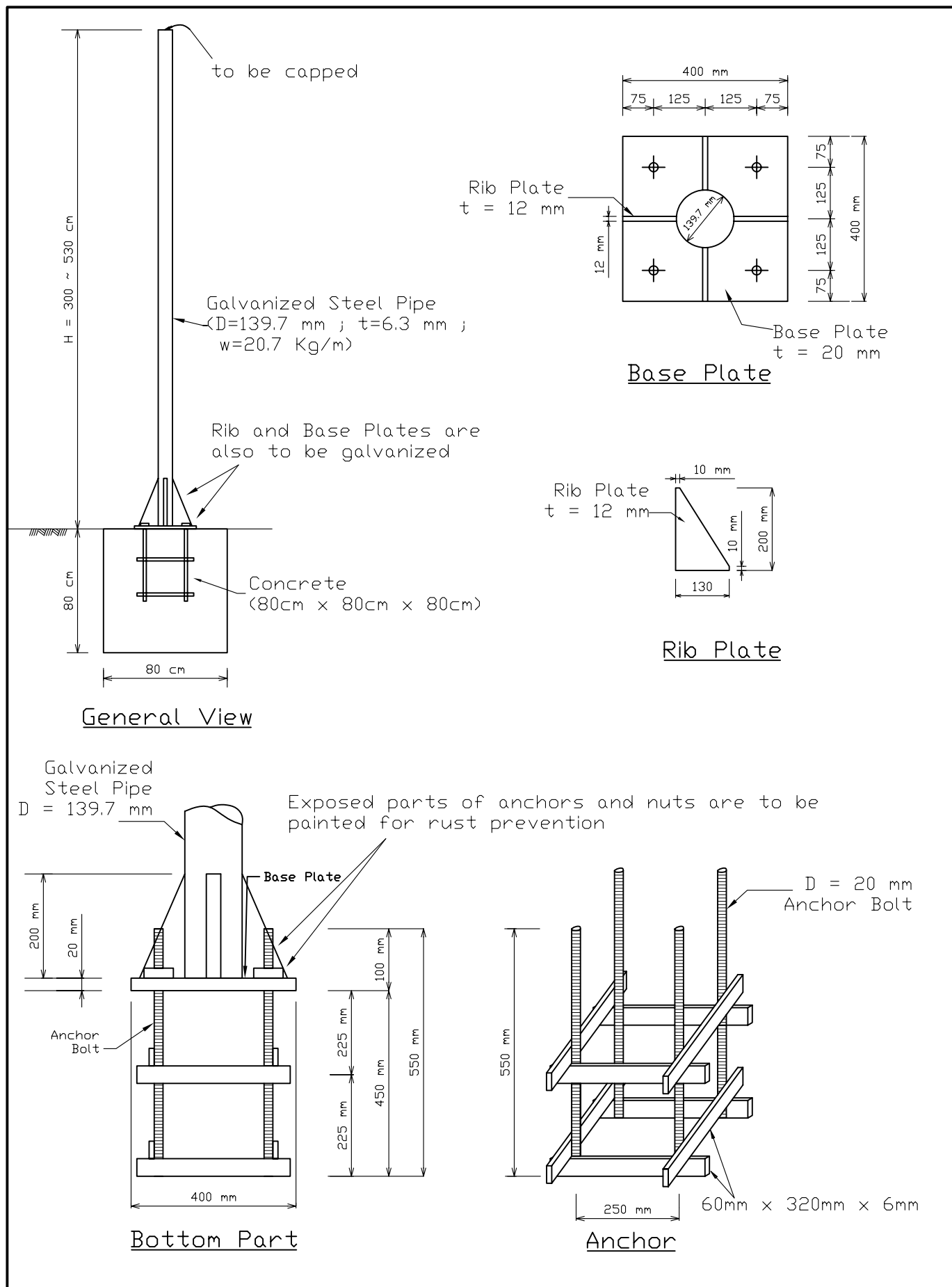
**Fig. 6.4.3 RESULTS OF RADIO CURCUIT
CALCULATION**

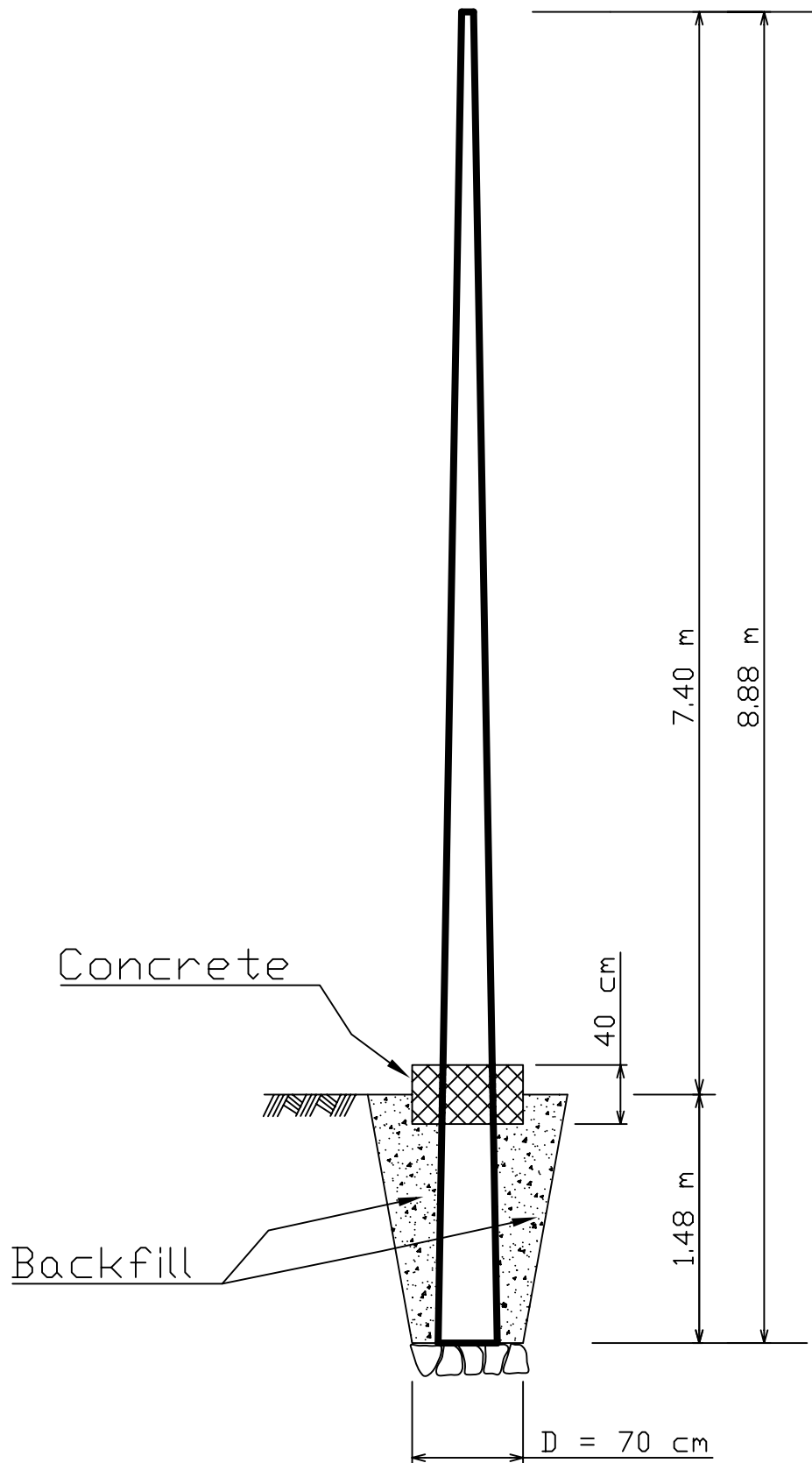


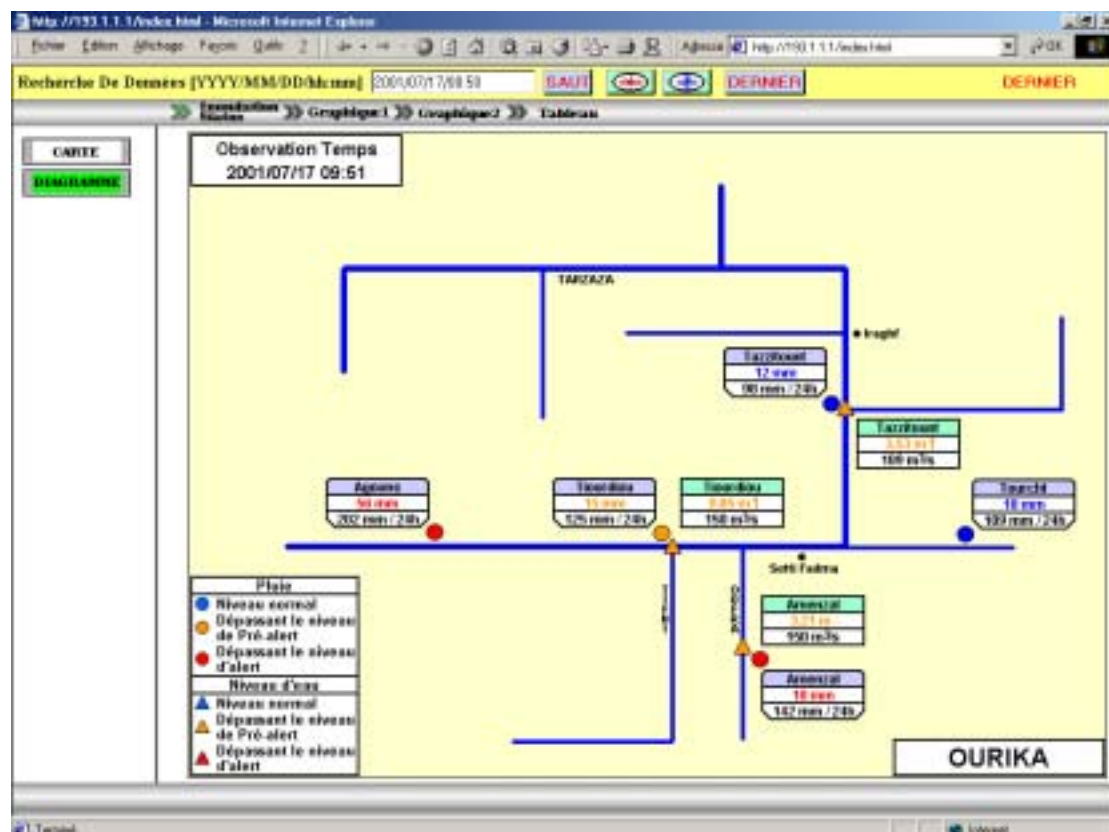
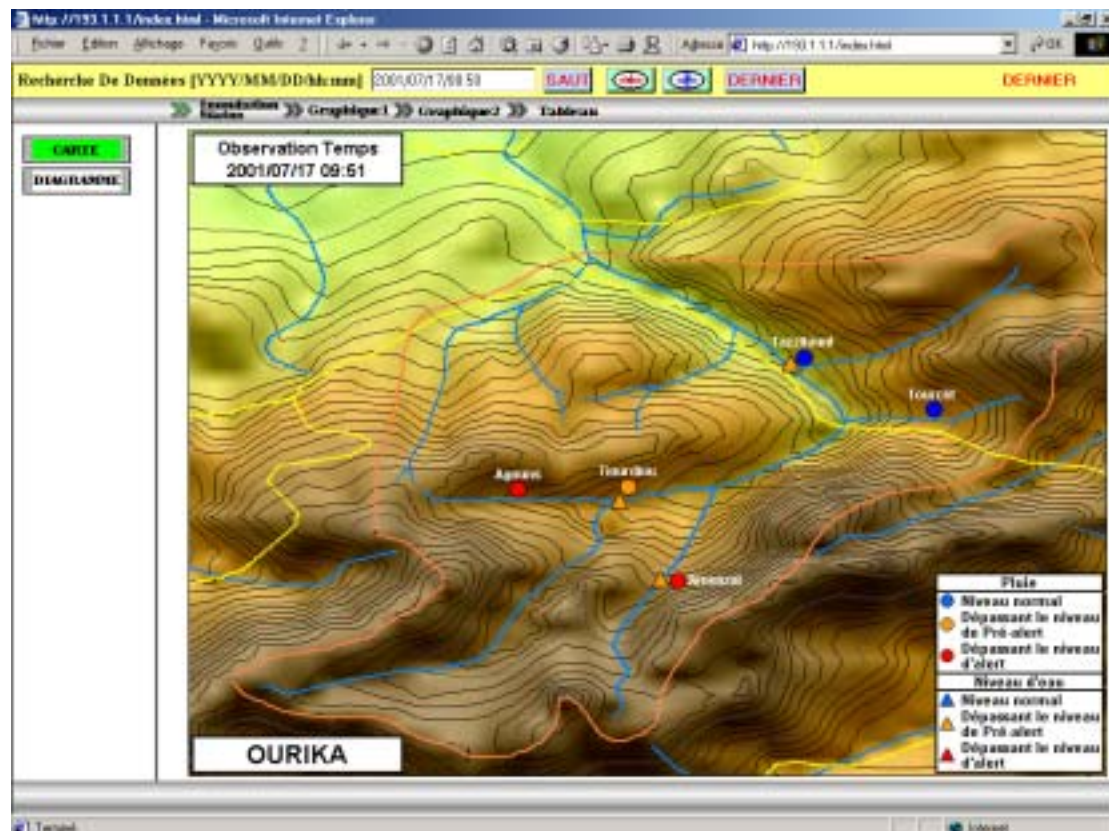


THE MASTER PLAN STUDY ON
FLOOD FORECASTING AND WARNING SYSTEM
FOR ATLAS REGION IN THE KINGDOM OF MOROCCO

Fig.6.4.4(2/2) BLOCK DIAGRAM FOR
REPEATER STATION
(ADRAR TAZAINA)

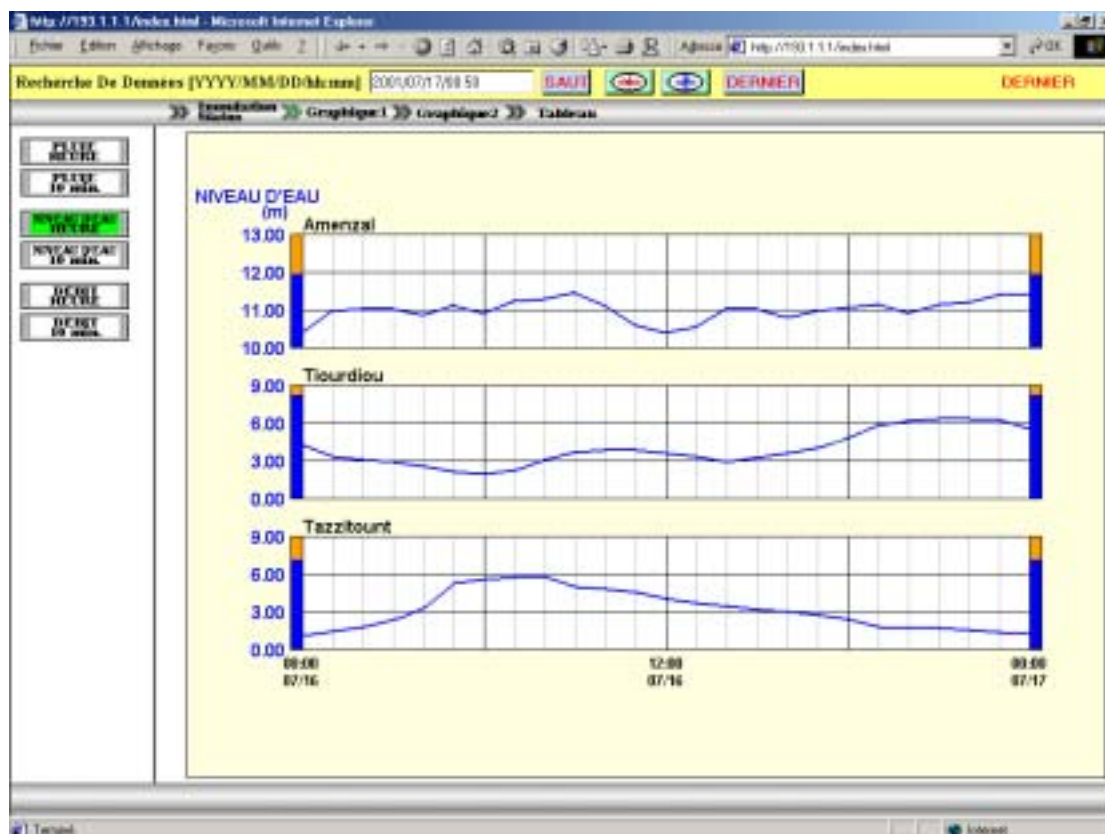
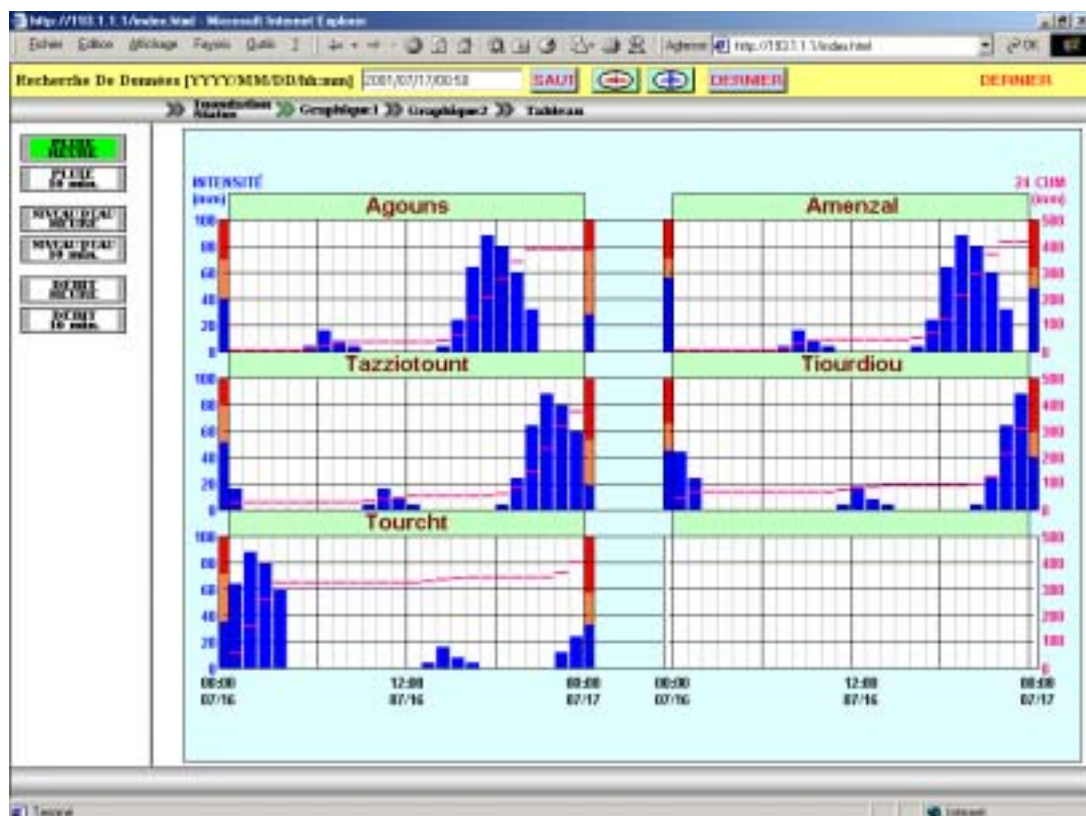






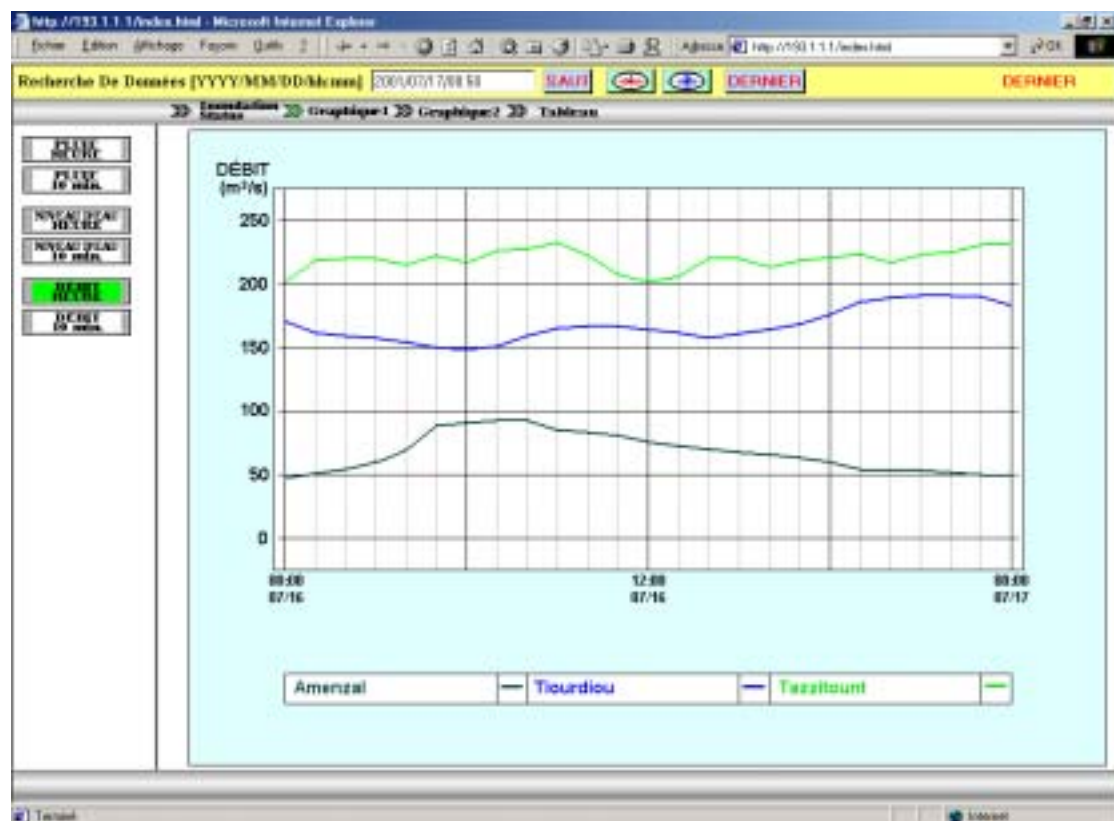
THE MASTER PLAN STUDY ON
FLOOD FORECASTING AND WARNING SYSTEM
FOR ATLAS REGION IN THE KINGDOM OF MOROCCO

Fig. 7.1.3(1/4) EXAMPLES OF GRAPHIC
INFORMATION PROVIDED
BY DRHT



THE MASTER PLAN STUDY ON
FLOOD FORECASTING AND WARNING SYSTEM
FOR ATLAS REGION IN THE KINGDOM OF MOROCCO

Fig. 7.1.3(2/4) EXAMPLES OF GRAPHIC
INFORMATION PROVIDED
BY DRHT



THE MASTER PLAN STUDY ON
FLOOD FORECASTING AND WARNING SYSTEM
FOR ATLAS REGION IN THE KINGDOM OF MOROCCO

Fig. 7.1.3(3/4) EXAMPLES OF GRAPHIC
INFORMATION PROVIDED
BY DRHT

http://193.1.1.1/index.html - Microsoft Internet Explorer

Recherche De Données [YYYY/MM/DD hh:mm] 2001/07/17 00:50 SAUT

Tableau

OBSERVATION TEMPS [Y/MM/DD hh:mm]	Agouss		Amenzal		Tazzitount		Tisourdou		Tourche	
	INTEN [mm]	CUM PL [mm]	INTEN [mm]	CUM PL [mm]	INTEN [mm]	CUM PL [mm]	INTEN [mm]	CUM PL [mm]	INTEN [mm]	CUM PL [mm]
2001/07/16 11:00	6	10	4	10	6	15	4	17	4	7
2001/07/16 12:00	4	11	4	14	3	18	4	21	6	13
2001/07/16 13:00	7	12	9	23	7	25	5	26	8	21
2001/07/16 14:00	3	13	4	27	4	29	5	31	11	32
2001/07/16 15:00	4	14	2	29	4	33	4	35	4	36
2001/07/16 16:00	6	15	3	32	7	40	7	42	2	38
2001/07/16 17:00	6	16	5	37	13	53	12	54	2	40
2001/07/16 18:00	1	17	0	37	4	57	9	63	0	40
2001/07/16 19:00	14	18	10	47	13	70	12	75	3	43
2001/07/16 20:00	7	19	10	57	4	74	3	78	14	57
2001/07/16 21:00	0	20	0	57	0	74	0	78	1	58
2001/07/16 22:00	0	21	1	58	1	75	2	80	1	59
2001/07/16 23:00	0	21	0	58	0	75	0	80	0	59
2001/07/17 00:00	0	0	0	0	0	0	0	0	0	0
2001/07/16 23:00										
2001/07/16 23:10										
2001/07/16 23:20										
2001/07/16 23:30										
2001/07/16 23:40										
2001/07/16 23:50										
2001/07/17 00:00										
2001/07/17 00:10										
2001/07/17 00:20										
2001/07/17 00:30										
2001/07/17 00:40										
2001/07/17 00:50										

EXEMPLE: "" = AUCUNE DONNÉE / ERREUR, -- = INCORRECTES DONNÉES

http://193.1.1.1/index.html - Microsoft Internet Explorer

Recherche De Données [YYYY/MM/DD hh:mm] 2001/07/17 00:50 SAUT DERNIER

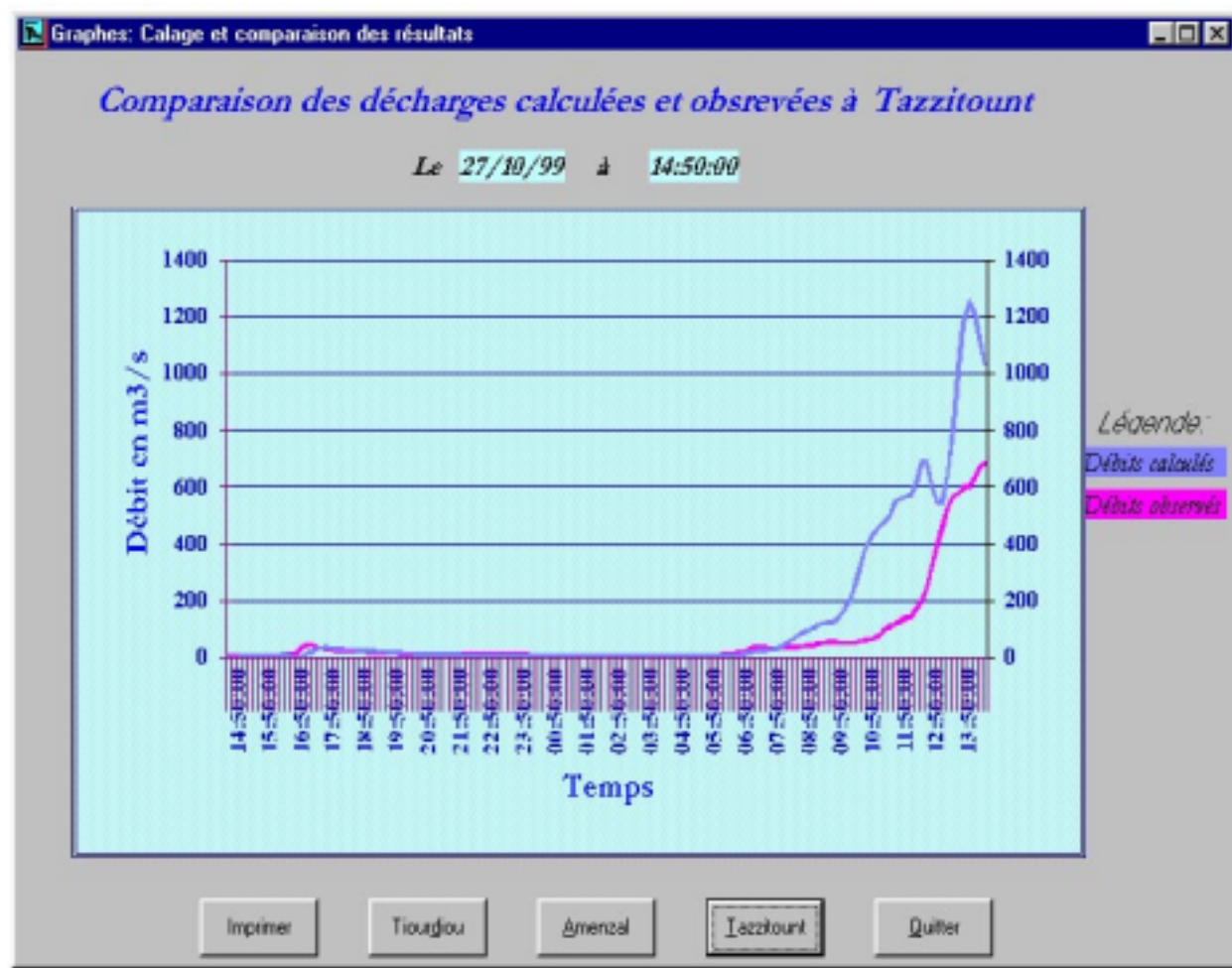
Tableau

OBSERVATION TEMPS [Y/MM/DD hh:mm]	Amenzal			Tazzitount			Tisourdou		
	WTRLV [m]	DÉBIT [m³/s]	MOYBAS [mm]	WTRLV [m]	DÉBIT [m³/s]	MOYBAS [mm]	WTRLV [m]	DÉBIT [m³/s]	MOYBAS [mm]
2001/07/16 11:00	8.10	4	4	8.82	5	2	9.20	4	6
2001/07/16 12:00	8.11	4	4	8.87	5	2	9.18	4	3
2001/07/16 13:00	8.15	4	5	8.72	5	2	9.10	4	7
2001/07/16 14:00	8.22	4	5	8.85	5	0	9.03	4	4
2001/07/16 15:00	8.22	4	4	8.84	5	1	9.03	4	4
2001/07/16 16:00	8.23	4	7	8.88	5	3	9.08	4	7
2001/07/16 17:00	8.27	4	12	8.89	5	5	9.15	5	13
2001/07/16 18:00	8.53	4	9	8.97	5	15	9.45	5	4
2001/07/16 19:00	8.79	4	12	9.08	5	5	9.55	5	13
2001/07/16 20:00	8.83	4	3	8.95	5	1	9.91	5	4
2001/07/16 21:00	8.53	5	0	8.81	10	1	9.95	5	0
2001/07/16 22:00	8.11	4	4	8.87	5	2	9.15	4	3
2001/07/16 23:00	8.53	5	0	8.81	10	1	9.95	5	0
2001/07/17 00:00	8.11	4	4	8.87	5	2	9.15	4	3
2001/07/16 23:00									
2001/07/16 23:10									
2001/07/16 23:20									
2001/07/16 23:30									
2001/07/16 23:40									
2001/07/16 23:50									
2001/07/17 00:00									
2001/07/17 00:10									
2001/07/17 00:20									
2001/07/17 00:30									
2001/07/17 00:40									
2001/07/17 00:50									

EXEMPLE: "" = AUCUNE DONNÉE / ERREUR, -- = INCORRECTES DONNÉES

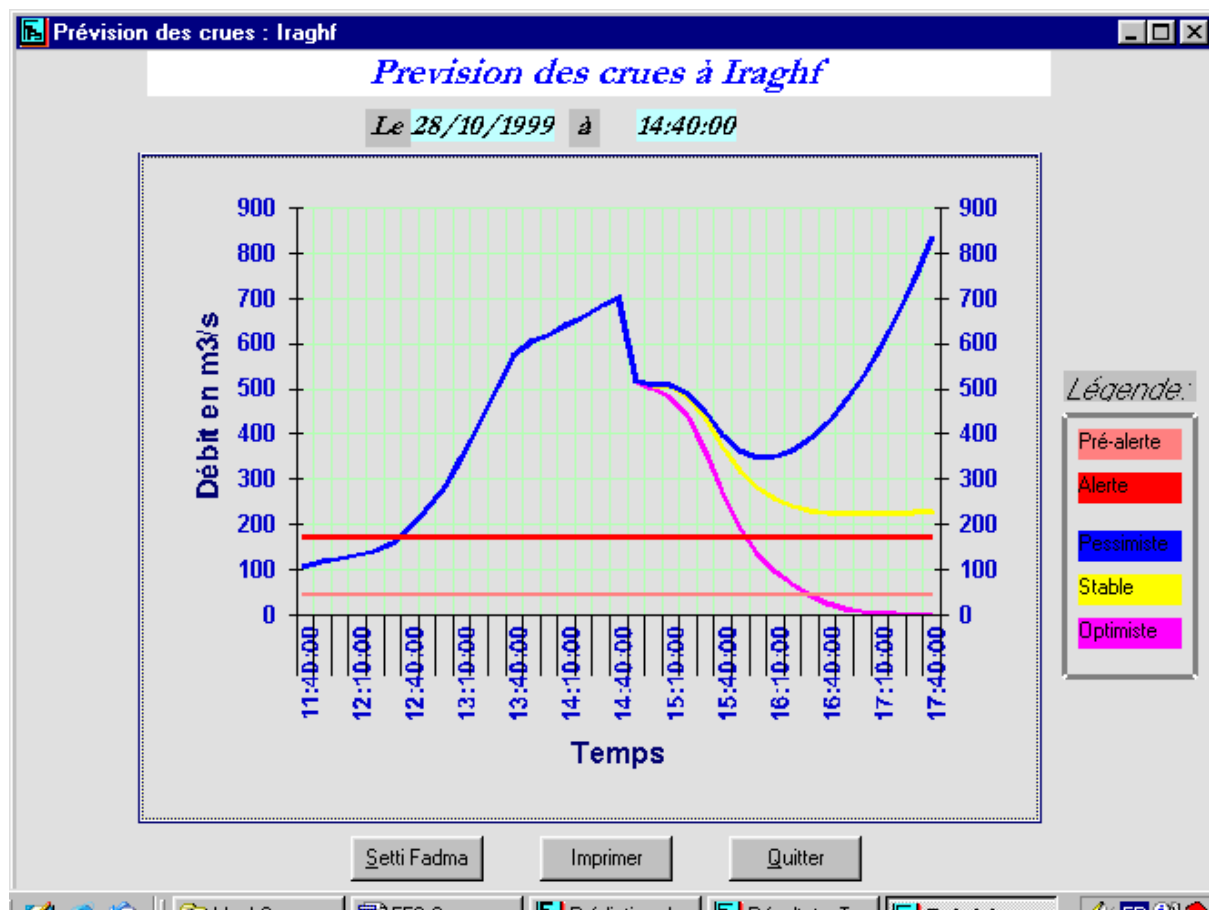
THE MASTER PLAN STUDY ON
FLOOD FORECASTING AND WARNING SYSTEM
FOR ATLAS REGION IN THE KINGDOM OF MOROCCO

Fig. 7.1.3(4/4) EXAMPLES OF GRAPHIC
INFORMATION PROVIDED
BY DRHT



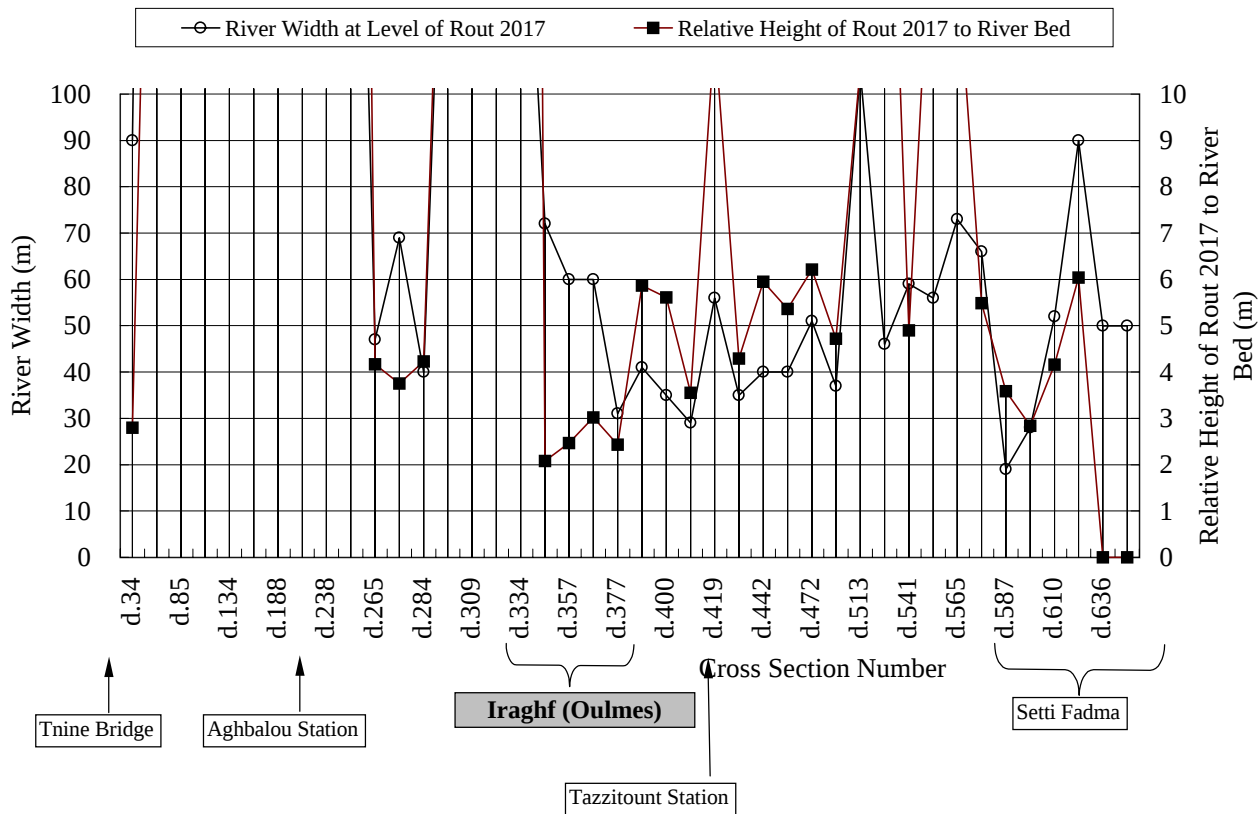
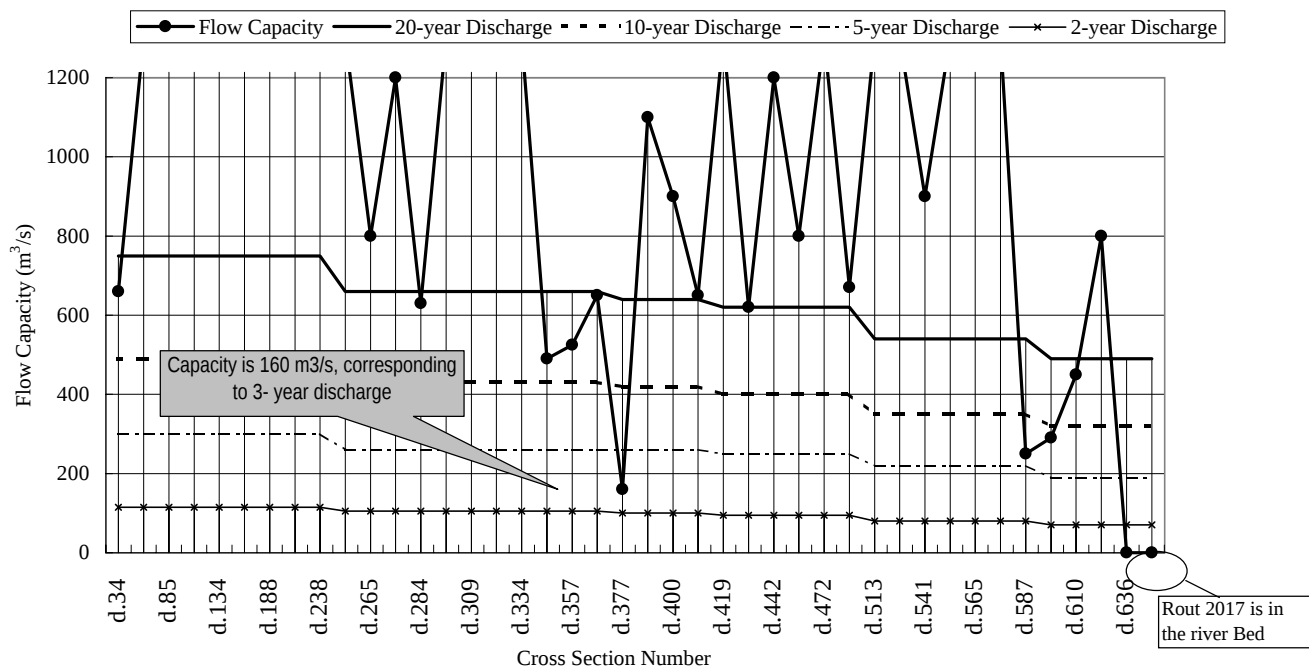
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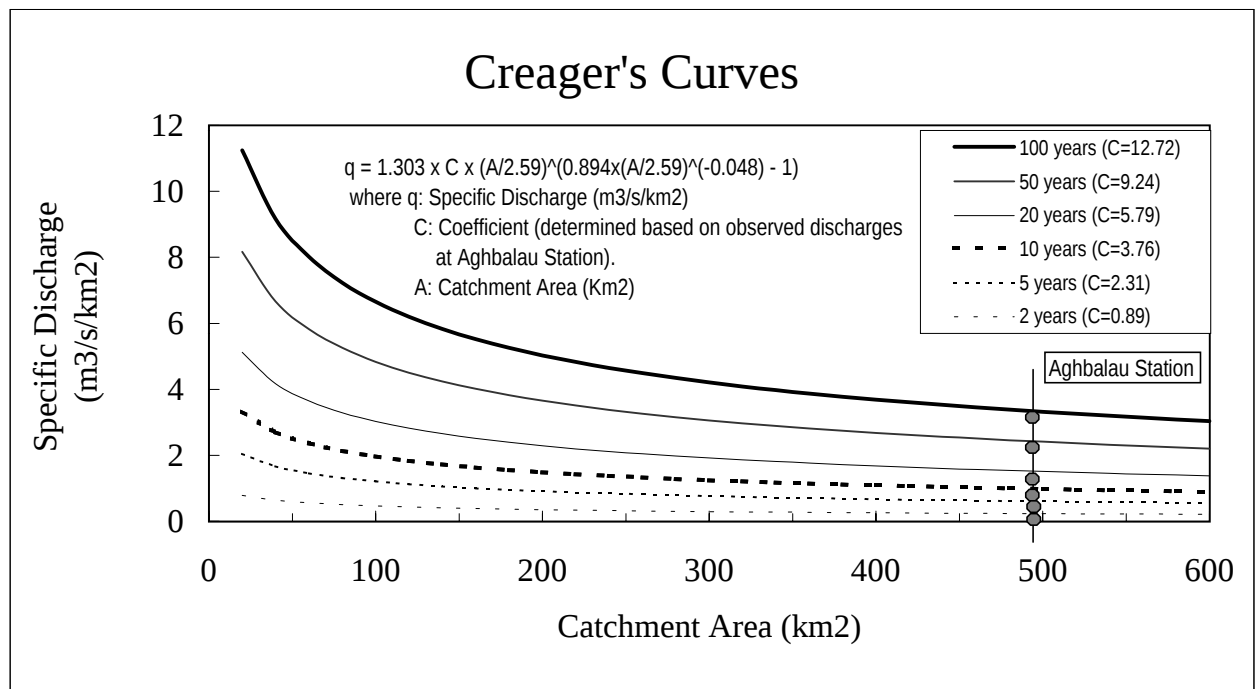
Fig. 7.1.4(1/2) EXAMPLE OF SIMULATION
RESULTS (COMPARISON)



THE MASTER PLAN STUDY ON
FLOOD FORECASTING AND WARNING SYSTEM
FOR ATLAS REGION IN THE KINGDOM OF MOROCCO

Fig. 7.1.4(2/2) EXAMPLE OF SIMULATION
RESULTS (FORECAST)

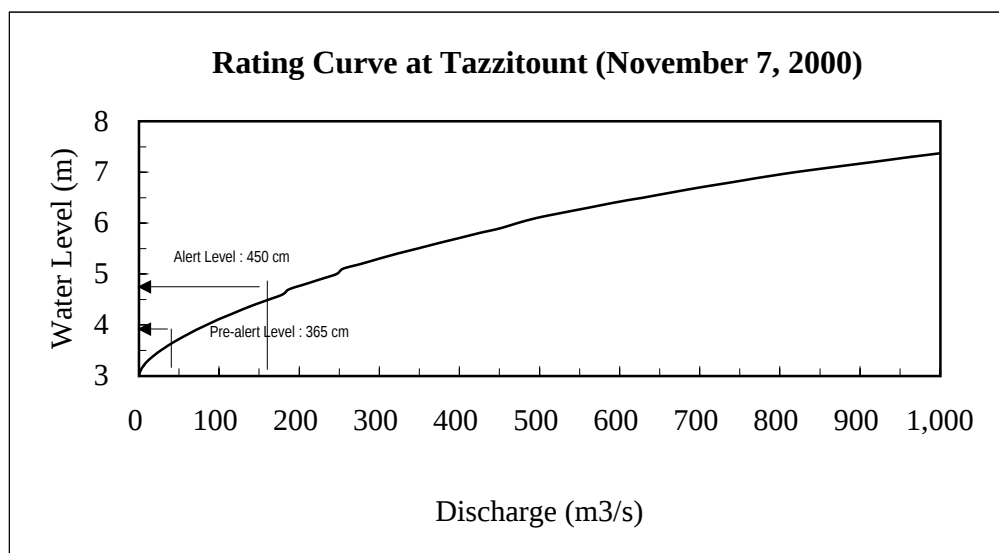
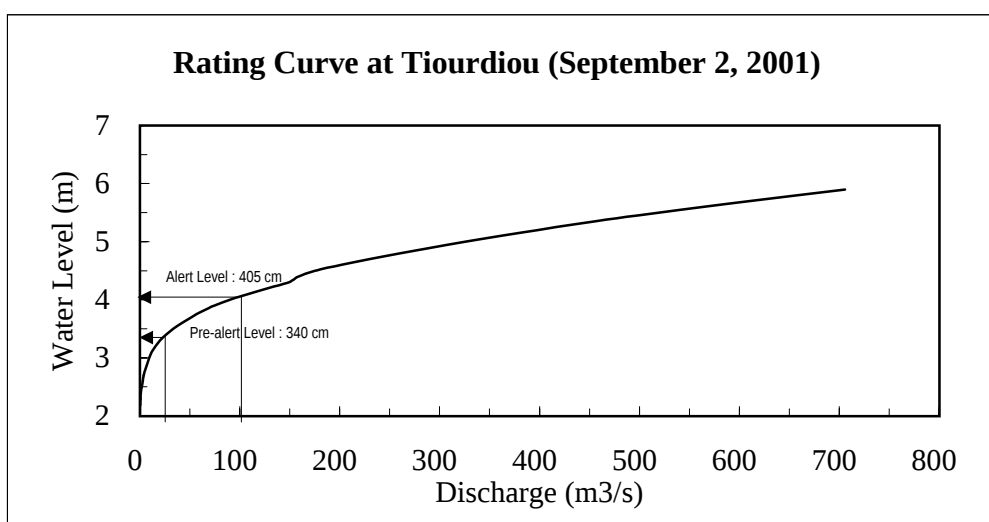
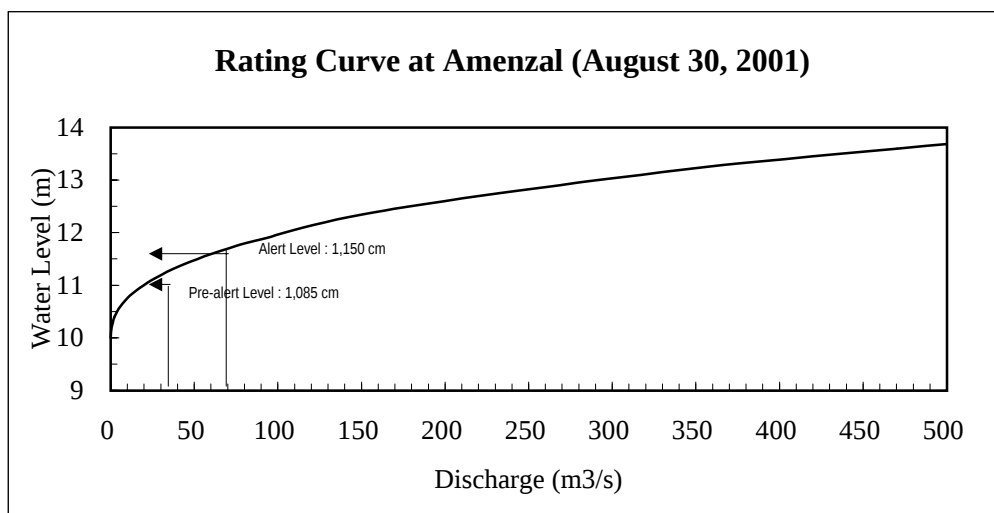


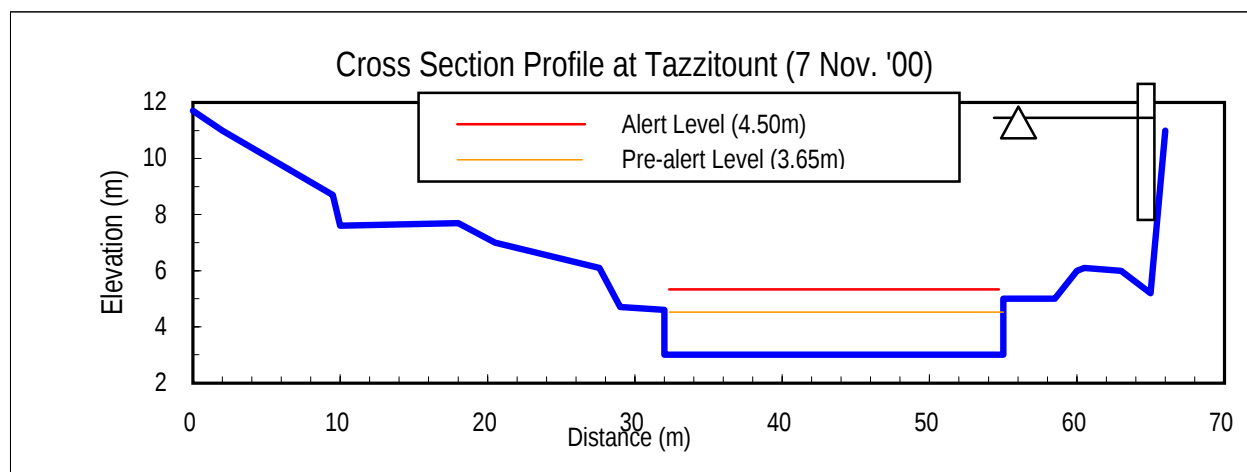
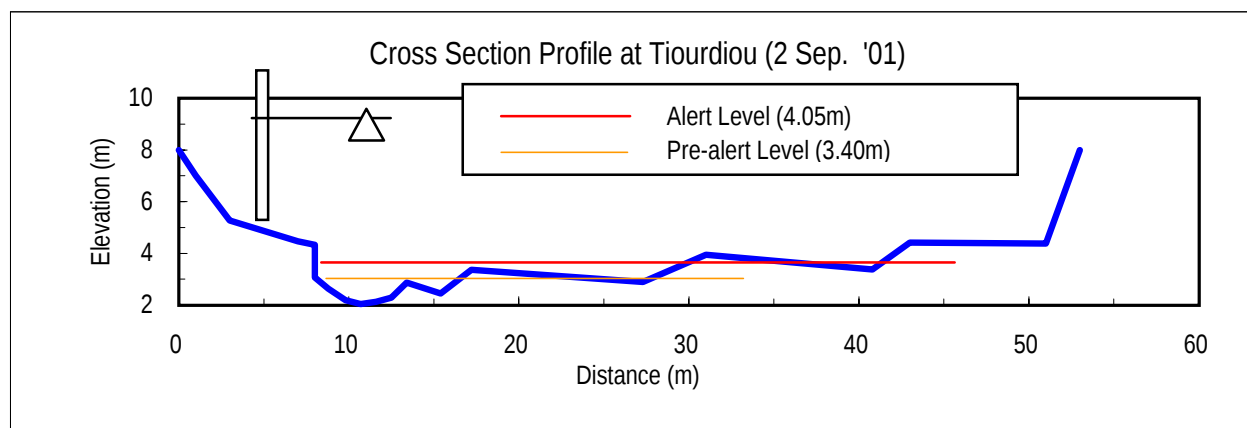
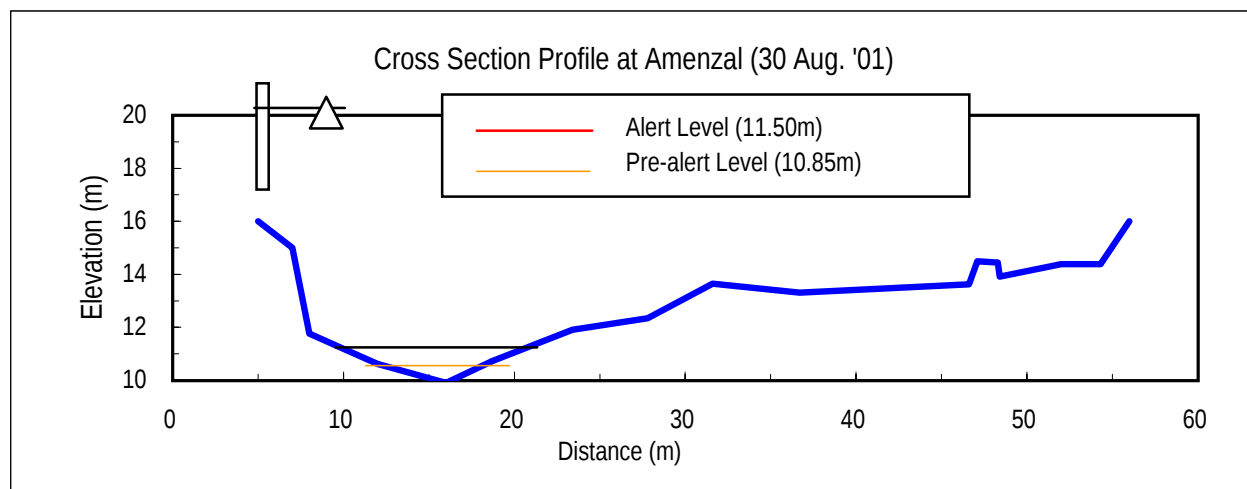


Estimation of Probable Discharge by Return Period

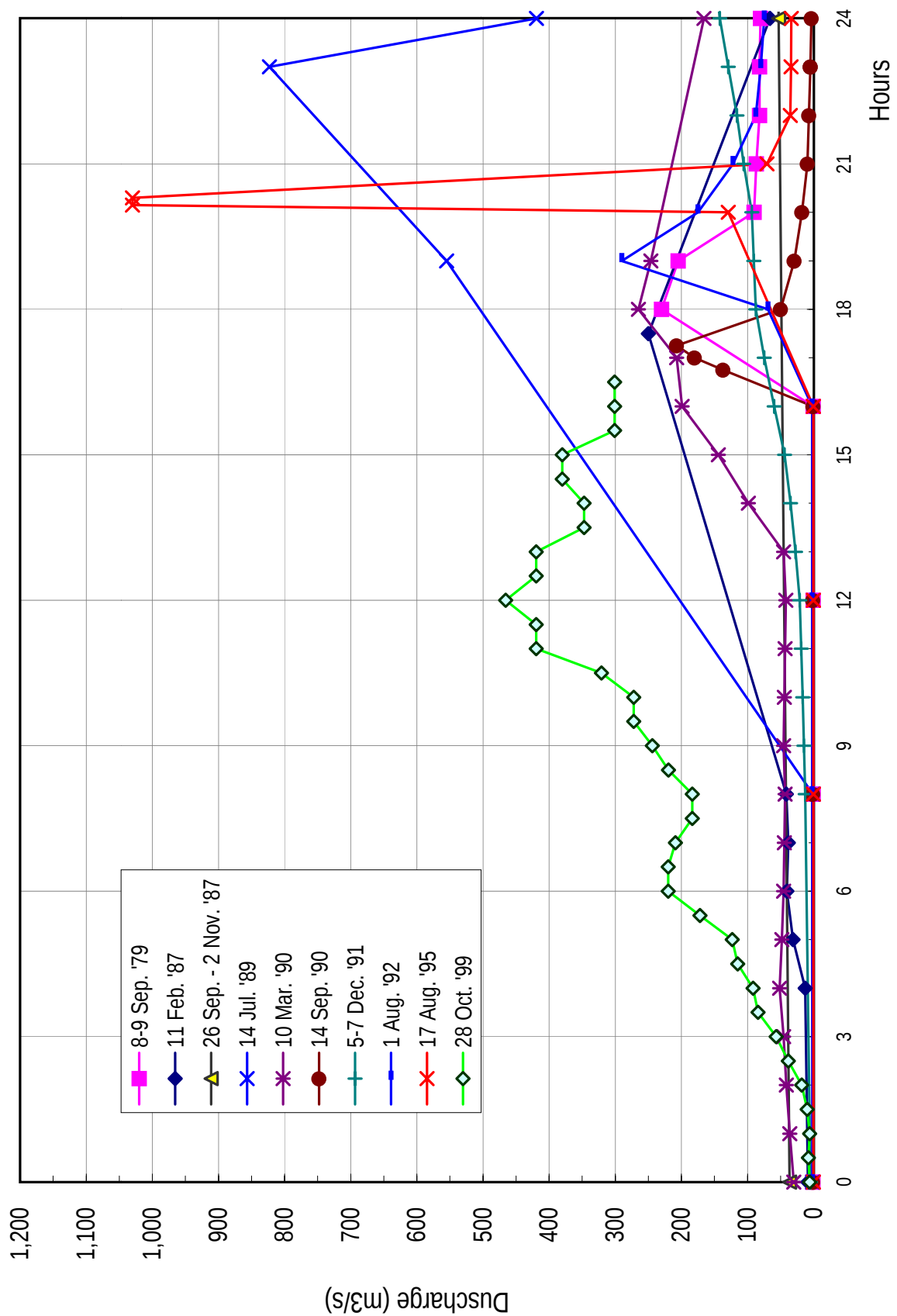
Location	Catchment Area (km ²)	100 years		50 years		20 years		10 years		5 years		2 years	
		(m ³ /s/km ²)	(m ³ /s)	(m ³ /s/km ²)	(m ³ /s)	(m ³ /s/km ²)	(m ³ /s)	(m ³ /s/km ²)	(m ³ /s)	(m ³ /s/km ²)	(m ³ /s)	(m ³ /s/km ²)	(m ³ /s)
Aghbalau Station	495	3.33	1,650	2.42	1,200	1.52	750	0.99	490	0.61	300	0.23	115
Before confluence with Tarzaza R.	390	3.73	1,460	2.71	1,060	1.70	660	1.10	430	0.68	260	0.26	105
Before confluence with Tighzit R.	365	3.85	1,400	2.80	1,020	1.75	640	1.14	420	0.70	260	0.27	100
Tazzitount Station	347	3.94	1,370	2.86	990	1.79	620	1.16	400	0.72	250	0.28	95
Before confluence with Wigrane R.	266	4.44	1,180	3.23	860	2.02	540	1.31	350	0.81	220	0.31	80
Setti Fadma	223	4.80	1,070	3.48	780	2.18	490	1.42	320	0.87	190	0.34	70
Tiourdiou Station	134	5.93	790	4.31	580	2.70	360	1.75	240	1.08	140	0.42	60
Amenzal Station	49	8.58	420	6.24	310	3.91	190	2.54	120	1.56	75	0.60	30

Note: The probable discharges at Aghbalau Station were estimated by DRHT using observed data.





Observed Flood Hydrographs at Aghbalau



MINISTRY OF EQUIPMENT

DIRECTION GENERALE DE L'HYDROULIQUE

DIRECTION DE LA REGIONAL HYDRAULIQUE DE TENSIFT

PRE RIVER FLOOD NOTICE

NO. 23/01

Announced at 15:20, Friday, 21 December 2001

Please be informed that rainfall at Tiourdiou Station reached Pre-alert Level and that the flood is further developing in the Ourika River Basin.

A) RAINFALL

Station	Accumulated Rainfall	15:00 – 15:20 21/12/01	14:00-15:00 21/12/01	Pre-alert Level		Alert Level	
		10 min Rainfall	1 hour Rainfall	10 min	1 hour	10 min	1 hour
Agouns	9	1	4	2	5	6	20
Amenzal	23	0	3	2	5	6	20
Tiourdiou	20	3	5	2	5	6	20
Tourcht	12	1	2	2	5	6	20
Tazzitount	11	1	3	2	5	6	20

B) WATER LEVEL AND DISCHARGE

Station	15:20 21/12/01		Pre-alert Level		Alert Level	
	Water Level (cm)	Discharge (m3/s)	Water Level (cm)	Discharge (m3/s)	Water Level (cm)	Discharge (m3/s)
Amenzal	1,080	6	1,085	13	1,150	50
Tiourdiou	352	36	340	25	405	100
Tazzitount	330	12	365	40	450	160

Destinations:

DPE Al Haouz

Al Haouz Province

DGH

DMN Marrakech

THE MASTER PLAN STUDY ON
FLOOD FORECASTING AND WARNING SYSTEM
FOR ATLAS REGION IN THE KINGDOM OF MOROCCO

**Fig. 7.2.6(1/3) FAX FORM OF FLOOD NOTICE
(PRE RIVER FLOOD NOTICE)**

MINISTRY OF EQUIPMENT

DIRECTION GENERALE DE L'HYDROULIQUE

DIRECTION DE LA REGIONAL HYDRAULIQUE DE TENSIFT

RIVER FLOOD NOTICE

NO. 24/01

Announced at 18:35, Friday, 21 December 2001

Please be informed that water level at Tazzitount Station exceeded Alert Level and that the flood is further developing to cause inundation along Ourika River.

A) RAINFALL

Station	Accumulated Rainfall	18:20 – 18:30 21/12/01	17:00-18:00 21/12/01	Pre-alert Level		Alert Level	
		10 min Rainfall	1 hour Rainfall	10 min	1 hour	10 min	1 hour
Agouns	26	5	14	2	5	6	20
Amenzal	78	4	13	2	5	6	20
Tiourdiou	80	3	8	2	5	6	20
Tourcht	76	4	12	2	5	6	20
Tazzitount	111	3	19	2	5	6	20

B) WATER LEVEL AND DISCHARGE

Station	18:30 21/12/01		Pre-alert Level		Alert Level	
	Water Level (cm)	Discharge (m3/s)	Water Level (cm)	Discharge (m3/s)	Water Level (cm)	Discharge (m3/s)
Amenzal	1,120	43	1,085	13	1,150	50
Tiourdiou	399	85	340	25	405	100
Tazzitount	480	200	365	40	450	160

Destinations:

DPE Al Haouz

Al Haouz Province

DGH

DMN Marrakech

THE MASTER PLAN STUDY ON
FLOOD FORECASTING AND WARNING SYSTEM
FOR ATLAS REGION IN THE KINGDOM OF MOROCCO

**Fig. 7.2.6(2/3) FAX FORM OF FLOOD NOTICE
(RIVER FLOOD NOTICE)**

MINISTRY OF EQUIPMENT

DIRECTION GENERALE DE L'HYDROULIQUE

DIRECTION DE LA REGIONAL HYDRAULIQUE DE TENSIFT

**CANCELLATION OF
PRE-RIVER AND/OR RIVER FLOOD NOTICE**

NO. 25/01

Announced at 22:10, Friday 21, December 2001

Please be informed that rainfall and water level at all the stations in Ourika River Basin has gone down under Pre-alert Level and the river has returned to normal conditions.

A) RAINFALL

Station	Accumulated Rainfall	22:00 -22:10 21/12/01	21:00-22:00 21/12/01	Pre-alert Level		Alert Level	
		10 min Rainfall	1 hour Rainfall	10 min	1 hour	10 min	1 hour
Agouns	34	0	1	2	5	6	20
Amenzal	50	0	0	2	5	6	20
Tiourdiou	43	0	2	2	5	6	20
Tourcht	47	0	0	2	5	6	20
Tazzitount	43	0	0	2	5	6	20

B) WATER LEVEL AND DISCHARGE

Station	22:10 21/12/01		Pre-alert Level		Alert Level	
	Water Level (cm)	Discharge (m3/s)	Water Level (cm)	Discharge (m3/s)	Water Level (cm)	Discharge (m3/s)
Amenzal	1,070	9	1,085	13	1,150	50
Tiourdiou	320	16	340	25	405	100
Tazzitount	360	37	365	40	450	160

Destinations:

DPE Al Haouz

Al Haouz Province

DGH

DMN Marrakech

THE MASTER PLAN STUDY ON
FLOOD FORECASTING AND WARNING SYSTEM
FOR ATLAS REGION IN THE KINGDOM OF MOROCCO

**Fig. 7.2.6(3/3) FAX FORM OF FLOOD NOTICE
(CANCELLATION)**

AL HAOUZ PROVINCE

RIVER FLOOD CAUTION

NO. 23/01

Issued at 15:30, Friday, 21 December 2001

Please be informed that heavy rainfall and/or water level rising are being observed in the Ourika River Basin. You are advised to get prepared against further development of the flood.

Destinations:

Royal Mounted Police

Civil Protection

Tahanaout Cercle

THE MASTER PLAN STUDY ON
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Fig. 7.2.7(1/3) FAX FORM OF FLOOD
WARNING (RIVER FLOOD
(CAUTION)

AL HAOUZ PROVINCE

EVACUATION ADVICE

NO. 24/01

Issued at 18:40, Friday, 21 December 2001

Please be informed that the flood is further developing into a dangerous level in the Ourika River Basin. Those who are in and near the river are advised to evacuate yourself to safer places.

Destinations:

Royal Mounted Police

Civil Protection

Tahanaout Cercle

THE MASTER PLAN STUDY ON
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Fig. 7.2.7(2/3) FAX FORM OF FLOOD
WARNING (EVACUATION
ADVICE)

AL HAOUZ PROVINCE

CANCELLATION OF FLOOD WARNING(S)

NO. 25/01

Issued at 22:20, Friday, 21 December 2001

Please be informed that the flood risk has passed and the river has returned to normal conditions in the Ourika River Basin.

Destinations:

Royal Mounted Police

Civil Protection

Tahanaout Cercle

THE MASTER PLAN STUDY ON
FLOOD FORECASTING AND WARNING SYSTEM
FOR ATLAS REGION IN THE KINGDOM OF MOROCCO

Fig. 7.2.7(3/3) FAX FORM OF FLOOD
WARNING (CANCELLATION)