

### 9.2.10 Selection of Priority Projects

Priority projects that are subject to the Feasibility Study in the next Phase 3 are selected one each for one of the rivers in both the Greater Tunis and Sousse area as mutually agreed before. The selection criteria are;

- higher population affected by flooding,
- higher economic return, and
- less environmental adverse effect.

## 9.3 Flood Damages

### 9.3.1 Methodology

Flooding data on the extent of flooding and its duration in present land use and in future land use conditions is used as a basis for evaluating flood damage. Since at this stage it is impossible to define exact land use for every flooding period, damage assessment has been made for the 100-year return period, and damage for the intervening years has been made on a pro-rata basis according to areas flooded.

The estimation of flood damage is based at this stage on a number of assumptions concerning present and future land use and data on the socio-economic conditions of specific areas. Since the purpose is to prioritize the different oueds and draw up a master plan, a common basis of comparison is made. Detailed evaluations based on site surveys are carried out in the Phase 3 of the study.

Flood damage is assessed based on the following aspects:

#### (1) Damage to housing and residential property

In view of the various factors that affect property values within the same area, including speculation, construction costs are used as a proxy. In general, three types of housing are available. 3% of construction costs are proposed to account for flood damage. The following factors are used:

### Estimated Flood Damage Costs by Building Type

<u>Category</u>	<u>Construction Cost (DT/m<sup>2</sup>)</u>	<u>Flood Damage (DT/m<sup>2</sup>)</u>
Popular housing	200	6.0
Medium standard	350	10.5
High standard	500	15.0

Housing density in the various flooded areas is based on Urban Plans and data used by ONAS.

#### (2) Loss of income by residents/industrial employees

Assuming that duration of flooding will prevent residents from going to work, loss of income will be involved. It is assumed that there are two workers in each household affected. Projections of wages have been made till the year 2020 based on expected growth of GDP (6% p.a. till the year 2000, 5.5% between years 2000 and 2010 and 5% between years 2010 and 2020). On this basis the estimated wages for skilled labor are DT67 per day and for unskilled labor DT22 per day in the year 2020.

#### (3) Damage to factories

3% of construction costs (DT500/m<sup>2</sup>) is taken as a proxy for rehabilitation of factories.

#### (4) Damage to agricultural areas

Since at this stage it is impossible to estimate actual crops damaged, it is proposed to take as a proxy the value of agricultural land for lost income. This varies according to fertility and location, but an average figure is estimated at DT15,000 per hectare and this figure is used.

#### (5) Road damage

It is assumed that in both cases (flooding under present land use and flooding under future land use conditions) roads flooded will need rehabilitation. These are assumed at DT120,000/km for primary road and DT80,000/km for secondary road.

(6) Traffic delays

These are a major element in damages caused through delays and the consequent loss of income. The value of time is taken at 25% of earnings. It is assumed that passengers in private cars and taxis will be in the skilled labor bracket and all others will be unskilled. Rates for the year 2020 are used for the base case, and these are estimated at DT2.1/hour for skilled and DT0.7/hour for unskilled labor. Traffic flows and occupancy rates are based on traffic surveys. Where no data is available, assumptions have been made based on surveys in the vicinity.

Traffic projections are based on GDP growth rates till the year 2000. Lower rates are used beyond that to account for saturation levels: these are 4% p.a. for years 2000 to 2010, and 2% p.a. for years 2010 and 2020.

(7) Increased vehicle operating costs (VOCs)

While it is assumed that the level of flooding will be sufficient to halt traffic completely during the period of inundation, a further impact will be felt in the increase operating costs experienced by vehicles both as a result of more difficult operating conditions and following the degradation in the road surface. This additional cost should be included in the damage assessment. For the purposes of the evaluation it is assumed that increased VOCs will be experienced for a period of 30 days during which the road will be rehabilitated. The costs of increased vehicle operation are based on assumptions from the World Bank HDM model, assuming different degrees of roughness of surfaces in a "with" and "without" situation.

The difference in costs is estimated as follows:

Difference in Vehicle Operating Costs in the Flooded and Non-flooded Cases

(Unit:DT per 1,000 vehicle/km)

<u>Vehicle Type</u>	<u>Non-flooded Case</u>	<u>Flooded Case</u>	<u>Difference</u>
Private car/Taxi	114.51	143.3	28.79
Bus	459.57	511.17	51.60
Light/Medium Goods	247.59	333.70	86.11
Heavy Goods	663.81	900.54	236.73

These rates are applied to the existing and expected traffic flows. It is assumed that damage will be the same in cases of present and future land use conditions.

### 9.3.2 Damage Assessments for the Various Oueds

In line with the methodology described in Sub-section 9.3.1 herein above, assessment of flood damage for each oued in both Greater Tunis and Sousse area was made and the results are summarized below:

#### (1) Oued Enkhilet and Sebket Ariana

##### Summary of Estimated Flood Damages - Present and Future Situation (Unit:1,000DT)

<u>Descriptions</u>	<u>Present</u>	<u>Future</u>
Persons affected	45,600	55,000
Damage to property	19,500	23,790
Loss of income (residents)	1,200	1,500
Road Damage	3,700	3,700
Traffic delays (income loss)	14,600	25,000
Increases vehicle operating costs	1,000	1,000
<u>Total:</u>	<u>40,000</u>	<u>55,000</u>

#### (2) Oued Greb

##### Summary of Estimated Flood Damages - Present and Future Situation (Unit:1,000DT)

<u>Descriptions</u>	<u>Present</u>	<u>Future</u>
Persons affected		1,000
Damage to property (residents)	6,315	8,790
Loss of income (residents)	188	268
Road Damage	632	632
Traffic delays (income loss)	7,509	10,149
Increases vehicle operating costs	402	546
<u>Total:</u>	<u>15,046</u>	<u>20,385</u>

(3) Oued Gariana and Sebkhet Sijoumi

Summary of Estimated Flood Damages - Present and Future Situation (Unit:1,000DT)

<u>Descriptions</u>	<u>Present</u>	<u>Future</u>
Persons affected	45,300	82,400
Damage to property	8,000	14,000
Loss of income (residents)	1,200	2,200
Road Damage	1,500	1,500
Traffic delays (income loss)	17,700	35,500
Increases vehicle operating costs	978	978
<u>Total:</u>	<u>29,378</u>	<u>54,178</u>

(4) Oued Maliyan

Summary of Estimated Flood Damages - Present and Future Situation (Unit:1,000DT)

<u>Descriptions</u>	<u>Present</u>	<u>Future</u>
Persons affected	90,000	90,000
Damage to property (residents)	58,230	58,230
Loss of income (residents)	5,000	5,000
Damage (local road)	4,220	4,220
Traffic delays (income loss)	95,200	95,200
Increases vehicle operating costs	4,300	4,300
Damage to industries	120	120
Loss of incomes (industries)	561	561
<u>Total:</u>	<u>180,731</u>	<u>180,731</u>

It is judged that the present land use and future land use in the inundation area will be unchanged, then the estimated flood damages for the Oued Maliyan basin is common.

(5) Oued Mayzette

Summary of Estimated Flood Damages - Present and Future Situation (Unit:1,000DT)

<u>Descriptions</u>	<u>Present</u>	<u>Future</u>
Zone A	22,297	33,723
Zone B	855	1,200
Zone C	460	609
<u>Total:</u>	<u>23,612</u>	<u>35,533</u>

Notes:

Zone A: This is a residential area consisting mainly of detached housing and four-story housing. According to the Master Plan the area will expand between GP1 and MC33. The flooded area also cuts across the two main roads. Damage in this area will be as follows:

- Damage to housing
- Damage to internal, secondary and major road arteries
- Loss of income to residents due to immobility caused by floods
- Loss of income to drivers and passengers due to traffic delays
- Increased vehicle operating costs

Zone B: This area is agricultural with a few scattered farmhouses. According to the Urban Plan, the area will continue to be agricultural. Damages will be to existing and potential crops.

Zone C: The area that borders the oued consists of agriculture, swamp and grassland. Damages will be to existing and potential crops.

(6) Oued Bou Khamsa

Summary of Estimated Flood Damages - Present and Future Situation (Unit:1,000DT)

<u>Descriptions</u>	<u>Present</u>	<u>Future</u>
Persons affected	9,500	26,700
Damage to property	150	214
Loss of income (residents)	32	469
Loss of income (employee)	41	82
Damage (local roads)	704	1,408

Damage (GP1/MC33E)	504	504
Traffic delays (income losses)	766	9,000
Increased vehicle operating costs	225	938
<u>Total:</u>	<u>2,422</u>	<u>12,615</u>

(7) Oued Ain Zerga

Summary of Estimated Flood Damages - Present and Future Situation (Unit:1,000DT)

<u>Descriptions</u>	<u>Present</u>	<u>Future</u>
Damage to property	1,523	2,027
Loss of income (residents)	216	286
Damage to local roads	380	380
Loss of income (GP1)	4,640	8,980
Increases vehicle operating costs	150	640
<u>Total:</u>	<u>6,909</u>	<u>12,313</u>

(8) Oued Hammam

Summary of Estimated Flood Damages - Present and Future Situation (Unit:1,000DT)

<u>Descriptions</u>	<u>Present</u>	<u>Future</u>
<i>Persons affected</i>		
Damage to property (residents)	4,300	5,160
Loss of income (residents)	246	345
Road Damage	1,580	1,580
Traffic delays (income loss)	29,425	39,250
Increases vehicle operating costs	180	180
Agricultural areas	180	210
Damage to industries	100	150
Loss if income (industries)	232	309
<u>Total:</u>	<u>36,243</u>	<u>47,184</u>

(9) Oued Blibene

Summary of Estimated Flood Damages - Present and Future Situation (Unit:1,000DT)

<u>Descriptions</u>	<u>Present</u>	<u>Future</u>
Zone A	3,226	4,795
Zone B	129	150
Zone C	15	15
<u>Total:</u>	<u>3,370</u>	<u>4,960</u>

Notes:

Zone A: This area is located between the GP1 and the sea, and it can be divided into two land uses. The area between the tourist road and the sea is mainly a tourist area and will remain. It is estimated at 4.5 ha according to future land use conditions. The sea between the two roads (5 ha) consists of spontaneous housing, and is designated in the future as an area for mixed and collective housing.

Zone B: This zone can be split into two major land uses. The area near the fork is densely populated and is marked with residential zones and industries. The future of this area is designated for rehabilitation and relocation projects. The rest of the area adjoining the Oued Kharroub is presently used for small and limited agricultural activities. Future use of this area depends on the scenario adopted.

Zone C: The area bordering the north fork of the Oued Blibene is at present marked with a medium rate of occupancy (50%) of residential housing and spontaneous settlements.

(10) Oued Hallouf

Summary of Estimated Flood Damages - Present and Future Situation (Unit:1,000DT)

<u>Descriptions</u>	<u>Present</u>	<u>Future</u>
Loss of income (industries)	131.8	197.2
Loss of income (residents)	14.9	30.9
Damage to industries	1,260	1,690
Damage to housing	375	1,050
Traffic delays (income losses)	9,870	15,060
Increased vehicle operating costs	600	600
Road damage	220	220
Agricultural losses	270	60
<u>Total:</u>	<u>12,741</u>	<u>18,908</u>



(11) Oued Hamdoun

Summary of Estimated Flood Damages - Present and Future Situation (Unit:1,000DT)

<u>Descriptions</u>	<u>Present</u>	<u>Future</u>
Loss of income (industries)	47	47
Damage to industries	720	720
Traffic delays (income losses)	3,630	4,000
Increased vehicle operating costs	300	300
Road damage	92	92
Agricultural losses	2,000	2,000
<u>Total:</u>	<u>6,789</u>	<u>7,259</u>

#### 9.4 Economic Evaluations of Selected Alternative Cases

##### 9.4.1 Estimate of Annual Average Benefit

The annual average benefit is defined as the reduction of probable flood damage under the with- and the without-project situations. On the basis of the estimated damages of each probable flood, the annual average benefit is calculated by the following formula.

$$B = \sum_{i=1}^n 1/2 [D(Q_{i-1}) + D(Q_i)] \cdot [P(Q_{i-1}) + P(Q_i)]$$

where,

- B : Annual average benefit
- D(Q<sub>i-1</sub>), D(Q<sub>i</sub>) : Flood Damage caused by the floods with Q<sub>i-1</sub> and Q<sub>i</sub> discharges, respectively
- P(Q<sub>i-1</sub>), P(Q<sub>i</sub>) : Probabilities of occurrence of Q<sub>i-1</sub> and Q<sub>i</sub> discharges, respectively
- n : Number of floods applied

##### 9.4.2 Economic Project Cost

The economic costs of the project are nominal figures that duly reflect the true economic value of goods and services involved. These costs are used only for the economic evaluation of the project. Transfer items such as taxes and duties imposed on construction materials and equipment, including government subsidy and contractor's profit, are excluded from the elements of financial cost. It is assumed that 10% of the financial construction cost is deemed as the transfer items.

Land has to be acquired for project implementation, and its economic value is considered to correspond to the productivity foregone by the project, which is reflected by the price. Land acquisition cost is then included in the economic cost. Also, the construction cost of

improvement works for urban drainage is included in the economic cost since the above said annual average benefit contains that from the urban drainage.

### 9.4.3 Economic Evaluation

The project is evaluated from the economic viewpoint by figuring out the viability in terms of economic internal rate of return (EIRR). All the monetary calculation is based on the price level of April 1993, and the project life (for economic evaluation) is fixed for 50 years.

The calculation of EIRR is based on the cost and benefit streams that is prepared from the above-said economic cost and the annual average benefit in accordance with the implementation schedule.

The lead time of 2 years is considered for the works of design and tender, etc. It is assumed that the river improvement works for 10-year probable flood will be completed by the year 2000 in every case, and the project cost is evenly disbursed year to year. The river improvement works for 100-year flood is continued just after the completion of the 10-year works and the same annual project cost is assumed to be disbursed.

The improvement works for the urban drainage is continued in accordance with the extension of urbanization until the target year of 2020. The operation and maintenance cost is taken for 0.5 % of the accumulated project cost in the respective year.

The cost and benefit streams prepared for each oued is shown in Tables 9.1 to 9.11, and the estimated EIRR is summarized as follows.

<u>Name of Oued</u>	<u>EIRR(%)</u>
<u>Greater Tunis Area</u>	
Ennkhilet	12
Greb	8
Gariana	4
Maliyan	12
Mayzette	10
Bou Khamsa	7
Ain Zerga	10

#### Greater Sousse Area

Hammam	18
Blibene	5
Hallouf	13
Hamdoun	5

### 9.5 Selection of Priority Project

As a result of comparative study on alternative plans for objective rivers, the priority projects to be selected would be the following.

#### Greater Tunis Area

- 1st priority : Oued Maliyan improvement (Oued Hamma river improvement including flood control dam project)
- 2nd priority : Oued Ennkhilet improvement (Lower reaches channel improvement)

#### Greater Sousse Area

- 1st priority : Oued Hammam (Channel improvement )
- 2nd priority : Oued Hallouf (Channel improvement)

Accordingly first priority projects above will be the project on which the feasibility study be made during the Phase 3 of the study.

The JICA Study Team explained the study result of Master Plan to MOEH at the beginning of Phase 3. Both parties exchanged their views on the first priority projects to be selected. As a result, MOEH showed a strong request the JICA Study Team to adopt the first priority project the "Oued Ennkhilet" case instead of "Oued Maliyan" case in Greater Tunis area from technical and environmental viewpoints. JICA Tokyo eventually accepted MOEH's request. MOEH has no objection for the first priority project in Greater Sousse area be "Oued Hammam" case as the JICA Study Team recommends.

### 9.6 Recommendations

One priority project each has been selected for both the Greater Tunis and Sousse area for further study, that is, feasibility study on it. However it will take some times until such projects are to be implemented in the future, then it is recommendable MOEH and other

government agencies concerned to take necessary actions to mitigate flood damages and to improve the environmental situation of the project area by taking following measures.

- Prevention of garbage disposal to river channel
- Prevention of effluent of untreated sewer water and industrial water to river channel
- Removal of trees planted on the river bed
- *Construction of small-scaled retarding basins as needed*
- Rehabilitation and construction of urban drainage system
- Removal of squatters in the river channel and/or on the shore of sebkhet

It requires a close cooperation for MOA, ONAS and other government agencies concerned to carry out the feasibility study on the selected priority projects. Then it is requested MOEH will organize a steering committee consisting of members of MOEH and from those government agencies, and the Study Team.

## ***TABLES***



TABLE 1.1 GROWTH OF GROSS DOMESTIC PRODUCT BY SECTOR, 1987 TO 1991  
(in million Dinars)  
(Constant Prices 1990)

	1987	1988	1989	1990	1991
Agriculture/Fisheries.	1,585.0	1,176.0	1,243.0	1,587.0	1,830.0
Industry	2,704.9	2,768.2	2,916.9	3,094.2	3,228.7
Tourism	401.4	448.1	435.5	432.0	287.4
Other Non Administrative Services	2,831.7	3,098.7	3,190.6	3,307.8	3,377.9
Gross Domestic Production at factor cost	7,523.0	7,491.0	7,786.0	8,421.0	8,724.0
Admin-Services	1,173.0	1,211.0	1,260.0	1,313.0	1,368.0
<b>GROSS DOMESTIC PRODUCT AT FACTOR COST</b>	<b>8,696.0</b>	<b>8,702.0</b>	<b>9,046.0</b>	<b>9,734.0</b>	<b>10,092.0</b>
Net taxes etc.	1,144.0	1,145.0	1,167.0	1,256.0	1,287.0
<b>GROSS DOMESTIC PRODUCT AT MARKET PRICES</b>	<b>9,840.0</b>	<b>9,847.0</b>	<b>10,213.0</b>	<b>10,990.0</b>	<b>11,379.0</b>
Rate of Growth	6.7%	0.1%	3.7%	7.6%	3.5%

TABLE 1.2 GROWTH OF GROSS DOMESTIC PRODUCT BY SECTOR, VIII Plan 1992-1996  
(in million Dinars)  
Annual Growth (%)

	1992	1993	1994	1995	1996	
Agriculture/Fisheries.	1,800	1,800	1,900	2,020	2,141	2.0%
Industry						
Industry (Manufact.)	1,868	2,001	2,187	2,405	2,649	8.67%
Ind. Non Manuf	1,573	1,603	1,686	1,735	1,794	3.54%
Services	4,120	4,333	4,618	4,936	5,286	8.06%
*Tourism	(480)	(509)	(542)	(579)	(624)	
6.78%						
<b>GROSS DOMESTIC PRODUCT AT MARKET PRICES</b>						
	12,163	12,658	13,469	14,353	15,319	
Rate of Growth	6.9%	4.1%	6.4%	6.6%	6.7%	6.0%

TABLE 1.3 COMPARISON OF THE MAIN PARAMETERS OF THE VII AND VIII PLANS  
(Annual Growth at Constant Prices 1990)

	VII PLAN	VIII PLAN
GDP	4.2	6.0
PER CAPITA INCOME	2.1	4.1
CONSUMPTION	2.7	4.2
INVESTMENT	0.5	9.6
IMPORTS	6.5	7.5
EXPORTS	10.8	9.1
AVERAGE INVESTMENT RATE	21.5	25.5
EMPLOYMENT CREATION (in 000)	204	320

TABLE 1.4 ESTIMATES OF EXISTING AND FUTURE POPULATION IN TUNIS DISTRICT

DISTRICT	1984	1988	1991	1996
TUNIS	773,469	826,998	874,371	952,953
ARIANA	375,087	487,806	554,302	695,143
BEN AROUS	246,193	299,948	334,376	411,054
TOTAL	1,394,749	1,614,752	1,763,049	2,049,150

TABLE 1.5 GOVERNORATE OF SOUSSE - ESTIMATION OF POPULATION BY  
DELEGATION - 1 JAN 1992

DELEGATION	TOTAL	POPULATION COMMUNAL	RURAL	RATE OF URBANISATION
AKOUDA	16,900	13,800	3,100	81.66
HAMMAM SOUSSE	25,200	25,200	0	100.00
KALAA KEBIRA	43,100	37,700	5,400	87.47
KALAA SGHIRA	16,900	14,900	2,000	87.17
M'SAKEN	75,400	58,300	17,100	77.32
SIDI BOU ALI	16,350	8,100	8,250	49.54
SIDI EL HANI	11,150	0	11,150	0.00
SOUSSE JAOUHARA	56,750	56,750	0	100.00
SOUSSE MEDINA	40,150	40,150	0	100.00
SOUSSE RIADH	30,750	30,750	0	100.00
TOTAL SOUSSE	403,400	302,300	101,100	76.94



Table 1.6

BASE SOCIO-ECONOMIC DATA FOR GREATER TUNIS,  
1989 GOVERNORATES (1/2)

	TUNIS	ARIANA	BEN AROUS	TUNISIA
SURFACE AREA (000 ha)	28.8	158.2	68.70	155,000
POPULATION	815,800	517,800	297,090	7,909,600
* Male	416,100	267,900	154,500	4,013,800
* Female	399,700	249,900	142,600	3,895,800
Density (Hab/km <sup>2</sup> )	2,832.6	325.3	432.4	50.8
Net Migration (1984/1989)	(-69,800)	(+53,500)	(+32,100)	0
Population Growth Rates (1984/1989)				
* Total	1.0%	6.3%	3.6%	2.4%
* Urban	1.0%	6.8%	4.5%	3.0%
* Rural	-	4.6%	5.1%	1.6%
Urbanisation				
- Urban Population	815,800	105,100	276,300	4,685,400
* Urban/Total	100.0%	78.2%	93.0%	59.2%
EMPLOYMENT				
- Active Population	275,600	161,700	102,700	2,360,600
- Unemployed	45,300	22,700	15,300	316,600
- Rate of unemployment (%)	17.6%	15.6%	15.9%	15.3%
- Sectoral Distribution				
* Agriculture	1.0%	6.9%	25.8%	
* Manufacturing Ind.	21.4%	30.2%	19.3%	
* Traditional	9.1%	9.2%	14.3%	
* Services	64.8%	53.7%	39.0%	
* Others	3.7%		1.6%	
PER CAPITA INCOME	779	471		
HOUSEHOLD DATA				
No. of households	168,500	96,800	57,800	1,458,100
* of which urban	(168,500)	(77,700)	(53,900)	(897,600)
Household size	4.8	5.3	5.2	5.4
* Urban	(4.8)	(5.2)	(5.1)	(5.4)
Potable Water				
- Households connected in urban areas	94.3%	70.7%	89.7%	58.2%
Households connected with drainage	84.4%	67.4%	54.7%	

Table 1.6

BASE SOCIO-ECONOMIC DATA FOR GREATER TUNIS,  
1989 GOVERNORATES (2/2)

	TUNIS	ARIANA	BEN AROUS	TUNISIA
<b>SOCIO-ECONOMIC DATA</b>				
<b>Education</b>				
- Illiteracy rate	24.8%	34.4%	22.6%	37.1%
- Urban literacy	98.1%	87.5%	73.2%	
- Rural literacy	-	66.1%	39.3%	
<b>- Schools (1991/2)</b>				
* Primary Schools	191	157	114	3,940
* Students (Primary)	118,131	90,814	55,685	1,417,803
* Students (Secondary)	62,749	29,537	23,967	518,522
<b>ii) Health</b>				
- Doctors	1,162	234	134	4,313
- Population/Doctor	702	2,213	2,217	1,800
- No. of beds	3,991	1,178	-	16,116
- Beds per 1000 inhabitants	5.57	2.27	-	1.98
- General Hospitals	4	-	-	
- Health centres	43	42	33	1,510

Source: National Institute of Statistics, Annual 1989; Statistical Data from Governorates of Tunis, Ariana and Ben Arous.

TABLE 1.7 BASIC SOCIO ECONOMIC PARAMETERS OF THE GOVERNORATE  
OF SOUSSE 1984 AND 1989

	1984	1989
SURFACE AREA (000 ha)	266.9	266.9
POPULATION		
* Total	322,500	380,300
* Male	164,100	191,400
* Female	158,400	188,900
- Density (Hab/km <sup>2</sup> )	123.0	142.5
POPULATION GROWTH RATES (1984/1989)		
- Rate of growth	2.7%	3.2%
* Urban	2.5%	3.1%
* Rural	3.0%	3.4%
LEVEL OF URBANISATION		
- Urban	228,600	287,200
* Urban/Total	70.9%	75.5%
NET MIGRATION (1984/1989)	+5,800	+6,700
EMPLOYMENT		
- Active Population	100,000	126,900
- Unemployed	9,900	16,900
- Rate of unemployment (%)	9.9%	13.3%
- Sectoral Distribution (%)		
* Agriculture	13.9%	16.7%
* Manufacturing Ind.	26.1%	27.9%
* Mines/energy	1.1%	1.1%
* Construction etc.	15.4%	11.6%
* Commerce, Bank/Transpt	18.8%	21.3%
* Admin/other services	21.8%	21.0%
* Others	2.9%	0.4%
HOUSING		
No. of Houses	64,000	77,400
No. of households	60,600	73,000
* of which urban	(43,600)	(56,000)
Household size	5.3	5.1
*Urban	5.3	5.1
DRAINAGE		
* Houses connected to ONAS	54.9%	57.1%
* Ditches, cess pits	25.5	34.7
* Others	19.7	8.2

TABLE 1.8 STRUCTURE OF EMPLOYMENT IN THE GOVERNORATE OF SOUSSE

BRANCH	1984	%	1989	%
AGRICULTURE AND FISHERIES	11,940	14.4	17,677	16.8
MANUFACTURING	22,270	26.8	29,472	28.0
MINES AND ENERGY	940	1.1	1,239	1.2
CONSTRUCTION AND PUBLIC WORKS	13,210	15.9	12,321	11.7
COMMERCE, TOURISM, SERVICES AND BANKING	19,530	23.5	22,495	21.3
SERVICES AND ADMINISTRATION	15,160	18.3	22,195	21.0
TOTAL	83,050		105,399	

Source: Atlas of Sousse, Governorate of Sousse

TABLE 1.9 GOVERNORATE OF SOUSSE: MAJOR ACTIVITIES BY DELEGATION, 1984

DELEGATION	MAJOR ACTIVITIES (% employed)
SOUSSE	Manufacturing (33%); Commerce and Tourism, (32%);
M'SAKEN	Construction (23%); Manufacturing (21%), Commerce (18%);
K SEGHIRA	Manufacturing (32%); Commerce etc. (21%);
K KEBIRA	Construction (27%); Manufacturing (27%), Agriculture (19%);
AKOUDA	Manufacturing (29%); Commerce etc. (21%).

Table 2.1 Summary of Laboratory Soil Test

LOCA- TION	DEPTH (m)	Gs	W <sub>n</sub> (%)	GRADATION				CONSISTENCY			COMPACTION		PERMEA- BILITY (cm/sec)	CLASSI- FICA- TION
				GRVL (%)	SAND (%)	SILT (%)	CLAY (%)	LL (%)	IP (%)	OMC (%)	MDD (ton/m <sup>3</sup> )			
T-1	0.0-3.0	2.67	10.4	32	19	23	19	43.3	21.0	15.7	1.79	5.6E-7	GC	
T-2	0.0-3.0	2.68	18.0	0	7	27	66	58.2	38.2	21.2	1.64	3.1E-9	CH	
T-3	0.0-3.0	2.64	15.1	1	12	37	50	42.7	24.4	16.1	1.76	8.1E-10	CL	
S-1	0.0-3.0	2.69	10.3	0	60	27.5	12.5	28.1	16.3	11.9	1.89	1.8E-4	SC	
S-2	0.0-3.0	2.67	5.3	0	72	24	4	24.9	N.P	12.5	1.86	1.5E-3	SP-SM	
S-3	0.0-3.0	2.69	9.9	0	41	32	27	30.6	16.1	14.6	1.80	8.2E-5	CL	
S-4	0.0-3.0	2.66	6.4	1	65	24	11	28.1	15.2	10.7	1.92	3.2E-4	CL	
S-5	0.0-0.8	2.62	7.7	0	45	34	21	29.4	15.6	11.5	1.86	7.6E-5	CL	
	0.8-3.0	2.69	13.5	0	35	35	30	36.0	19.0	15.2	1.78	8.7E-6	CL	

**LEGEND**

Gs : specific gravity,  
W<sub>n</sub>: natural moisture content,  
GRVL: gravel,

LL : liquid limit,  
IP : plasticity index,

Table 3.1 List of Existing Rainfall Gauge Station

No		Code	Name of Station	Creation	Altitude	Gradient		Depres			
						Latitude	Longitude	Latitude	Longitude	Latitude	Longitude
1	T	40154	AIN DJAJA PONT DU FAHS	1952	193	40 41 25	8 34 45	36 37 22	36 22	9 8 50 9	5 51
2	T	40196	AIN FAOUAR	1962	320	40 39 00	8 52 00	36 34 20	36 21	10 00 52	10 0
3	T	40946	BIR HALIMA BOU REMADA	1921	193	40 44 30	8 56 30	36 39 97	36 24	10 04 39	10 3
4	T	40961	BIR MECHARGE BGE		120	40 57 05	8 53 10	36 51 35	36 31	10 01 51	10 1
5	T	40962	BIR MCHERGA SM	1934	155	40 57 00	8 49 00	36 51 30	36 31	9 56 92	9 58
6	T	41058	BORJ CHAKIR	1908	63	40 85 00	8 60 00	36 76 50	36 46	10 07 72	10 5
7	T	41290	BOUCHA ECOLE	1967	200	40 55 70	8 39 50	36 50 13	36 30	9 53 96	9 53
8	T	41307	BOU ARADA II	1953	248	40 39 00	8 10 00	36 35 10	36 21	9 62 72	9 36
9	T	41311	BOU ARADA DRE		260	40 39 90	8 08 60	36 34 92	36 21	9 61 46	9 37
10	T	41336	BOU CHLAKA	1962	235	40 60 60	8 73 10	36 54 54	36 33	10 19 51	10 12
11	T	41347	BOU REBIA	1929	67	40 66 50	8 65 10	36 59 95	36 36	10 12 31	10 7
12	T	41593	CHARTER EX ETTOUILA	1964	207	40 36 80	8 35 60	36 33 12	36 20	9 8 59 4	9 52
13	T	41632	CHALALIG	1962	420	40 23 00	8 41 00	36 20 70	36 12	9 9 06 2	9 54
14	T	41697	COOP GHORBANE	1964	285	40 48 00	8 15 00	36 43 20	36 26	9 67 22	9 40
15	T	41776	CRETEVILLE	1950	80	40 73 70	8 87 90	36 66 33	36 40	10 32 83	10 20
16	T	41782	DAMNET EL HELBA	1962	125	40 60 00	8 61 70	36 54 00	36 32	10 09 25	10 6
17	T	41833	DEPIENNE GARE	1954	149	40 51 00	8 54 50	36 45 90	36 28	10 02 77	10 2
18	T	41897	DJ BOU KORNINE ECOLE	1963	200	40 52 60	8 32 00	36 47 34	36 28	9 8 25 2	9 50
19	T	41899	DJ BOU KORNINE GRIFFET		205	40 51 00	8 33 20	36 45 90	36 28	9 8 36 0	9 50
20	T	41923	DJEBEL DJOUGGAR CFPA	1930	320	40 30 00	8 45 00	36 27 00	36 16	9 9 42 2	9 57
21	T	42248	DOMAINE DECHAMUNE	1964	50	40 71 20	8 84 40	36 64 08	36 38	10 29 68	10 18
22	T	42379	DACHRET MEDJEN	1962	515	40 37 00	8 61 00	36 33 30	36 20	10 06 62	10 5
23	T	42520	INAT ECOLE SM		10	40 92 00	8 72 00	36 82 80	36 50	10 18 52	10 11
24	T	42538	EL HAMMA AMONT	1969	170	40 58 50	8 06 00	36 52 85	36 32	10 31 84	10 19
25	T	42544	EL HAMMA AVAL		34	40 74 45	8 82 05	36 67 01	36 40	10 27 57	10 17
26	T	42597	FALUVETTE DOMAINE	1925	178	40 44 70	8 40 00	36 40 23	36 24	9 8 97 2	9 54
27	T	43050	HALG ENNEB		220	40 26 20	8 63 70	36 25 36	36 15	10 11 05	10 7
28	T	43055	HAMMEM BT JEDIDI		80	40 44 00	8 82 80	36 39 60	36 24	10 37 33	10 22
29	T	43927	LABORATOIRE DE L'ARIANA	1960	18	40 94 25	8 72 60	36 84 83	36 51	10 19 06	10 11
30	T	44121	MANOUBA		68	40 69 00	8 61 00	36 79 20	36 48	10 06 62	10 5
31	T	44156	MARJAT DU FAHS	1972	210	40 40 10	8 21 00	36 36 09	36 22	9 7 25 2	9 44
32	T	44415	MENZAH 6 LE PADDAGE		38	40 96 30	8 69 90	36 86 67	36 52	10 16 54	10 10
33	T	44505	MOGRANE CSA/SM	1953	155	40 48 00	8 61 50	36 43 20	36 25	10 09 07	10 5
34	T	44896	OUED EL KHADRA		310	40 36 00	8 52 10	36 34 20	36 21	10 00 61	10 0
35	T	45199	POTIN BERGERIE	1957	126	40 75 43	8 94 10	36 67 89	36 41	10 36 41	10 23
36	T	45238	FAHS OMVVM		185	40 42 40	8 41 48	36 38 16	36 23	9 9 10 5	9 55
37	T	45246	PONT DU FAHS ESSOUANI	1969	175	40 43 00	8 39 10	36 38 70	36 23	9 8 63 1	9 53
38	T	45416	ROBAA GN	1970	590	40 10 50	8 03 90	36 09 45	36 6	9 57 23	9 34
39	T	45496	OUED EZZIT		100	40 48 30	8 85 60	36 41 67	36 25	10 30 76	10 18
40	T	45998	SIDI AOUIDET		375	40 24 60	8 23 90	36 22 14	36 13	9 7 52 3	9 45
41	T	46108	SIDI ARFA	1950	543	40 33 20	8 11 90	36 29 99	36 18	9 6 44 3	9 39
42	T	46232	SIDI BOU BAKER BGE KB SM	1921	340	40 27 80	8 29 00	36 25 02	36 15	9 7 90 3	9 48
43	T	46386	SIDI HAMID	1964	162	40 45 00	8 48 00	36 40 50	36 24	9 9 69 2	9 58
44	T	46868	ISMINDJA DEPIENNE	1951	145	40 50 50	8 51 70	36 45 45	36 27	10 00 25	10 0
45	T	47054	ISOXRA		5	40 96 30	8 60 74	36 86 67	36 52	10 26 39	10 16
46	T	47406	BARRAGE TAHOUNA		210	40 61 00	9 00 60	36 54 90	36 33	10 44 26	10 27
47	T	47422	TARF CHENA	1927	260	40 39 65	8 20 50	36 35 69	36 21	9 7 21 7	9 43
48	T	47620	TELLET ERRAIE	1950	470	40 27 68	8 14 50	36 24 91	36 15	9 6 57 7	9 40
49	T	47623	TELLET ESSAFRA		190	40 50 70	8 72 20	36 45 63	36 27	10 18 70	10 11
50	T	47816	TURJRO MAJUS	1969	178	40 42 90	8 38 00	36 39 61	36 23	9 8 72 2	9 53
51	T	47832	TUNIS CARTHAGE SM	1924	5	40 94 00	8 79 00	36 84 60	36 51	10 24 82	10 15
52	T	47836	TUNIS MANOUBIA	1872	66	40 87 15	8 70 65	36 78 44	36 47	10 17 31	10 10
53	T	48000	MNIHLA EX VILLE JAQUE		112	40 96 80	8 65 90	36 87 12	36 52	10 12 49	10 7
54	T	48075	ZAGHOUAN SM	1908	184	40 44 80	8 67 50	36 40 32	36 24	10 14 47	10 9
55	T	48076	ZAGHOUAN DRE		184	40 44 80	8 67 50	36 40 32	36 24	10 14 47	10 9
56	T	48077	ZAGHOUAN PF	1960	230	40 47 25	8 65 75	36 42 53	36 26	10 12 90	10 8
57	S	70593	AKOUDA SM		40	39 85 10	9 14 90	35 86 59	35 52	10 57 04	10 34
58	S	70747	BALAOUM KALAAT KEBIRA		47	39 87 70	9 07 00	35 88 93	35 53	10 41 02	10 25
59	S	71637	CHOTT MARIEM CRGR		20	39 91 43	9 14 70	35 92 26	35 55	10 56 95	10 34
60	S	72004	JEMMEL	1970	30	39 58 30	9 36 00	35 62 47	35 37	10 76 12	10 46
61	S	72525	EL ONK SE	1960	91	39 66 00	9 00 40	35 69 40	35 42	10 44 08	10 26
62	S	73063	HAMMAM SOUSSE		10	39 83 60	9 18 10	35 85 42	35 51	10 60 01	10 36
63	S	73509	KALAA KEBIRA		50	39 85 40	9 11 70	35 86 96	35 52	10 54 25	10 33
64	S	73510	KALAA SEGHIRA	1966	55	39 80 50	9 14 20	35 82 45	35 49	10 56 50	10 34
65	S	74396	JEMMEL CFPA		30	39 59 50	9 25 90	35 63 55	35 36	10 69 73	10 42
66	S	74603	MASAKEN DELG SM	1933	62	39 70 25	9 15 60	35 73 23	35 44	10 57 76	10 35
67	S	74951	OUED LAYA	1929	63	39 76 90	9 11 36	35 79 21	35 48	10 53 94	10 32
68	S	76210	SIDI BOU ALI		20	39 95 90	9 04 30	35 95 31	35 58	10 47 59	10 29
69	S	76400	SIDI EL HANT CTV		75	39 64 70	8 86 30	35 68 23	35 41	10 31 39	10 19
70	S	76788	SKANES MONASTIR SM	1968	15	39 72 21	9 35 17	35 74 99	35 45	10 76 37	10 45
71	S	77072	SOUSSE PF	1967	53	39 79 20	9 22 40	35 81 28	35 49	10 63 08	10 38
72	S	78232	ZERAMDINE		104	39 53 00	9 33 50	35 57 70	35 35	10 73 67	10 44

Note: T) station in Greater Tunis, S) station in Sousse (for column 2)

Source: "Annuaire Pnytomique de Tunisie", Direction General des Ressources en Eau

Table 3.2 Annual Maximum Daily Rainfall (1/2)

No	Nc	Code	Name of Station	Annual Maximum Daily Rainfall												
				69/69 (mm)	69/70 (mm)	70/71 (mm)	71/72 (mm)	72/73 (mm)	73/74 (mm)	74/75 (mm)	75/76 (mm)	76/77 (mm)	77/78 (mm)	78/79 (mm)	79/80 (mm)	
1	T	1	43154	AIN DJAJA PONT DU FAHS	15.5	149.0	86.0	27.5	80.0	76.0	36.0	93.5	39.6	32.5	18.5	34.3
2	T	2	43156	AIN FAOUAR	31.0	137.0	120.0	62.0	127.0	92.0	65.0	30.0	51.0	32.0	37.0	43.0
3	T	3	40946	BIR HALIMA BOU REMADA	27.5	102.5	150.0									
4	T	4	40961	BIR MECHARGE BGE							78.7	100.1	40.6		27.0	63.5
5	T	5	40962	BIR MCHERGA S.M	21.5	43.7	89.3	46.0			65.5	78.2	30.0		18.0	29.2
6	T	6	41058	BORJ CHAKIR	32.0	112.0	59.0	34.0			54.0	122.4	47.0		23.0	31.3
7	T	7	41290	BOUCHA ECOLE	22.5	115.0						40.0	37.0	27.0	26.0	53.0
8	T	8	41307	BOU ARADA II	25.0	119.0	60.0	30.0	56.4		49.0	83.0	43.0	28.2	35.0	41.0
9	T	9	41311	BOU ARADA DRE									41.6	26.0	43.4	36.0
10	T	10	41335	BOU CHLAKA	19.0	93.0	76.0			140.0	95.5	120.0	46.4		35.5	54.0
11	T	11	41347	BOU REBIA	46.5	108.0		48.0		107.0	79.7	112.5	32.2		31.5	26.0
12	T	12	41583	CHARTER EX ETTOUILA			80.0	40.0	66.5		55.0	73.0	39.7	30.0	25.0	42.3
13	T	13	41632	CHLALIG	23.0	105.0	129.0	61.0	100.0	133.0	50.0	130.0	56.0	36.0	30.0	70.0
14	T	14	41697	ICOOP GHORBANE	28.0	140.0	73.2	32.2	72.0		54.5	99.0	39.5	21.5	20.2	49.7
15	T	15	41775	CRETEVILLE	25.7	69.4	107.1	60.6	68.0	123.0	95.0	111.4	50.0	27.0	48.0	38.0
16	T	16	41762	DAMNET EL HELBA	32.0	88.0	74.7		85.0		34.0	96.4	45.0		17.0	36.5
17	T	17	41833	DEPIENNE GARE	24.2	93.0	114.2	39.0	65.0	87.0	80.0	100.0	34.2		29.0	90.5
18	T	18	41897	DJ BOU KORNINE ECOLE	25.0	115.0	100.0	32.5	139.2		55.5	82.0	35.0		25.0	53.5
19	T	19	41899	DJ BOU KORNINE GRIFFET						25.0	48.0				17.1	32.0
20	T	20	41923	DJEBEL DJOUGGAR CFPA	25.5	120.7	125.5	47.5	116.0	130.0	170.0	125.0	52.3		36.5	53.3
21	T	21	42248	DOMAINE DECHAMUNE	27.3	110.0	80.2	79.0	76.2	150.0	80.0	113.7	48.0		50.0	42.0
22	T	22	42379	DAGHRET MEDIEN	43.0	140.0	100.0	65.0		52.5	43.7	130.2	45.0	22.0	19.4	56.0
23	T	23	42520	INAT ECOLE S.M												
24	T	24	42536	EL HAMMA AMONT		109.0	160.0	43.5	69.8	164.0	86.0	67.5	59.2	39.6	34.0	44.5
25	T	25	42544	EL HAMMA AVAL												
26	T	26	42597	FAUVETTE DOMAINE			100.5	35.0	77.3	48.5	45.2	52.0	38.3		17.0	63.5
27	T	27	43060	HALG ENNEB											31.4	65.0
28	T	28	43065	HAMMEM BT JEDIDI											47.0	35.3
29	T	29	43927	LABORATOIRE DE L'ARIANA	32.6	64.5	47.7	30.0	75.0	91.0	30.5	57.5	47.5	39.5	28.5	90.5
30	T	30	44121	MANOUBA												
31	T	31	44155	MARJA PT DU FAHS						81.5	60.0	93.3	41.0	40.5	18.7	
32	T	32	44415	IMENZAH 6 LE PADDAGE												
33	T	33	44505	IMOGRANE CSA/S.M	31.4	122.0	136.0	63.2	55.9	164.0	91.0	144.2		26.8	26.9	70.0
34	T	34	44896	IOUED EL KHADRA									50.5	43.5	31.6	96.5
35	T	35	45198	POTIN BERGERIE	48.6	20.1	89.5				68.1	117.0	46.5		42.8	42.7
36	T	36	45238	FAHS OUVVM												
37	T	37	45246	PONT DU FAHS ESSOUANI	32.2			40.0			49.2	55.5	41.3		18.5	33.0
38	T	38	45416	ROBAA GN		144.5	140.0	40.0	70.0	65.0			41.0		27.0	93.0
39	T	39	45496	OUED EZZIT										28.0	37.5	38.2
40	T	40	46088	SIDI AOUIDET	23.0	252.5	86.0	42.0		80.0	59.2	42.5	56.0	65.0	26.0	53.0
41	T	41	46108	SIDI ARFA	30.0	28.0	70.0		100.0	63.0	49.0	43.9	33.0	36.0	20.0	33.2
42	T	42	46232	SIDI BOU BAKER BGE KB S.M	27.0	230.0	90.0	39.4	79.5	90.0	57.0	72.0	61.5	81.0	25.5	65.0
43	T	43	46366	SIDI HAMID	22.5	92.5	94.5		76.0	94.0	65.0	95.0	36.8	29.0	17.5	68.0
44	T	44	46868	S.MINDJA DEPIENNE	24.2		29.6	42.0		97.0	23.0	108.0	24.0	16.0	35.0	53.0
45	T	45	47054	SOKRA									56.7	31.7	48.1	41.5
46	T	46	47406	BARRAGE TAHOUNA									31.0	33.0	19.3	50.0
47	T	47	47422	TARF CHENA			58.5	40.6	62.0	91.4		104.0				
48	T	48	47620	TELLET ERRAIB		86.0	70.5		195.0	120.5	45.0	73.4	40.0	32.0	17.0	55.0
49	T	49	47623	TELLET ESSAFRA										33.5	44.4	40.6
50	T	50	47816	TUBURBO MAJUS		121.0	91.8	37.0	80.4	84.0	44.0	56.4	39.6	32.7	18.7	38.4
51	T	51	47832	TUNIS CARTHAGE S.M		36.6	43.9	24.3		92.4	55.7	133.5	92.1	26.7	55.4	95.7
52	T	52	47836	TUNIS MANOUBIA	25.5	70.3	46.0	35.8		75.5	57.4	117.5	68.0	31.2	23.5	29.0
53	T	53	48000	MNIHLA EX VILLE JAQUE												
54	T	54	49075	ZAGHOUAN S.M	35.5		105.0	78.0		134.0	58.0	114.0	92.0	70.0	30.1	48.0
55	T	55	49076	ZAGHOUAN DRE								216.8	62.0	33.6	24.9	41.2
56	T	56	49077	ZAGHOUAN PF	36.5	120.0	112.0	25.5		142.0	91.4	114.0	37.0	32.7	31.0	43.5
				Data	30	32	35	30	23	29	37	39	42	31	48	47
				Max.	48.6	252.5	160.0	79.0	156.0	184.0	170.0	216.8	92.1	81.0	55.4	96.5
				Ave.	28.8	108.0	91.9	44.0	86.6	100.5	62.8	95.4	45.3	35.1	29.3	51.2
				Min.	15.5	20.1	29.6	24.3	55.9	25.0	23.0	30.0	24.0	16.0	17.0	26.0
57	S	1	70583	AKOUDA S.M	22.0	67.0	116.0	39.0	50.0	170.0	80.0	50.0	159.0	34.5	100.0	18.0
58	S	2	70747	BALAOUM KALAAT KEBIRA												
59	S	3	71637	CHOTT MARIEM CRGR					45.0	163.2	122.0	78.1	136.5	29.0	24.0	33.0
60	S	4	72004	JEMMEL			73.0	29.5	60.3	150.0	78.0	71.5	90.0	67.0	84.0	36.0
61	S	5	72525	EL ONK SE	27.2		53.2			118.5	24.6	37.0	34.8	31.7	28.0	32.0
62	S	6	73069	HAMMAM SOUSSE		177.0										
63	S	7	73509	KALAA KEBIRA						267.0	65.0	46.9	172.0	25.0	34.0	125.0
64	S	8	73510	KALAA SEGHIRA	22.0		95.0	41.0	76.0	145.0	60.0	36.5	118.1	27.6	42.0	48.0
65	S	9	74396	JEMMEL CFPA												
66	S	10	74583	IMSAKEN DELG S.M	20.0	85.0	150.0	65.0	58.0	212.2	28.5	43.3	52.3	36.5	31.0	26.0
67	S	11	74951	OUED LAYA	28.5	85.5	97.7	34.0	69.0	137.7	65.8	79.4	47.0	27.6	47.5	28.7
68	S	12	76210	SIDI BOU ALI												
69	S	13	76400	SIDI EL HANT CTV												
70	S	14	76788	SKANES MONASTIR S.M		96.5	47.2	40.2	69.0	168.7	55.0	41.9	60.6		44.3	44.8
71	S	15	77072	SOUSSE PF	18.0	142.0	142.3		80.4	106.0	124.7	37.0	89.7		61.0	35.7
72	S	16	76232	ZERAMDINE								59.5	61.0		45.0	56.0
				Data	6	6	8	6	8	10	10	11	11	8	11	11
				Max.	28.5	177.0	150.0	85.0	80.4	267.0	124.7	79.4	172.0	67.0	100.0	125.0
				Ave.	23.0	108.8	96.8	44.8	63.5	163.8	70.4	52.8	92.7	34.9	49.0	44.1
				Min.	18.0	67.0	47.2	29.5	45.0	106.0	24.6	36.5	34.8	25.0	24.0	18.0

Source : "Annuaire Puvimétrique de Tunisie". Direction General des Ressources en Eau

Table 3.2 Annual Maximum Daily Rainfall (2/2)

No.	No.	Code	Name of Station	Annual Maximum Daily Rainfall											
				01/01	01/02	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/00	00/01	
				(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	
1	T	1	40154	AIN DJAJA PONT DU FAHS	21.5	41.0	51.5	27.5	50.5	47.0	83.0	44.0	21.0	42.5	53.0
2	T	2	40195	AIN FAOUAR		66.0	100.0	66.0	42.0	41.0	48.0	16.0	27.0	56.0	36.0
3	T	3	40346	IBIR HALIMA BOU REMADA									20.0	58.0	42.0
4	T	4	40361	IBIR MECHARGE BGE	28.1	49.3	53.3	33.7	45.7	60.6	60.4	33.3	51.6	36.0	57.2
5	T	5	40362	IBIR MCHERGA SM	66.0	74.6	163.0	32.0	49.0	38.3	71.0	70.2	65.0	35.1	61.2
6	T	6	41056	BORJ CHAKIR	53.0	32.0	54.7	12.7	46.0	28.0	42.5	17.0	23.0	32.0	53.0
7	T	7	41250	BOUGHIA ECOLE		60.0	55.0	40.0	40.0	30.0	47.0	40.0	10.0	53.0	25.0
8	T	8	41307	BOU ARADA II	41.4	47.1	48.0	25.0	47.0	48.0	48.0	41.0	30.0	44.0	63.0
9	T	9	41311	BOU ARADA DRE	44.0	48.0	40.0	25.0	56.0	46.7	42.0	23.5	42.0	40.5	56.0
10	T	10	41335	BOU CHLAKA	35.0	51.0	114.0	44.0	60.0	53.5	153.0	28.5	40.0	55.0	60.0
11	T	11	41347	BOU REBIA	32.0	43.0	137.5	42.0	50.0	32.0	58.0	36.6	32.0	34.0	44.0
12	T	12	41583	CHARTER EX ETTOUILA	25.0	50.0			57.2		93.5	36.0		29.0	35.0
13	T	13	41632	ICHLALIG	40.0	69.0	73.0	44.0	60.0		97.0	23.0	17.0	81.0	78.0
14	T	14	41697	COOP GHORBANE	26.1	55.0	45.2	55.0	41.0	31.0	34.6		32.0	43.0	23.0
15	T	15	41775	ICRETEVILLE	68.0	75.0	95.0	48.5	48.0	42.0	125.0	23.0	22.0	49.0	75.0
16	T	16	41782	DAMNET EL HELBA	28.1	50.0	162.0	58.0	49.0	47.0	32.0	18.3	16.0	38.0	42.5
17	T	17	41833	DEPIENNE GARE	61.0	81.5	115.3	22.7	54.5	44.0	45.6	28.0	31.1	34.0	47.2
18	T	18	41897	DJ BOU KORNIINE ECOLE	20.0	70.0	15.6	45.0	50.0	48.0	60.0	37.0	18.0	33.0	35.0
19	T	19	41899	DJ BOU KORNIINE GRIFFET	29.4		39.0	49.5	48.5	31.5	39.1	12.0	15.0	28.0	35.0
20	T	20	41923	DJEBEL DJOUGGAR CFPA	25.0	55.0	74.0	45.0	53.0	41.0	56.0	30.0	28.5	56.0	52.0
21	T	21	42248	DOMAINE DECHAMUNE	67.3	84.0	85.0	34.0	50.0	45.0	100.0	19.4	18.5	50.3	71.0
22	T	22	42379	DACHRET MEDJEN	39.0	55.6	225.0	47.0			70.0	40.0	35.0	56.0	39.0
23	T	23	42520	INAT ECOLE SM						33.0	101.0				
24	T	24	42538	EL HAMMA AMONT	62.3	92.5	74.3	88.4	46.4	34.3	98.4	30.2	32.7	18.2	58.4
25	T	25	42544	EL HAMMA AVAL	55.2	64.2	73.0	47.1	51.0		66.0	16.8	17.7	47.3	66.6
26	T	26	42597	FAUETTE DOMAINE	22.1	46.0	75.0	38.8	53.5	29.3	62.5	29.3	12.0	26.5	46.0
27	T	27	43055	HALG ENNEB	21.0	67.0	130.0	66.0	97.0	44.0	92.0	28.0	32.0	46.0	40.2
28	T	28	43055	HAMMEM BT JEDIDI	35.7	85.6		40.1	85.0	45.0	70.3	37.1	30.2	62.0	47.3
29	T	29	43927	LABORATOIRE DE L'ARIANA		62.5	62.5	45.0		34.0	120.0	22.5	29.2		
30	T	30	44121	MANOUBA						23.9		45.0	37.5		
31	T	31	44155	MARJA PT DU FAHS	24.0	36.5	74.0	27.0	54.5	39.0	73.0	33.0	19.0	36.0	36.0
32	T	32	44415	MENZAH 6 LE PADDAGE				37.7	95.6	37.0	104.3	24.5	129.9	41.8	87.3
33	T	33	44505	MOGRANE CSA/SM	41.3	69.5	121.4	73.0	70.3	48.6	44.2	24.9	19.3	27.7	37.8
34	T	34	44896	OUED EL KHADRA	36.5	72.5	85.5	64.5	69.5	52.5	51.5	32.5	27.5	48.5	56.5
35	T	35	45196	POTIN BERGERIE		67.6	91.0	121.5	66.7	41.5	115.0	35.4	25.2	101.6	79.0
36	T	36	45238	FAHS OMVVM								26.5	17.5	22.8	45.5
37	T	37	45246	PONT DU FAHS ESSOUANI	45.0	50.0	54.0	28.7	40.0	38.5	60.0	32.0	12.0	28.5	41.5
38	T	38	45416	ROBAA GN	96.0	64.0	49.0	18.0	68.0	44.0	52.0	42.0	25.0	90.0	60.0
39	T	39	45495	OUED EZZIT	102.6	67.0	70.0	65.5	82.2	40.3	125.8	28.3	28.2	54.4	47.4
40	T	40	46088	SIDI AOUIDET	29.0	67.0	50.0	24.5	46.2	96.0	96.0	64.0	36.3	103.2	50.4
41	T	41	46106	SIDI ARFA	31.0	45.0	78.0	36.4	33.0	26.0	55.0	35.0	28.0	48.0	33.0
42	T	42	46232	SIDI BOU BAKER BGE KB SM	31.5	60.0	70.0	21.7	48.0	53.0	113.0	19.0	43.0	54.0	76.0
43	T	43	46386	SIDI HAMID	31.0	58.0	140.0	27.8	43.0	41.0	35.5	29.0	20.0	30.0	35.5
44	T	44	46888	SMINDJA DEPIENNE	64.0	77.0	124.0	35.0	40.0	45.0	40.0	94.0	20.0	28.0	30.0
45	T	45	47054	SOKRA							27.0	116.0	53.0	3.5	
46	T	46	47406	BARRAGE TAHOUNA	49.7	96.5	54.5	53.5	41.6	41.2	137.0	30.2	36.1	66.2	70.5
47	T	47	47422	TARF CHENA	20.0	60.0	55.0	25.0	46.0	50.0	28.0	41.0	17.5	36.0	45.0
48	T	48	47620	TELLET ERRAIB		43.0	100.0	35.0	64.0	34.0	58.0	33.0	63.0	42.0	59.0
49	T	49	47823	TELLET ESSAFRA	55.5	55.2	114.5	45.0	64.0	48.0	140.0	20.0	22.0	60.0	40.0
50	T	50	47816	TUBURBO MAJUS	50.6	49.0	76.4	41.1	41.1	46.8	69.4	32.7	13.5	22.5	39.8
51	T	51	47832	TUNIS CARTHAGE SM	47.5	51.3	53.5	63.8	51.5	30.0	72.2	65.4	42.2	29.4	51.4
52	T	52	47836	TUNIS MANOUBIA	57.6	58.3	56.5	50.8	41.0	24.8	55.3	32.2	26.6	38.1	62.1
53	T	53	48000	MNIHLA EX VILLE JAQUE					72.5	32.5	30.8	45.0	101.5	37.8	78.5
54	T	54	48075	ZAGHOUAN SM						57.8	46.5	19.0	27.0	45.5	58.5
55	T	55	48076	ZAGHOUAN DRE	33.5	56.3	160.0	42.3	51.9	46.5	44.5	25.0	24.0	35.0	56.0
56	T	56	48077	ZAGHOUAN PF	35.1	60.0	206.0	63.0	57.0	62.4	38.5	32.0	23.8	43.5	59.0
				Data	43	47	46	48	48	50	53	53	54	52	52
				Max.	102.6	96.5	225.0	121.5	97.0	96.0	153.0	94.0	129.9	103.2	87.9
				Ave.	42.9	60.6	68.1	44.7	54.4	42.0	72.7	33.4	30.4	45.3	51.9
				Min.	20.0	32.0	15.6	12.7	33.0	23.9	28.0	12.0	3.5	18.2	23.0
57	S	1	70583	AKOUDA SM	24.0	67.5	103.0	53.0	43.0	47.0	100.0	42.0	54.0	105.0	62.0
58	S	2	70747	IBALAOUM KALAAT KEBIRA				55.0	59.0			35.0	50.0	65.0	50.0
59	S	3	71637	ICHOTT MARIEM CRGR	17.5	104.0	78.5	44.5	65.5	43.8	47.9	40.4	25.2	48.0	32.1
60	S	4	72004	JEMMEL	41.0	120.0	180.0	21.0		98.0	55.0	38.0	53.0	56.0	51.0
61	S	5	72525	EL ONK SE	30.7	43.7	51.4	18.3	58.6	40.2	38.5	22.4	64.0	38.0	32.5
62	S	6	73069	HAMMAM SOUSSE			122.5	25.0	32.0	53.0	68.5	43.0	27.0	64.0	75.0
63	S	7	73509	KALAA KEBIRA		58.0	130.0	48.0	45.0	37.0	63.5	30.0	60.0	60.0	76.0
64	S	8	73510	KALAA SEGHIRA	23.3	63.8	136.0	50.0	70.5	44.0	70.0	36.0	67.0	68.0	62.0
65	S	9	74368	JEMMEL CFPA			73.0	12.7	76.0	57.0	60.0	51.0	48.0	54.5	52.0
66	S	10	74603	MASAKEN DELG SM	30.0	65.2	87.0	20.0	59.5	35.5	36.0	41.0	26.0	59.0	63.0
67	S	11	74951	OUED LAYA		60.0	90.0			56.5	43.0	23.8	51.0	70.0	42.0
68	S	12	76210	SIDI BOU ALI			123.0	24.0		43.0	24.0	66.0	23.0	80.0	112.0
69	S	13	76400	SIDI EL HANT CTV				29.0	75.0	42.0	23.0	30.0	50.0	40.0	70.0
70	S	14	76788	SKANES MONASTIR SM	24.5	58.2	82.1	12.4	58.3	73.6	57.4		5.0		
71	S	15	77072	SOUSS E PF	19.6	65.0		30.2	52.6	64.0	83.0	24.0	100.0	71.0	35.0
72	S	16	78232	ZERAMDINE		95.0	96.0	40.0	50.0	90.0	40.0	17.0	52.0	52.0	57.0
				Data	8	11	13	15	13	15	16	15	16	15	15
				Max.	41.0	120.0	180.0	55.0	90.0	99.0	100.0	66.0	100.0	105.0	112.0
				Ave.	26.3	74.6	104.2	31.6	60.4	56.0	51.8	36.0	47.2	63.5	58.1
				Min.	17.5	43.7	51.4	12.4	32.0	35.5	20.0	17.0	5.0	39.0	32.1

Source : "Annuaire Pluviométrique de Tunisie", Direction Générale des Ressources en Eau



Table 3.3 Intensity Duration Frequency Curve (1/2)  
at Tunis-Carthage

Return Period	Formula	Parameter		Rainfall Duration (min)											
		a	b	c	6	15	30	45	60	90	120	180	240	300	360
0.5	1)	0.90	395.94	-	78.94	34.61	18.54	12.87	9.94	6.90	5.33	3.70	2.85	2.33	1.98
	2)	186.86	0.31	0.83	73.60	34.40	19.35	13.82	10.89	7.78	6.12	4.37	3.44	2.86	2.46
1	1)	0.84	436.36	-	96.87	44.87	25.06	17.83	14.00	9.96	7.82	5.56	4.37	3.62	3.11
	2)	186.86	0.31	0.83	91.24	42.65	23.98	17.14	13.50	9.64	7.59	5.42	4.27	3.55	3.05
2	1)	0.81	503.14	-	117.87	56.11	32.01	23.05	18.26	13.14	10.41	7.50	5.94	4.96	4.28
	2)	186.86	0.31	0.83	113.11	52.87	29.74	21.24	16.73	11.95	9.41	6.72	5.29	4.40	3.78
5	1)	0.80	647.83	-	154.50	74.23	42.63	30.82	24.49	17.70	14.06	10.17	8.08	6.76	5.84
	2)	186.86	0.31	0.83	150.27	70.24	39.51	28.22	22.23	15.88	12.50	8.93	7.03	5.84	5.02
10	1)	0.81	815.96	-	191.15	91.00	51.90	37.37	29.61	21.32	16.89	12.16	9.63	8.04	6.94
	2)	186.86	0.31	0.83	186.29	87.08	48.98	34.99	27.55	19.68	15.50	11.07	8.72	7.25	6.23
20	1)	0.82	986.30	-	226.95	107.06	60.64	43.49	34.35	24.63	19.46	13.95	11.02	9.18	7.90
	2)	186.86	0.31	0.83	230.95	107.95	60.73	43.37	34.16	24.40	19.22	13.72	10.81	8.98	7.72
25	1)	0.82	1055.17	-	242.79	114.53	64.88	46.53	36.75	26.35	20.82	14.93	11.79	9.82	8.46
	2)	186.86	0.31	0.83	247.49	115.68	65.07	46.48	36.61	26.15	20.59	14.71	11.58	9.63	8.27
30	1)	0.82	1105.50	-	254.38	120.00	67.97	48.74	38.50	27.61	21.81	15.64	12.35	10.29	8.86
	2)	186.86	0.31	0.83	261.88	122.41	68.86	49.18	38.74	27.67	21.79	15.56	12.26	10.18	8.75
40	1)	0.82	1192.09	-	274.30	129.39	73.29	52.56	41.52	29.77	23.52	16.86	13.32	11.09	9.55
	2)	186.86	0.31	0.83	286.31	133.83	75.28	53.77	42.35	30.25	23.82	17.01	13.40	11.14	9.57
50	1)	0.82	1251.30	-	287.92	135.82	76.93	55.17	43.58	31.25	24.68	17.70	13.98	11.64	10.03
	2)	186.86	0.31	0.83	306.82	143.41	80.67	57.62	45.38	32.41	25.53	18.23	14.36	11.93	10.26

Formula 1) :  $I = b / t^a$  (mm/h), where t is the duration in minutes

2) :  $I = a T^b / t^c$  (mm/h), where T is the return period in months and t is the duration in minutes

Table 3.3 Intensity Duration Frequency Curve (2/2)  
at Monastir

Return Period	Formula	Parameter			Rainfall Duration (min)											
		a	b	c	6	15	30	45	60	90	120	180	240	300	360	
0.5	1)	1.09	730.02	-	103.55	38.14	17.92	11.52	8.42	5.41	3.95	2.54	1.86	1.46	1.19	
	2)	123.47	0.34	0.74	60.30	30.61	18.33	13.58	10.97	8.13	6.57	4.87	3.93	3.33	2.91	
1	1)	0.87	498.12	-	104.80	47.22	25.84	18.16	14.14	9.93	7.73	5.44	4.23	3.49	2.97	
	2)	123.47	0.34	0.74	76.32	38.74	23.20	17.18	13.89	10.29	8.32	6.16	4.98	4.22	3.69	
2	1)	0.77	472.65	-	118.95	58.74	34.45	25.21	20.20	14.78	11.85	8.67	6.95	5.85	5.08	
	2)	123.47	0.34	0.74	96.61	49.04	29.36	21.75	17.58	13.02	10.53	7.80	6.30	5.34	4.67	
5	1)	0.70	489.96	-	139.78	73.60	45.31	34.11	27.89	21.00	17.17	12.93	10.57	9.04	7.96	
	2)	123.47	0.34	0.74	131.92	66.96	40.09	29.70	24.00	17.78	14.37	10.65	8.61	7.30	6.37	
10	1)	0.71	632.51	-	177.25	92.48	56.53	42.39	34.56	25.92	21.13	15.84	12.92	11.02	9.68	
	2)	123.47	0.34	0.74	166.97	84.76	50.75	37.59	30.38	22.51	18.19	13.48	10.89	9.23	8.07	
20	1)	0.66	584.74	-	179.22	97.89	61.95	47.41	39.21	30.00	24.81	18.99	15.70	13.55	12.02	
	2)	123.47	0.34	0.74	211.35	107.28	64.23	47.58	38.46	28.49	23.03	17.06	13.79	11.69	10.21	
25	1)	0.66	632.52	-	193.86	105.89	67.02	51.28	42.41	32.45	26.84	20.54	16.99	14.66	13.00	
	2)	123.47	0.34	0.74	228.01	115.74	69.30	51.33	41.49	30.74	24.84	18.40	14.87	12.61	11.02	
30	1)	0.65	624.75	-	194.94	107.46	68.48	52.62	43.64	33.53	27.81	21.37	17.72	15.33	13.62	
	2)	123.47	0.34	0.74	242.59	123.14	73.73	54.62	44.14	32.70	26.43	19.58	15.83	13.42	11.72	
40	1)	0.65	647.03	-	201.90	111.29	70.92	54.49	45.20	34.73	28.80	22.13	18.36	15.88	14.10	
	2)	123.47	0.34	0.74	267.52	135.79	81.30	60.23	48.68	36.06	29.15	21.59	17.45	14.79	12.93	
50	1)	0.65	676.78	-	211.18	116.41	74.19	57.00	47.28	36.32	30.13	23.15	19.20	16.61	14.75	
	2)	123.47	0.34	0.74	288.60	146.50	87.71	64.98	52.52	38.90	31.44	23.29	18.83	15.96	13.95	

Formula 1) :  $I = b / t^c \cdot a$  (mm/h), where t is the duration in minutes

2) :  $I = a \cdot T^b / t^c$  (mm/h), where T is the return period in months and t is the duration in minutes

Table 3.4 Basic Condition of Rational Formula

1) Rational Formula

$$Q = \frac{1}{3.6} \cdot f \cdot i \cdot A$$

$Q$  : peak discharge ( $m^3/s$ )  
 $f$  : runoff coefficient  
 $i$  : rainfall intensity in time  $T_c$  (mm/hr)  
 $A$  : catchment area ( $km^2$ )

2) Runoff Coefficient (f)

Land Use	Present Condition	Future Condition
ZONE 1 : Urban center, Commercial, Industrial, Residential areas	0.6	0.8
ZONE 2 : Agricultural lands, Open spaces	0.2	0.2
ZONE 3 : Water surfaces	1.0	1.0

3) Time of Concentration ( $T_c$ )

$$T_c = T_i + T_f$$

$T_c$  : time of concentration (min)  
 $T_i$  : inlet time (min)  
 $T_f$  : flow time (min)

$$T_i = 0.01947 \left( \frac{L_0}{\sqrt{S}} \right)^{0.77}$$

$L_0$  : overland flow length (m)  
 $S$  : average basin slope

$$T_f = \frac{1}{60} \sum \frac{L_i}{v_i}$$

$L_i$  : length in channel (m)  
 $v_i$  : average velocity (m/s)

4) IDF curve formula

Station : Tunis-Carthage (1970 - 1990)

$$i = \frac{403.7 \times T^{0.31}}{t^{0.83}}$$

$i$  : average rainfall intensity (mm/hr)  
 $T$  : return period (year)  
 $t$  : rainfall duration (min)

Station : Monastir (1981-1990)

$$i = \frac{287.4 \times T^{0.34}}{t^{0.74}}$$

Table 3.5 Basic Condition of Storage Function Method

1) Basin runoff model

The storage function of basin is expressed by the following equations;

$$S_1 = K \cdot Q_1^P$$

$$\frac{dS_1}{dt} = \frac{1}{3.6} f \cdot r_{ave} \cdot A - Q_1$$

$S_1$  : apparent storage in basin ( $m^3/s \cdot hr$ )  
 $Q_1(t)=Q(t+T_1)$  : direct runoff from basin with lag time ( $m^3/s$ )  
 $K, P$  : constant  
 $t$  : time interval (hr)  
 $T_1$  : lag time (hr)  
 $f$  : runoff ratio  
 $r_{ave}$  : average basin rainfall (mm/hr)  
 $A$  : catchment area ( $km^2$ )

Constants of K and P in the equation are estimated employing the following empirical formula;

$$K = 43.4 \cdot C \cdot S^{-\frac{1}{3}} \cdot L^{\frac{1}{3}}$$

$$P = \frac{1}{3}$$

$C$  : reserve constant (=0.120)  
 $S$  : average basin slope  
 $L$  : river length (km)

Flood runoff from sub-basin is adjusted taking lag time into consideration. The lag time is estimated by empirical formula expressed below;

$$T_1 = 0.047L - 0.56 \quad (L > 11.9 \text{ km})$$

$$T_1 = 0.0 \quad (L < 11.9 \text{ km})$$

$T_1$  : lag time in basin (hr)  
 $L$  : river length (km)

2) River channel model

Flood runoff through a river channel was estimated by the following equations ;

$$S_1 = K \cdot Q_1^P$$

$$\frac{dS_1}{dt} = I - Q_1$$

$S_1$  : apparent storage volume in river channel ( $m^3/s \cdot hr$ )  
 $Q_1(t)=Q(t+T_1)$  : discharge at lower boundary of channel with lag time ( $m^3/s$ )  
 $K, P$  : constant  
 $t$  : time interval (hr)  
 $T_1$  : lag time (hr)

Constants of K and P are estimated by flow calculation.

The lag time in river channel is estimated by the empirical formula expressed below;

$$T_1 = 7.36 \times 10^{-4} \cdot L \cdot s^{-0.5}$$

$T_1$  : lag time in river channel (hr)  
 $L$  : river length (km)  
 $s$  : average river bed slope

Table 3.6 Description of New Rainfall Gauge Station (1/2)

Description	Station No.1
Model of Recorder	SKI-30 (3 month recording)
Serial No.	93091
Basin	Greater Tunis, Oued Enkhilet
Location	CENTRE DE L'ENTRETIEN DE LA D.H.U. ROUTE DE RAOUED, ARIANA NORD
Caretaker	MOEH staff
Remarks	Construction Works: 10, May '93 Installation of recorder: 12, May '93

Description	Station No.2
Model of Recorder	SKI-30 (3 month recording)
Serial No.	93092
Basin	Greater Tunis, Oued Greb / Oued Gariana
Location	ECOLE NATIONALE D'INGENIEURS DE TUNIS BP. 37, Tunis Belvédère - 1002
Caretaker	Mr. Maalel (Chief of hydraulic laboratory)
Remarks	Construction Works: 22, Apr. '93 Installation of recorder: 28, Apr. '93

Description	Station No.3
Model of Recorder	SKI-30 (3 month recording)
Serial No.	93093
Basin	Greater Tunis, Oued Maliyan
Location	Station K8 (+500 m of Sidi Saad Bridge) Hamma Aval
Caretaker	Mr. Naceur Menzli (CRDA staff)
Remarks	Construction Works: 28, Apr. '93 Installation of recorder: 8, May '93

Table 3.6 Description of New Rainfall Gauge Station (2/2)

Description	Station No.4
Model of Recorder	SKI-30 (3 month recording)
Serial No.	93094
Basin	Greater Tunis, Oued Maliyan
Location	BIR M'CHERGA Dam site
Caretaker	DGETH staff of site office
Remarks	Construction Works: 29, Apr. '93 Installation of recorder: 10, May '93

Description	Station No.5
Model of Recorder	SKI-30 (3 month recording)
Serial No.	93095
Basin	Greater Sousse, Oued Hammam
Location	Kalaa Srira
Caretaker	MOEH staff
Remarks	Construction Works: beginning of May '93 Installation of recorder: beginning of May '93

Description	Station No.6
Model of Recorder	SKI-30 (3 month recording)
Serial No.	93090
Basin	Greater Sousse, Oued Hamdoun
Location	Bourdjine
Caretaker	MOEH staff
Remarks	Construction Works: beginning of May '93 Installation of recorder: beginning of May '93

Table 3.7 Description of Water Level Gauging Station

Code	Station	Oued / Sebkhet	Completion	Catchment (sq.km)	Type	Status	Elevation (NGT.m)	Longitude E	Latitude N	Remarks
T K 2	Sidi Aoudet	Kébir (Maliyen)	1923	228	Staff	P	350	8G 23 30'	40G 25'10"	+200 m of "Pont Route Pont du Fado-Siliana P42 on Sidi A ouder"
T K 4	Cheytus	Maliyen	1939	1419	Automatic	-	66	8G 56 35'	40G 62 25'	Pont Route Tuna-Pont du Fado, 3 km Aures
T K 5	La Medekaine	Maliyen	1932	1946	-	-	10	8G 79 90'	40G 60 70'	Pont Route Tuna-Morning
T K 8	Hamma Avel	Hamma (Maliyen)	1962	222	Automatic	O	32	8G 82 00'	40G 74 50'	+50 m "Pont Route Morad-Sidi Saïd"
T K 10	Sidi Saïd	Kébir (Maliyen)			Staff	P				
T K 11	Avel	Tahouna (Maliyen)	1962	43	Staff	P	250	8G 45 20'	40G 32 30'	+200 m of "Pont Route Djezouga-Dhoula"
T K 12	Djarabiah	Djarabiah (Maliyen)	1963	449	-	-	178	8G 37 50'	40G 42 65'	Djebel Ben Kieh, +100m of confluence of Oued Djarabiah and Oued Kabi
T K 14	Sidi Hamid	Sidi Hamid (Maliyen)	1971	28	-	-	160	8G 49 80'	40G 45 15'	Pont Route Pont de Fado-Zaghouan
T K 18	Thourbo Majus	Maliyen	1969	1019	Automatic	O	170	8G 41 65'	40G 43 80'	+300 m of "Pont du Tuna-Pont du Fado", 3 km. north Pont du Fado"
T KS19	Bir M'Cherga	Maliyen		1398	Staff	P				
T K 21	Hamma Amont	Hamma (Maliyen)	1989	14.5	-	-	150	8G 67 00'	40G 58 30'	+20 m "Pont Route Tuna-Pont Ficht"
T K 27	Bou Arada	Bou Arada (Maliyen)	1980	103	Automatic	O	270	8G 08 90'	40G 38 00'	+500m of "Pont Route Bou Arada-Galour près de Bou Arada"
T K 28	Pont Route GP4	Bou Dhebarne (Maliyen)		188	Staff	P				
T K 29	Pont Route	Kébir (Maliyen)		865	Staff	P				
T K 30	Kef Lazregue	Kébir (Maliyen)			Staff	P				
T K 31	Djebel Bou Kieb	Kébir (Maliyen)			Staff	P				
T No.1	Ariana	Sebkhet Ariana	(1993)	124.4	Automatic	New				Bridge site at the outlet of Sebkhet Ariana
T No.2	Sijoumi	Sebkhet Sijoumi	(1993)	241.1	Automatic	New				Cité El Mendak
T No.3	La Medekaine	Maliyen	(1993)	1946	Automatic	New				Bridge site at the road Tuna-Morning (P3)
T No.4	Thourbo Majus II	Maliyen	(1993)	1019	Automatic	New				Bridge site at the downstream of K14
S	Dar et Caïd	Hammam	1990	208.3	Automatic	O				+200m of Road GP1 in Hammam Source
S	Kalaa Sirta	Hammam	1988	148	Automatic	O				Brings site at the road Akoula Kalaa Sirta
S No.5	Manken	Hamdoun	(1993)	144.4	Automatic	New				Bridge site at the road Makran-Doudjira

Note : Status (in column 6)

O : Operating

P : Periodical Measure

New : will be installed by MOEH

Source :

- 1) "MONOGRAPHIE DE L'OUED MILIANE" 1973, MINISTERE DE L'AGRICULTURE, DIRECTION DES RESSOURCES EN EAU ET SOL, DIVISION DES RESSOURCES EN EAU
- 2) "ANNUAIRE HYDROLOGIQUE DE TUNISIE" 1965/67
- 3) "Etude Hydrologique, Hydrogéologique et DPH, des B.V. des Oueds el Hammam, Hamdoun, Bilibana et el Halloul", Octobre 1991

Table 3.8 Monthly Mean Air Temperature (1/3)

Station : TUNIS-CARTHAGE (Sept. 1986 - Dec. 1991)

	Monthly Absolute Maximum												Annual Mean
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
1986									36.10	30.50	22.40	19.30	27.08
1987	21.30	19.80	26.20	26.20	31.20	36.70	44.60	43.80	32.90	28.60	20.90	18.90	29.26
1988	18.20	17.00	19.40	23.20	39.00	39.40	40.40	43.50	44.40	34.80	26.00	20.90	30.52
1989	20.00	21.50	28.20	31.00	28.40	35.20	39.40	38.90	34.60	26.70	27.10	25.50	29.71
1990	19.50	29.20	26.10	29.00	33.00	39.80	41.20	36.90	38.10	34.00	26.20	19.10	30.68
1991	21.70	19.40	25.80	22.50	28.50	36.20	38.60	30.10	35.40	35.00	26.90	19.10	28.27
Avg.	20.14	20.18	25.14	26.38	32.02	37.46	40.84	38.64	36.92	31.60	25.25	20.47	29.59

	Monthly Absolute Minimum												Annual Mean
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
1986									15.40	10.50	7.80	3.50	9.30
1987	0.90	4.50	2.30	4.30	7.00	10.90	17.90	18.60	19.90	17.60	11.20	9.30	10.37
1988	7.80	7.00	9.00	10.10	10.50	14.10	18.20	18.20	13.80	12.40	5.20	3.20	10.79
1989	1.30	-0.30	4.00	6.60	8.40	13.00	17.00	17.00	15.00	10.00	5.50	4.10	8.47
1990	4.00	4.00	1.80	6.80	9.60	12.20	16.00	15.50	16.00	12.40	5.80	3.00	8.93
1991	3.40	4.30	6.60	5.70	6.40	12.70	13.00	17.60	17.40	9.00	3.60	2.40	8.51
Avg.	3.48	3.90	4.74	6.70	8.38	12.58	16.42	17.38	16.25	11.98	6.52	4.25	9.38

	Monthly Mean												Annual Mean
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
1986									25.00	21.40	15.50	11.60	18.38
1987	10.70	12.20	11.50	15.50	17.80	23.20	27.90	28.40	26.40	23.10	16.00	14.10	18.90
1988	13.00	12.00	14.20	17.10	21.80	23.80	27.60	28.00	24.20	22.90	16.50	12.00	19.43
1989	11.10	11.30	15.10	16.50	19.10	23.00	27.10	28.10	25.00	19.40	16.40	14.80	18.91
1990	12.00	13.90	13.80	15.70	20.90	27.80	26.50	26.60	27.10	23.80	16.40	10.80	19.60
1991	11.20	11.28	15.17	13.82	16.60	22.50	26.20	27.00	26.00	20.80	15.30	11.70	18.13
Avg.	11.60	12.12	13.95	15.72	19.24	24.06	27.06	27.62	25.62	21.90	16.02	12.50	18.95

Source : INSTITUT NATIONAL DE LA METEOROLOGIE, ALMANACH 1988 - 1992, MINISTERE DU TRANSPORT



Table 3.8 Monthly Mean Air Temperature (2/3)

Station : SILIANA (Sept. 1986 - Dec. 1991)

Monthly Absolute Maximum												(Unit : °C)	
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual Mean
1986									36.20	32.10	24.40	19.30	28.00
1987	24.20	21.60	24.60	29.40	32.40	44.60	44.30	43.60	34.30	28.60	18.90	18.10	30.38
1988	16.40	15.50	17.50	22.70	38.50	36.50	44.00		42.00	34.60	27.20	19.20	28.55
1989	20.60	21.20	28.90	28.60	39.00	36.20	39.60	42.90	36.10	27.40	28.20	27.50	31.52
1990	20.20	24.60	25.60	29.20	34.60	40.20	41.50	37.40	40.60	34.60	25.60	19.80	31.16
1991	21.80	19.80	24.50	23.50	27.80	30.20	41.00	38.50	37.90	33.70	25.20	16.00	28.33
Avg.	20.64	20.54	24.22	26.68	34.46	37.94	42.08	40.60	37.85	31.83	24.92	19.98	30.15

Monthly Absolute Minimum												(Unit : °C)	
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual Mean
1986									10.10	6.70	4.80	-1.80	5.00
1987	-0.50	0.10	-1.80	-0.30	2.10	6.50	12.40	13.80	16.10	13.70	7.50	5.90	6.29
1988	4.20	2.80	4.60	8.00	4.60	9.00	12.20		8.70	6.20	0.10	0.10	5.50
1989	-1.50	-0.90	0.10	2.00	3.60	9.40	13.80	15.10	9.60	7.40	3.20	1.60	5.28
1990	-0.40	1.60	0.20	1.60	1.00	9.50	12.50	13.00	10.70	11.00	0.60	-1.00	5.03
1991	-1.20	0.30	3.30	0.10	2.00	8.40	8.40	13.40	14.60	6.80	1.20	-1.40	4.66
Avg.	0.12	0.78	1.28	2.28	2.66	8.56	11.86	13.83	11.63	8.63	2.90	0.60	5.43

Monthly Mean												(Unit : °C)	
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual Mean
1986									22.50	18.80	13.90	8.50	15.93
1987	8.30	9.40	9.10	13.80	16.60	23.70	28.60	28.70	25.20	21.10	13.20	12.00	17.48
1988	10.30	9.10	11.10	15.30	21.20	23.60	28.10		21.60	20.20	13.60	8.10	16.56
1989	8.10	9.30	12.50	14.90	8.00	21.70	26.10	27.20	23.10	17.10	14.50	12.80	16.28
1990	8.80	11.70	11.50	13.60	19.20	24.80	25.60	24.00	25.80	21.60	13.80	8.10	17.29
1991	8.14	8.41	12.72	11.07	14.80	21.90	26.80	26.50	24.10	17.60	13.20	7.70	16.10
Avg.	8.73	9.58	11.38	13.73	15.76	23.14	27.04	26.60	23.72	19.43	13.70	9.53	16.86

Source : INSTITUT NATIONAL DE LA METEOROLOGIE, ALMANACH 1988 - 1992, MINISTERE DU TRANSPORT

Table 3.8 Monthly Mean Air Temperature (3/3)

Station : MONASTIR (Sept. 1986 - Dec. 1991)

Monthly Absolute Maximum													
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual Mean
1986									33.90	31.20	22.50	21.50	27.28
1987	25.50	22.90	27.00	27.50	30.10	39.20	42.60	45.50	32.00	28.30	21.00	19.00	30.05
1988	18.10	17.40	20.00	21.60	36.60	39.50	38.90	42.50	43.00	35.00	25.90	19.30	29.82
1989	16.50	24.00	26.00	32.00	39.80	37.50	39.00	39.50	34.10	27.50	27.00	25.70	30.88
1990	18.30	24.30	27.50	31.40	32.60	37.20	39.00	35.90	41.40	35.90	25.40	19.30	30.68
1991	20.10	20.30	27.30	24.50	31.30	37.20	39.00	35.50	34.50	31.60	27.20	18.90	28.95
Avg.	20.10	21.78	25.56	27.40	34.08	38.12	39.70	39.78	36.48	31.58	24.83	20.62	30.00

Monthly Absolute Minimum													
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual Mean
1986									16.00	11.50	8.00	2.70	9.55
1987	2.50	4.20	5.00	5.00	8.50	13.60	19.70	21.00	20.60	19.30	13.00	10.90	11.94
1988	8.10	8.20	10.20	12.80	11.20	15.70	20.00	20.30	14.60	12.30	6.00	3.90	11.94
1989	5.00	4.40	6.00	8.60	9.10	15.00	19.80	21.00	18.50	12.60	9.40	5.50	11.24
1990	6.50	6.80	6.50	8.30	10.40	14.30	19.10	19.40	18.60	15.40	7.30	2.90	11.29
1991	3.20	3.80	7.90	7.20	10.30	16.10	15.50	20.10	18.40	9.90	6.00	4.20	10.22
Avg.	5.06	5.48	7.12	8.38	9.90	14.94	18.82	20.36	17.78	13.50	8.28	5.02	11.22

Monthly Mean													
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual Mean
1986									25.50	21.20	15.80	12.00	18.63
1987	11.30	13.30	12.90	16.30	18.20	23.80	27.40	28.60	26.30	23.90	17.00	14.90	19.48
1988	13.10	12.90	15.10	17.20	21.90	24.00	27.70	28.40	24.70	23.10	17.20	12.20	19.78
1989	11.40	12.60	15.40	17.40	19.40	23.40	27.20	28.30	25.50	20.60	17.60	15.50	19.53
1990	13.20	14.80	15.10	16.80	20.20	24.60	26.80	26.70	26.10	24.40	16.90	11.10	19.73
1991	11.58	11.88	15.98	15.01	18.00	23.30	26.40	27.40	26.10	20.80	16.06	11.50	18.67
Avg.	12.12	13.08	14.90	16.54	19.54	23.82	27.10	27.88	25.70	22.32	16.76	12.87	19.38

Source : INSTITUT NATIONAL DE LA METEOROLOGIE, ALMANACH 1988 - 1992, MINISTERE DU TRANSPORT

Table 3.9 Monthly Mean Relative Humidity

Station : TUNIS-CARTHAGE

(Unit : %)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual Mean
1986									71.1	78.4	83.9	80.8	78.6
1987	79.4	80.5	77.7	73.5	71.0	63.0	65.6	65.1	69.0	72.0	69.0	80.0	72.2
1988	74.0	73.0	66.0	69.0	65.0	66.0	60.0	67.0	66.0	75.0	75.0	76.0	69.3
1989	83.0	77.0	74.0	68.0	69.0	65.0	60.0	66.0	74.0	80.0	79.0	82.0	73.1
1990	86.0	80.0	76.0	72.0	73.0	63.0	62.0	68.0	67.0	72.0	75.0	80.0	72.8
1991	84.0	81.0	76.0	76.0	68.0	65.0	59.0	69.0	74.0	74.0	78.0	79.0	73.6
Avg.	81.3	78.3	73.9	71.7	69.2	64.4	61.3	67.0	70.2	75.2	76.7	79.6	72.4

Station : SILIANA

(Unit : %)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual Mean
1986									63.1	75.0	82.3	83.3	75.9
1987	72.5	75.5	78.4	70.0	66.6	47.6	42.0	42.4	48.0	57.0	68.0	72.0	61.7
1988	72.0	73.0	69.0	68.0	58.0	55.0	39.0	51.0	62.0	67.0	81.0	85.0	66.3
1989	80.0	73.0	75.0	61.0	62.0	59.0	47.0	64.0	66.0	80.0	71.0	77.0	66.8
1990	85.0	74.0	76.0	74.0	71.0	52.0	50.0	64.0	52.0	64.0	78.0	81.0	68.4
1991	82.0	80.0	74.0	77.0	64.0	59.0	47.0	53.0	64.0	70.0	70.0	76.0	68.0
Avg.	78.3	75.1	74.5	70.0	64.3	54.5	45.0	52.6	59.2	68.8	75.1	79.1	66.4

Station : MONASTIR

(Unit : %)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual Mean
1986									65.5	70.3	72.0	71.7	69.9
1987	64.1	66.4	69.3	71.8	76.8	64.8	65.2	61.4	64.0	67.0	60.0	69.0	66.7
1988	64.0	59.0	54.0	69.0	65.0	66.0	61.0	64.0	67.0	71.0	70.0	72.0	65.2
1989	80.0	73.0	71.0	64.0	70.0	67.0	63.0	71.0	62.0	70.0	67.0	71.0	69.1
1990	77.0	71.0	69.0	64.0	68.0	67.0	63.0	68.0	67.0	69.0	70.0	66.0	68.3
1991	77.0	75.0	71.0	73.0	66.0	67.0	65.0	72.0	76.0	75.0	70.0	68.0	71.3
Avg.	72.4	68.9	66.9	68.4	69.2	66.4	63.4	67.3	66.9	70.4	68.2	69.6	68.2

Source : INSTITUT NATIONAL DE LA METEOROLOGIE, ALMANACH 1988 - 1992, MINISTERE DU TRANSPORT

Table 3.10 Monthly Sunshine Duration

Station : TUNIS-CARTHAGE  
(Unit : hr)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual Mean
1986									250.0	200.7	143.0	144.9	194.7
1987	129.4	125.1	177.5	238.1	227.8	300.0	319.1	320.8	262.5	219.5	154.5	130.8	217.1
1988	149.5	179.8	230.8	228.2	240.5	235.5	336.8	321.6	258.4	203.8	119.2	124.2	219.0
1989	146.3	172.4	247.8	226.4	230.0	284.2	295.2	295.5	203.3	205.6	170.3	150.2	218.9
1990	122.4	203.6	190.8	179.6	218.5	296.8	353.6	303.5	266.5	184.8	153.3	150.2	218.6
1991	143.1	130.5	152.4	184.9	307.3	306.6	358.6	338.2	250.3	173.5	183.8	132.3	221.8
Avg.	138.1	162.3	199.9	211.4	244.8	284.6	332.7	315.9	248.5	198.0	154.0	138.8	219.1

Station : SILIANA  
(Unit : hr)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual Mean
1986									243.0	187.5	125.0	124.0	169.9
1987	120.4	102.5	170.9	192.4	212.0	284.9	284.9	285.4	261.3	216.0	142.3	115.6	199.1
1988	154.4	183.8	209.2	227.2	228.4	181.2	287.4	310.9	254.8	196.9	116.2	114.2	205.4
1989	156.0	151.0	227.9	227.5	210.2	258.3	338.8	241.6	199.3	203.6	161.5	147.8	210.3
1990	92.6	173.6	165.6	162.7	210.1	283.9	339.0	287.5	246.4	193.6	145.5	154.0	204.5
1991	150.0	130.6	141.2	198.3	271.9	287.5	366.9	345.0	238.6	162.7	177.5	127.0	216.4
Avg.	134.7	148.3	183.0	201.6	226.5	259.2	323.4	294.1	240.6	193.4	144.7	130.4	206.6

Station : MONASTIR  
(Unit : hr)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual Mean
1986									249.8	202.5	166.6	168.4	196.8
1987	168.9	149.1	198.0	233.6	229.0	287.1		283.9	269.2	218.6	176.4	155.8	215.4
1988	168.4	201.5	232.1	234.0	233.0	204.6	315.5	299.1	240.6	221.6	124.8	141.0	218.0
1989	152.1	186.1	266.9	256.1	255.4	281.8	334.0	275.4	196.1	212.0	185.4	188.6	232.5
1990	136.5	202.4	201.2	200.0	236.7	295.8	363.4	310.3	270.9	207.2	181.0	164.6	230.8
1991	190.6	178.6	156.6	255.0	306.1	302.3	357.5	343.4	247.0	188.7	211.5	130.0	239.8
Avg.	163.3	183.5	211.0	235.7	252.0	274.3	342.6	302.4	245.6	210.1	174.3	158.1	229.4

Source : INSTITUT NATIONAL DE LA METEOROLOGIE, ALMANACH 1988 - 1992, MINISTERE DU TRANSPORT



Table 3.12 Catchment Area

Enkhkhiat		Greb		Gatrana		Maliyen		Magzetto		Bou Khamsa		Ain Zerga		Hammam		Bibene		Hailouf		Hamdoun	
No.	Area (sq.km)	No.	Area (sq.km)	No.	Area (sq.km)	No.	Area (sq.km)	No.	Area (sq.km)	No.	Area (sq.km)	No.	Area (sq.km)	No.	Area (sq.km)	No.	Area (sq.km)	No.	Area (sq.km)	No.	Area (sq.km)
1	0.32	1	1.10	1	2.36	1	228.00	1	0.50	1	0.82	1	2.52	1	46.00	1	3.98	1	1.48	1	120.30
2	0.35	2	0.89	2	1.63	2	44.00	2	0.31	2	0.34	2	0.12	2	13.00	2	0.90	2	1.34	2	24.10
3	0.22	3	0.51	3	1.33	3	93.00	3	0.47	3	0.29	3	0.27	3	40.00	3	2.18	3	0.55	3	13.00
4	0.60	4	0.83	4	3.47	4	2.00	4	0.58	4	0.32	4	0.14	4	14.60	4	0.37	4	0.33	4	13.20
5	0.62	5	0.20	5	0.37	5	11.00	5	0.79	5	0.79	5	0.12	5	21.80	5	0.85	5	0.22	5	7.80
6	1.56	6	1.52	6	9.94	6	103.00	6	1.32	6	0.09	6	0.03	6	12.60	6	1.26	6	1.51	6	0.60
7	1.05	7	0.97	7	0.32	7	164.00	7	1.11	7	0.50	7	0.27	7	15.00	7	0.05	7	1.58	7	11.30
8	0.25	8	1.04	8	3.37	8	113.00	8	0.66	8	0.12	8	0.73	8	0.40	8	0.35	8	0.67	8	2.80
9	1.14	9	1.17	9	1.59	9	69.00	9	1.24	9	0.78	9		9	14.00	9	0.16	9	0.08	9	0.10
10	0.79	10	0.86	10	4.87	10	43.00	10		10	0.23	10		10	12.60	10	0.37	10	1.63	10	6.90
11	0.29	11	1.14	11	7.88	11	145.00	11		11	0.10	11		11	0.50	11	0.37	11	0.06	11	1.00
12	0.29	12	2.15	12	1.05	12	4.00	12		12	0.20	12		12	8.50	12	0.34	12	0.56	12	1.50
13	0.16	13	0.31	13	0.17	13	379.00	13		13	0.61	13		13	1.20	13	0.33	13	0.14	13	8.90
14	0.96	14	2.60	14	9.89	14	21.00	14		14	0.61	14		14	1.10	14	0.08	14	0.46	14	7.50
15	0.74	15	1.23	15	4.47	15	132.00	15		15		15		15	4.10	15	0.18	15	0.18	15	12.00
16	0.66	16	2.01	16	3.47	16	92.00	16		16		16		16	0.30	16	0.45	16	0.46	16	26.20
17	2.15	17	0.34	17	3.23	17	41.00	17		17		17		17	10.80	17	0.35	17	0.39	17	1.70
18	0.04	18	9.14	18	9.14	18	20.00	18		18		18		18	5.90	18	2.36	18	0.70	18	21.70
19	0.96	19	3.27	19	3.27	19	123.00	19		19		19		19		19		19		19	1.40
20	1.41	20	3.11	20	3.11	20	99.00	20		20		20		20		20		20		20	4.50
21	0.51	21	2.32	21	2.32	21	20.00	21		21		21		21		21		21		21	5.90
22	0.57	22	0.36	22	0.36	22	11.00	22		22		22		22		22		22		22	20.40
23	0.60	23	1.15	23	1.15	23	5.00	23		23		23		23		23		23		23	
24	0.54	24	2.24	24	2.24	24	34.00	24		24		24		24		24		24		24	
25	0.38	25	0.81	25	0.81	25		25		25		25		25		25		25		25	
Sub-total (1-25)		26	0.88	26	0.88	26		26		26		26		26		26		26		26	
	17.12	27	3.63	27	3.63	27		27		27		27		27		27		27		27	
		Sub-total (1-27)		Sub-total (1-27)		Sub-total (1-27)		Sub-total (1-27)		Sub-total (1-27)		Sub-total (1-27)		Sub-total (1-27)		Sub-total (1-27)		Sub-total (1-27)		Sub-total (1-27)	
		28	96.52	28	96.52	28		28		28		28		28		28		28		28	
		29	128.78	29	128.78	29		29		29		29		29		29		29		29	
		Sub-total (26-27)		Sub-total (26-27)		Sub-total (26-27)		Sub-total (26-27)		Sub-total (26-27)		Sub-total (26-27)		Sub-total (26-27)		Sub-total (26-27)		Sub-total (26-27)		Sub-total (26-27)	
		107.31		107.31		107.31		107.31		107.31		107.31		107.31		107.31		107.31		107.31	
		Sub-total (28-29)		Sub-total (28-29)		Sub-total (28-29)		Sub-total (28-29)		Sub-total (28-29)		Sub-total (28-29)		Sub-total (28-29)		Sub-total (28-29)		Sub-total (28-29)		Sub-total (28-29)	
		154.62		154.62		154.62		154.62		154.62		154.62		154.62		154.62		154.62		154.62	
		Total	18.87	Total	241.14	Total	1996.00	Total	6.98	Total	6.20	Total	4.20	Total	222.30	Total	15.13	Total	12.34	Total	312.80
	124.43																				

Table 3.13 Runoff Coefficient (1/10)

Oued Ennkhitel & Ariana Basin				Present Land Use Condition				Future Land Use Condition			
Basin Code	Area (sq.km)	Ground El.		Zone 1 f=0.60 (sq.km)	Zone 2 f=0.20 (sq.km)	Zone 3 f=1.00 (sq.km)	Weighted f	Zone 1 f=0.80 (sq.km)	Zone 2 f=0.20 (sq.km)	Zone 3 f=1.00 (sq.km)	Weighted f
		Max. (mNGT)	Min. (mNGT)								
1	0.32	60	15	0.06	0.26	0.00	0.28	0.10	0.22	0.00	0.39
2	0.35	85	15	0.11	0.24	0.00	0.33	0.14	0.21	0.00	0.44
3	0.22	40	10	0.15	0.07	0.00	0.47	0.20	0.02	0.00	0.75
4	0.60	180	20	0.18	0.42	0.00	0.32	0.30	0.30	0.00	0.50
5	0.62	80	10	0.19	0.43	0.00	0.32	0.37	0.25	0.00	0.56
6	1.56	235	10	0.16	1.40	0.00	0.24	0.16	1.40	0.00	0.26
7	1.05	20	10	0.42	0.63	0.00	0.36	1.05	0.00	0.00	0.80
8	0.25	110	20	0.00	0.25	0.00	0.20	0.03	0.22	0.00	0.27
9	1.14	235	40	0.00	1.14	0.00	0.20	0.00	1.14	0.00	0.20
10	0.73	140	20	0.22	0.51	0.00	0.32	0.22	0.51	0.00	0.38
11	0.29	30	20	0.12	0.17	0.00	0.37	0.29	0.00	0.00	0.80
12	0.29	20	10	0.20	0.09	0.00	0.48	0.29	0.00	0.00	0.80
13	0.16	20	10	0.02	0.14	0.00	0.25	0.16	0.00	0.00	0.80
14	0.96	225	40	0.10	0.86	0.00	0.24	0.10	0.86	0.00	0.26
15	0.74	225	25	0.30	0.44	0.00	0.36	0.37	0.37	0.00	0.50
16	0.66	80	5	0.53	0.13	0.00	0.52	0.59	0.07	0.00	0.74
17	2.15	225	4	0.43	1.72	0.00	0.28	1.08	1.07	0.00	0.50
18	0.04	20	20	0.00	0.04	0.00	0.20	0.04	0.00	0.00	0.80
19	0.98	120	3	0.20	0.78	0.00	0.28	0.49	0.49	0.00	0.50
20	1.41	190	3	0.28	1.13	0.00	0.28	0.28	1.13	0.00	0.32
21	0.51	5	2	0.10	0.41	0.00	0.28	0.51	0.00	0.00	0.80
22	0.57	2	2	0.06	0.51	0.00	0.24	0.57	0.00	0.00	0.80
23	0.60	5	2	0.12	0.48	0.00	0.28	0.60	0.00	0.00	0.80
24	0.54	3	1	0.00	0.54	0.00	0.20	0.54	0.00	0.00	0.80
25	0.38	4	2	0.09	0.30	0.00	0.26	0.38	0.00	0.00	0.80
Sub-total	17.12	235	1	4.03	13.09	0.00	0.29	8.86	8.26	0.00	0.51
26	73.58	110	1	22.07	51.51	0.00	0.32	36.79	36.79	0.00	0.50
27	33.73	1	1	0.00	0.00	33.73	1.00	0.00	0.00	33.73	1.00
Total	124.43	235	1	26.10	64.60	33.73	0.50	45.65	45.05	33.73	0.64

Table 3.13 Runoff Coefficient (2/10)

Oued Greb Basin				Present Land Use Condition				Future Land Use Condition			
Basin Code	Area (sq.km)	Ground El.		Zone 1 f=0.60 (sq.km)	Zone 2 f=0.20 (sq.km)	Zone 3 f=1.00 (sq.km)	Weighted f	Zone 1 f=0.80 (sq.km)	Zone 2 f=0.20 (sq.km)	Zone 3 f=1.00 (sq.km)	Weighted f
		Max. (mNGT)	Min. (mNGT)								
1	1.10	235	75	0.00	1.10	0.00	0.20	0.00	1.10	0.00	0.20
2	0.89	170	45	0.27	0.62	0.00	0.32	0.62	0.27	0.00	0.62
3	0.51	85	30	0.20	0.31	0.00	0.36	0.36	0.15	0.00	0.62
4	0.83	140	35	0.33	0.50	0.00	0.36	0.58	0.25	0.00	0.62
5	0.20	80	35	0.10	0.10	0.00	0.40	0.20	0.00	0.00	0.80
6	1.52	80	25	1.37	0.15	0.00	0.56	1.52	0.00	0.00	0.80
7	0.97	40	15	0.87	0.10	0.00	0.56	0.97	0.00	0.00	0.80
8	1.04	40	10	0.94	0.10	0.00	0.56	0.94	0.10	0.00	0.74
9	1.17	20	7	0.70	0.47	0.00	0.44	1.05	0.12	0.00	0.74
10	0.86	8	2	0.43	0.43	0.00	0.40	0.86	0.00	0.00	0.80
11	1.14	235	95	0.00	1.14	0.00	0.20	0.00	1.14	0.00	0.20
12	2.15	160	60	0.65	1.50	0.00	0.32	1.51	0.64	0.00	0.62
13	0.31	120	45	0.06	0.25	0.00	0.28	0.31	0.00	0.00	0.80
14	2.60	155	35	1.56	1.04	0.00	0.44	2.60	0.00	0.00	0.80
15	1.23	100	30	1.11	0.12	0.00	0.56	1.23	0.00	0.00	0.80
16	2.01	80	10	1.81	0.40	0.00	0.52	1.81	0.20	0.00	0.74
17	0.34	15	8	0.17	0.17	0.00	0.40	0.34	0.00	0.00	0.80
Total	18.87	235	2	10.37	8.50	0.00	0.42	14.90	3.97	0.00	0.67

Table 3.13 Runoff Coefficient (3/10)

Oued Gariana & Sijoumi Basin				Present Land Use Condition				Future Land Use Condition			
Basin Code	Area (sq.km)	Ground El.		Zone 1	Zone 2	Zone 3	Weighted f	Zone 1	Zone 2	Zone 3	Weighted f
		Max. (mNGT)	Min. (mNGT)	f=0.60 (sq.km)	f=0.20 (sq.km)	f=1.00 (sq.km)		f=0.80 (sq.km)	f=0.20 (sq.km)	f=1.00 (sq.km)	
1	2.36	285	55	0.00	2.36	0.00	0.20	1.89	0.47	0.00	0.68
2	1.63	240	45	0.00	1.63	0.00	0.20	1.30	0.33	0.00	0.68
3	1.33	80	45	0.00	1.33	0.00	0.20	1.20	0.13	0.00	0.74
4	3.47	180	35	0.35	3.12	0.00	0.24	3.12	0.35	0.00	0.74
5	0.37	40	33	0.04	0.33	0.00	0.24	0.33	0.04	0.00	0.74
6	9.94	200	35	0.99	8.95	0.00	0.24	1.99	7.95	0.00	0.32
7	0.32	35	33	0.03	0.29	0.00	0.24	0.32	0.00	0.00	0.80
8	3.57	100	30	0.34	3.03	0.00	0.24	1.69	1.68	0.00	0.50
9	1.59	75	32	1.27	0.32	0.00	0.52	1.59	0.00	0.00	0.80
10	4.87	135	25	1.95	2.92	0.00	0.36	2.92	1.95	0.00	0.56
11	7.88	135	19	3.15	4.73	0.00	0.36	4.73	3.15	0.00	0.56
12	1.05	20	16	0.63	0.42	0.00	0.44	1.05	0.00	0.00	0.80
13	0.17	17	15	0.03	0.14	0.00	0.27	0.17	0.00	0.00	0.80
14	9.89	100	8	5.93	3.96	0.00	0.44	7.91	1.98	0.00	0.68
15	4.47	330	60	0.45	4.02	0.00	0.24	3.13	1.34	0.00	0.62
16	3.47	295	85	0.00	3.47	0.00	0.20	1.04	2.43	0.00	0.38
17	3.23	160	75	0.32	2.91	0.00	0.24	1.62	1.61	0.00	0.50
18	9.14	300	50	1.83	7.31	0.00	0.28	7.31	1.83	0.00	0.68
19	3.27	80	35	2.94	0.33	0.00	0.56	3.27	0.00	0.00	0.80
20	3.11	145	50	0.93	2.18	0.00	0.32	3.11	0.00	0.00	0.80
21	2.32	145	35	1.62	0.70	0.00	0.48	2.32	0.00	0.00	0.80
22	0.36	35	27	0.36	0.00	0.00	0.60	0.36	0.00	0.00	0.80
23	1.15	90	40	0.69	0.46	0.00	0.44	1.15	0.00	0.00	0.80
24	2.24	90	30	1.79	0.45	0.00	0.52	2.24	0.00	0.00	0.80
25	0.81	35	27	0.24	0.57	0.00	0.32	0.41	0.40	0.00	0.50
26	0.88	27	16	0.88	0.00	0.00	0.60	0.88	0.00	0.00	0.80
27	3.83	50	15	3.45	0.38	0.00	0.56	3.83	0.00	0.00	0.80
Sub-total	86.52	330	8	30.21	56.31	0.00	0.34	60.88	25.64	0.00	0.62
28	128.78	175	8	12.88	115.90	0.00	0.24	51.51	77.27	0.00	0.44
29	25.84	8	8	0.00	0.00	25.84	1.00	0.00	0.00	25.84	1.00
Total	241.14	330	8	43.09	172.21	25.84	0.36	112.39	102.91	25.84	0.57

Table 3.13 Runoff Coefficient (4/10)

Oued Mayzette Basin				Present Land Use Condition				Future Land Use Condition			
Basin Code	Area (sq.km)	Ground El.		Zone 1	Zone 2	Zone 3	Weighted f	Zone 1	Zone 2	Zone 3	Weighted f
		Max. (mNGT)	Min. (mNGT)	f=0.60 (sq.km)	f=0.20 (sq.km)	f=1.00 (sq.km)		f=0.80 (sq.km)	f=0.20 (sq.km)	f=1.00 (sq.km)	
1	0.50	23	8	0.25	0.25	0.00	0.40	0.50	0.00	0.00	0.80
2	0.31	11	6	0.09	0.22	0.00	0.32	0.31	0.00	0.00	0.80
3	0.47	12	6	0.14	0.33	0.00	0.32	0.47	0.00	0.00	0.80
4	0.58	11	5	0.17	0.41	0.00	0.32	0.29	0.29	0.00	0.50
5	0.79	12	5	0.08	0.71	0.00	0.24	0.08	0.71	0.00	0.26
6	1.32	7	2	0.13	1.19	0.00	0.24	0.13	1.19	0.00	0.26
7	1.11	5	2	0.11	1.00	0.00	0.24	0.11	1.00	0.00	0.26
8	0.66	2	0	0.40	0.26	0.00	0.44	0.40	0.26	0.00	0.56
9	1.24	6	2	0.99	0.25	0.00	0.52	1.24	0.00	0.00	0.80
Total	6.98	23	0	2.36	4.62	0.00	0.34	3.53	3.45	0.00	0.50



Table 3.13 Runoff Coefficient (5/10)

Oued Bou Khamaa Basin				Present Land Use Condition				Future Land Use Condition			
Basin Code	Area (sq.km)	Ground El.		Zone 1	Zone 2	Zone 3	Weighted f	Zone 1	Zone 2	Zone 3	Weighted f
		Max. (mNGT)	Min. (mNGT)	f=0.60 (sq.km)	f=0.20 (sq.km)	f=1.00 (sq.km)		f=0.80 (sq.km)	f=0.20 (sq.km)	f=1.00 (sq.km)	
1	0.82	228	20	0.08	0.74	0.00	0.24	0.33	0.49	0.00	0.44
2	0.54	228	15	0.05	0.49	0.00	0.24	0.43	0.11	0.00	0.68
3	0.29	203	15	0.03	0.26	0.00	0.24	0.17	0.12	0.00	0.55
4	0.32	203	5	0.05	0.47	0.00	0.24	0.31	0.21	0.00	0.56
5	0.79	20	5	0.16	0.63	0.00	0.28	0.79	0.00	0.00	0.80
6	0.09	10	4	0.05	0.04	0.00	0.42	0.09	0.00	0.00	0.80
7	0.50	6	4	0.40	0.10	0.00	0.52	0.45	0.05	0.00	0.74
8	0.12	4	2	0.07	0.05	0.00	0.43	0.12	0.00	0.00	0.80
9	0.78	2	2	0.78	0.00	0.00	0.60	0.78	0.00	0.00	0.80
10	0.23	2	0	0.14	0.09	0.00	0.44	0.21	0.02	0.00	0.75
11	0.10	4	2	0.05	0.05	0.00	0.40	0.05	0.05	0.00	0.50
12	0.20	100	4	0.14	0.06	0.00	0.48	0.14	0.06	0.00	0.62
13	0.61	284	20	0.12	0.49	0.00	0.28	0.18	0.43	0.00	0.38
14	0.61	300	40	0.00	0.61	0.00	0.20	0.00	0.61	0.00	0.20
Total	6.20	300	0	2.12	4.08	0.00	0.34	4.05	2.15	0.00	0.59

Table 3.13 Runoff Coefficient (6/10)

Oued Ain Zerga Basin				Present Land Use Condition				Future Land Use Condition			
Basin Code	Area (sq.km)	Ground El.		Zone 1	Zone 2	Zone 3	Weighted f	Zone 1	Zone 2	Zone 3	Weighted f
		Max. (mNGT)	Min. (mNGT)	f=0.60 (sq.km)	f=0.20 (sq.km)	f=1.00 (sq.km)		f=0.80 (sq.km)	f=0.20 (sq.km)	f=1.00 (sq.km)	
1	2.52	576	50	0.00	2.52	0.00	0.20	0.00	2.52	0.00	0.20
2	0.12	50	20	0.00	0.12	0.00	0.20	0.06	0.06	0.00	0.50
3	0.27	170	20	0.00	0.27	0.00	0.20	0.05	0.22	0.00	0.31
4	0.14	30	4	0.04	0.10	0.00	0.31	0.14	0.00	0.00	0.80
5	0.12	4	1	0.07	0.05	0.00	0.43	0.12	0.00	0.00	0.80
6	0.03	1	0	0.00	0.03	0.00	0.20	0.02	0.01	0.00	0.60
7	0.27	4	1	0.03	0.24	0.00	0.24	0.27	0.00	0.00	0.80
8	0.73	320	4	0.00	0.73	0.00	0.20	0.37	0.36	0.00	0.50
Total	4.20	576	0	0.14	4.06	0.00	0.21	1.03	3.17	0.00	0.35

Table 3.13 Runoff Coefficient (7/10)

Oued Hammam Basin				Present Land Use Condition				Future Land Use Condition			
Basin Code	Area (sq.km)	Ground El.		Zone 1	Zone 2	Zone 3	Weighted f	Zone 1	Zone 2	Zone 3	Weighted f
		Max. (mNGT)	Min. (mNGT)	f=0.60 (sq.km)	f=0.20 (sq.km)	f=1.00 (sq.km)		f=0.80 (sq.km)	f=0.20 (sq.km)	f=1.00 (sq.km)	
1	46.00	150	55	0.00	46.00	0.00	0.20	0.00	46.00	0.00	0.20
2	13.00	150	55	0.00	13.00	0.00	0.20	0.00	13.00	0.00	0.20
3	40.00	140	40	0.00	40.00	0.00	0.20	0.00	40.00	0.00	0.20
4	14.60	140	40	0.00	14.60	0.00	0.20	0.00	14.60	0.00	0.20
5	21.80	130	20	1.09	20.71	0.00	0.22	2.18	19.62	0.00	0.26
6	12.60	140	20	0.00	12.60	0.00	0.20	0.63	11.97	0.00	0.23
7	15.00	80	15	0.75	14.25	0.00	0.22	2.25	12.75	0.00	0.29
8	0.40	40	10	0.00	0.40	0.00	0.20	0.00	0.40	0.00	0.20
9	14.00	90	0	1.40	12.60	0.00	0.24	8.40	5.60	0.00	0.56
10	12.60	120	40	0.00	12.60	0.00	0.20	0.63	11.97	0.00	0.23
11	0.50	55	35	0.00	0.50	0.00	0.20	0.50	0.00	0.00	0.80
12	8.50	135	40	0.00	8.50	0.00	0.20	0.00	8.50	0.00	0.20
13	1.20	80	35	0.48	0.72	0.00	0.36	1.20	0.00	0.00	0.80
14	1.10	55	20	0.44	0.66	0.00	0.36	1.10	0.00	0.00	0.80
15	4.10	100	20	0.82	3.28	0.00	0.28	1.64	2.46	0.00	0.44
16	0.30	50	18	0.00	0.30	0.00	0.20	0.27	0.03	0.00	0.74
17	10.80	100	18	0.00	10.80	0.00	0.20	0.54	10.26	0.00	0.23
18	5.80	90	10	0.29	5.51	0.00	0.22	2.90	2.90	0.00	0.50
Total	222.30	150	0	5.27	217.03	0.00	0.21	22.24	200.06	0.00	0.26

Table 3.13 Runoff Coefficient (8/10)

Oued Blibene Basin				Present Land Use Condition				Future Land Use Condition			
Basin Code	Area (sq.km)	Ground El.		Zone 1	Zone 2	Zone 3	Weighted f	Zone 1	Zone 2	Zone 3	Weighted f
		Max. (mNGT)	Min. (mNGT)	f=0.60 (sq.km)	f=0.20 (sq.km)	f=1.00 (sq.km)		f=0.80 (sq.km)	f=0.20 (sq.km)	f=1.00 (sq.km)	
1	3.98	77	42	0.40	3.58	0.00	0.24	0.80	3.18	0.00	0.32
2	0.50	54	28	0.05	0.45	0.00	0.24	0.05	0.45	0.00	0.26
3	2.18	77	28	0.22	1.96	0.00	0.24	0.65	1.53	0.00	0.38
4	0.37	45	23	0.04	0.33	0.00	0.24	0.04	0.33	0.00	0.26
5	0.85	63	23	0.09	0.76	0.00	0.24	0.43	0.42	0.00	0.50
6	1.26	45	8	0.13	1.13	0.00	0.24	0.50	0.76	0.00	0.44
7	0.05	20	8	0.02	0.03	0.00	0.36	0.05	0.00	0.00	0.80
8	0.35	34	15	0.28	0.07	0.00	0.32	0.35	0.00	0.00	0.80
9	0.16	40	15	0.06	0.10	0.00	0.35	0.16	0.00	0.00	0.80
10	0.57	60	30	0.46	0.11	0.00	0.52	0.57	0.00	0.00	0.80
11	0.37	60	35	0.19	0.18	0.00	0.41	0.37	0.00	0.00	0.80
12	0.34	34	8	0.34	0.00	0.00	0.60	0.34	0.00	0.00	0.80
13	0.53	28	5	0.37	0.16	0.00	0.48	0.53	0.00	0.00	0.80
14	0.08	10	5	0.08	0.02	0.00	0.50	0.06	0.02	0.00	0.65
15	0.18	10	0	0.14	0.04	0.00	0.51	0.14	0.04	0.00	0.67
16	0.45	17	5	0.41	0.04	0.00	0.56	0.45	0.00	0.00	0.80
17	0.55	30	5	0.28	0.27	0.00	0.40	0.55	0.00	0.00	0.80
18	2.36	46	19	0.24	2.12	0.00	0.24	0.47	1.89	0.00	0.32
Total	15.13	77	0	3.78	11.35	0.00	0.30	6.51	8.62	0.00	0.46

Table 3.13 Runoff Coefficient (9/10)

Oued Hallouf Basin				Present Land Use Condition				Future Land Use Condition			
Basin Code	Area (sq.km)	Ground El.		Zone 1 f=0.60 (sq.km)	Zone 2 f=0.20 (sq.km)	Zone 3 f=1.00 (sq.km)	Weighted f	Zone 1 f=0.80 (sq.km)	Zone 2 f=0.20 (sq.km)	Zone 3 f=1.00 (sq.km)	Weighted f
		Max. (mNGT)	Min. (mNGT)								
1	1.48	75	33	1.18	0.30	0.00	0.52	1.48	0.00	0.00	0.80
2	1.34	60	31	0.27	1.07	0.00	0.28	1.34	0.00	0.00	0.80
3	0.55	35	22	0.22	0.33	0.00	0.36	0.55	0.00	0.00	0.80
4	0.33	25	12	0.03	0.30	0.00	0.24	0.33	0.00	0.00	0.80
5	0.22	21	10	0.04	0.18	0.00	0.27	0.20	0.02	0.00	0.75
6	1.51	60	30	0.15	1.36	0.00	0.24	0.76	0.75	0.00	0.50
7	1.58	40	12	0.32	1.26	0.00	0.28	0.95	0.63	0.00	0.56
8	0.67	14	5	0.07	0.60	0.00	0.24	0.34	0.33	0.00	0.50
9	0.08	5	2	0.01	0.07	0.00	0.25	0.06	0.02	0.00	0.65
10	1.63	20	2	1.14	0.49	0.00	0.48	1.30	0.33	0.00	0.68
11	0.06	2	0	0.05	0.01	0.00	0.53	0.05	0.01	0.00	0.70
12	0.56	21	5	0.45	0.11	0.00	0.52	0.56	0.00	0.00	0.80
13	0.14	17	10	0.10	0.04	0.00	0.49	0.14	0.00	0.00	0.80
14	0.46	25	14	0.41	0.05	0.00	0.56	0.46	0.00	0.00	0.80
15	0.18	23	10	0.07	0.11	0.00	0.36	0.18	0.00	0.00	0.80
16	0.46	25	17	0.28	0.18	0.00	0.44	0.46	0.00	0.00	0.80
17	0.39	31	22	0.31	0.08	0.00	0.52	0.39	0.00	0.00	0.80
18	0.70	63	30	0.63	0.07	0.00	0.56	0.70	0.00	0.00	0.80
Total	12.34	75	0	5.73	6.61	0.00	0.39	10.25	2.09	0.00	0.70

Table 3.13 Runoff Coefficient (10/10)

Oued Hamdoun Basin				Present Land Use Condition				Future Land Use Condition			
Basin Code	Area (sq.km)	Ground El.		Zone 1 f=0.60 (sq.km)	Zone 2 f=0.20 (sq.km)	Zone 3 f=1.00 (sq.km)	Weighted f	Zone 1 f=0.80 (sq.km)	Zone 2 f=0.20 (sq.km)	Zone 3 f=1.00 (sq.km)	Weighted f
		Max. (mNGT)	Min. (mNGT)								
1	120.30	120	45	6.02	114.28	0.00	0.22	6.02	114.28	0.00	0.23
2	24.10	105	40	0.00	24.10	0.00	0.20	0.00	24.10	0.00	0.20
3	13.00	115	40	0.65	12.35	0.00	0.22	0.65	12.35	0.00	0.23
4	13.20	105	30	3.96	9.24	0.00	0.32	7.92	5.28	0.00	0.56
5	7.80	110	28	0.00	7.80	0.00	0.20	0.78	7.02	0.00	0.26
6	0.60	60	28	0.00	0.60	0.00	0.20	0.06	0.54	0.00	0.26
7	11.30	110	28	0.00	11.30	0.00	0.20	0.00	11.30	0.00	0.20
8	2.80	55	21	0.00	2.80	0.00	0.20	0.00	2.80	0.00	0.20
9	0.10	25	20	0.00	0.10	0.00	0.20	0.00	0.10	0.00	0.20
10	6.90	95	20	0.00	6.90	0.00	0.20	0.00	6.90	0.00	0.20
11	1.00	60	17	0.00	1.00	0.00	0.20	0.00	1.00	0.00	0.20
12	1.50	60	15	0.00	1.50	0.00	0.20	0.00	1.50	0.00	0.20
13	8.90	75	10	0.45	8.45	0.00	0.22	0.89	8.01	0.00	0.26
14	7.50	85	10	0.00	7.50	0.00	0.20	0.00	7.50	0.00	0.20
15	12.00	50	2	0.60	11.40	0.00	0.22	2.40	9.60	0.00	0.32
16	26.20	95	2	1.31	24.89	0.00	0.22	1.31	24.89	0.00	0.23
17	1.70	25	0	0.09	1.61	0.00	0.22	0.17	1.53	0.00	0.26
18	21.70	120	45	1.09	20.61	0.00	0.22	1.09	20.61	0.00	0.23
19	1.40	60	35	0.00	1.40	0.00	0.20	0.14	1.26	0.00	0.26
20	4.50	90	35	0.00	4.50	0.00	0.20	0.00	4.50	0.00	0.20
21	5.90	60	21	0.00	5.90	0.00	0.20	2.36	3.54	0.00	0.44
22	20.40	80	17	0.00	20.40	0.00	0.20	2.04	18.36	0.00	0.26
Total	312.80	120	0	14.17	298.63	0.00	0.22	25.83	286.97	0.00	0.25

Table 3.14 Monthly Rainfall Depth

Station : TUNIS-CARTHAGE  
(Unit : mm)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1986									166.0	63.6	72.9	55.0	
1987	73.4	88.8	48.0	29.1	27.8	1.0	12.3	0.0	66.4	5.2	46.5	8.8	407.3
1988	48.9	27.7	42.3	34.0	4.9	19.4	0.8	0.0	14.0	33.8	25.9	51.8	303.5
1989	14.3	52.0	18.5	76.7	10.4	4.8	10.1	14.0	17.6	61.7	44.9	130.1	455.1
1990	132.7	12.4	25.3	15.6	47.7	1.0	1.0	17.5	0.0	25.3	133.9	167.7	590.1
1991	112.1	60.8	38.4	46.5	14.9	0.0	0.0	0.0	58.8	51.6	51.3	86.3	520.7
Avg.	76.3	48.3	34.5	40.4	21.1	5.2	4.8	6.3	53.8	40.2	62.6	83.3	476.9
Normal	70.2	46.8	43.8	41.9	22.5	10.4	1.2	11.1	36.5	56.6	56.8	70.9	468.7

Station : SILIANA  
(Unit : mm)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1986										29.5	36.3	39.6	
1987	16.7	40.3	59.4	31.1	18.7	0.1	17.3	8.0	4.9	14.6	25.5	7.0	243.6
1988	35.5	11.1	49.0	45.4	61.7	38.2	1.5	7.6	7.2	5.4	41.8	40.1	342.5
1989	9.8	29.0	34.3	16.9	5.5	40.4	25.7	58.5	19.2	24.6	12.0	13.4	289.3
1990	69.4	0.5	65.2	33.6	80.8	12.8	2.1	62.7	10.9	55.4	73.7	79.3	546.4
1991	95.0	46.1	89.5	41.2	11.2	0.0	0.0	41.4	121.5	53.7	51.5	24.6	575.7
Avg.	45.3	25.4	59.5	33.6	35.6	17.9	9.3	35.6	32.7	30.5	40.1	34.0	399.6
Normal	45.3	33.0	37.3	53.9	49.9	19.2	5.9	16.6	32.2	60.0	43.2	51.7	448.2

Station : SOUSSE  
(Unit : mm)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1986									3.1	101.1	54.4	159.3	
1987	13.7	18.0	37.8	37.9	16.5	4.1	0.8	0.0	38.2	16.6	41.3	18.1	243.0
1988	4.2	1.7	3.3	32.0	16.9	14.0	0.1	0.1	60.4	6.6	122.4	37.9	299.6
1989	67.1	30.1	10.1	9.9	1.1	12.5	0.2	3.3	25.3	110.3	9.2	67.0	346.1
1990	169.7	0.9	36.9	88.3	14.3	3.4	4.5	21.1	10.3	8.1	43.5	74.1	475.1
1991	63.6	39.0	93.8	43.4	12.6	0.0	0.0	0.0	103.9	15.5	89.3	31.5	492.6
Avg.	63.7	17.9	36.4	42.3	12.3	6.8	1.1	4.9	40.2	43.0	60.0	64.7	393.3
Normal	30.3	25.9	29.2	33.9	16.5	5.3	0.7	10.4	31.8	46.7	42.9	37.0	310.6

Note : Normal = Average in longer period

Source : INSTITUT NATIONAL DE LA METEOROLOGIE, ALMANACH 1988 - 1992, MINISTERE DU TRANSPORT

Table 3.15 Monthly Rainfall in Tunis (1/5)

Year	Station: 40154 AIN DJAJA PONT DU FAHS												Unit: (mm)			
	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Total			
66/67	12.0	30.0	48.2	36.0		51.0	22.0		13.0	0.0		27.0				
67/68		6.0	57.5	26.5	87.5	55.5	14.5	27.0	39.0		0.0					
68/69	0.0	11.0	0.0	10.5	47.6	32.5	36.0	39.5	15.5	0.0	0.0	0.0	192.6			
69/70	119.6	426.0	0.0	65.9	24.0	10.5	16.5	24.0	23.7	0.0	17.7	0.0	727.9			
70/71	0.0	23.0	5.0	77.0	46.1	198.5	16.5	16.0	20.0	0.0	0.0	0.0	402.1			
71/72	59.5	26.0	8.0	7.5	56.0	5.5	60.1	86.2	29.9	0.0	0.0	41.5	390.2			
72/73	44.0	75.5	5.0	76.5	82.7	69.2	185.5	39.5	0.0	0.0	0.0	5.0	582.9			
73/74	0.0	66.5	37.5	136.5	0.0	22.0	30.0	45.0	0.0	27.0	0.0	0.0	366.5			
74/75	15.0	9.5	49.5	5.7	9.0	102.5	39.3	26.6	49.4	0.0	0.0	21.0	327.5			
75/76	29.0	7.8	135.4	0.0	53.1	34.0	56.7	32.3	68.7	133.6	14.0	16.0	580.6			
76/77	21.2	58.6	58.3	8.5	41.4	6.5	60.8	49.7	18.2	2.5	5.0	2.0	332.7			
77/78	61.0	10.0	34.8	5.0	20.3	60.4	73.1	29.8	42.4	16.0	0.0	3.0	355.8			
78/79	0.0	23.2	38.0	10.5	11.0	50.5	47.0	42.5	4.0	4.0	0.0	6.0	236.7			
79/80	99.0	21.0	49.8	7.0	16.5	24.0	44.7	38.5	17.7	4.5	0.0	13.0	335.7			
80/81	24.0	32.5	17.5	76.0	38.1	60.7	12.5	15.0	40.0	7.0	0.0	3.5	326.8			
81/82	29.0	30.0	13.0	19.5	100.3	28.5	37.7	44.0	28.0	0.0	0.0	0.0	330.0			
82/83	30.5	110.0	120.7	43.0	43.5	0.0	33.5	0.0	9.5	0.0	0.0	3.5	394.2			
83/84	30.0	56.5	6.0	7.7	20.5	31.0	24.5	11.8	3.0	0.0	0.0	21.9	212.9			
84/85	28.5	126.0	29.0	111.5	46.2	42.5	59.9	40.5	71.3	0.0	0.0	0.0	555.4			
85/86	13.8	9.7	6.0	0.0	30.7	14.5	117.5	19.5	15.0	9.5	17.0	0.0	253.2			
86/87	90.0	59.0	72.5	36.0	14.5	53.0	52.5	28.5	36.5	7.5	0.0	6.0	456.0			
87/88	23.0	9.5	12.5	15.5		13.2	60.5	23.0	47.0	20.5	0.0	22.5				
88/89	28.0	2.5	35.0	30.5	20.0	24.7	27.5	28.0	7.7	9.0	10.0	31.0	253.9			
89/90	34.5	57.5	33.2	14.0	84.5	2.7	32.0	29.0			0.0	51.1				
90/91	0.0	11.0	60.0	66.3	72.3	62.5	55.5	78.0	31.2	2.5	0.0	0.0	439.3			
91/92																
Data	24	25	25	25	23	25	25	24	24	23	24	24	21			
Ave.	33.0	52.0	37.3	35.7	42.0	42.2	48.7	33.9	26.3	10.6	2.7	11.4	383.0			

Source: "Annuaire Pluviométrique de Tunisie", Direction General des Ressources en Eau

Table 3.15 Monthly Rainfall in Tunis (2/5)

Station: 40962		BIR MCHERGA SM												Unit : (mm)		
Year	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Total			
66/67	33.5	33.7	62.6	52.9	15.4	43.4	31.4	38.7	26.0							
67/68							22.6									
68/69	0.0	3.5	2.0	21.8	32.4	35.6	40.7	33.9	21.5	0.0	0.0	0.0	191.4			
69/70	79.3	118.9	0.0	54.6	23.8	26.2	21.3	20.9	9.4	0.0	0.0	0.0	354.4			
70/71	24.0	18.0	0.0	72.7	87.8	200.3	23.6	17.1	8.7	21.7	0.0	0.0	473.9			
71/72	45.6	78.3	9.8	37.3	65.8	24.4	60.1	91.4	4.7	5.0	0.0	16.2	438.6			
72/73																
73/74																
74/75	8.8	41.0	58.0	23.1	6.2	125.0	53.8	17.0	25.0	0.0	0.0	19.7	376.6			
75/76	5.0	1.3	155.5	0.0	40.9	32.7	35.4	17.4	95.0	134.1	18.9	16.2	552.4			
76/77	18.6	71.4	76.0	14.3	45.8	4.5	38.3	49.8	15.9	4.3	0.0	11.3	350.2			
77/78																
78/79	0.0	30.1	39.9	9.9	15.9	58.5	44.1	41.4	3.5	0.3	0.0	1.4	245.0			
79/80	113.6	20.1	72.8	17.0	31.9	39.8	46.9	37.4	34.3	3.5	0.0	36.8	454.1			
80/81	3.5	37.0	24.0	166.5	44.9	36.0	23.8	21.8	26.2	13.5	0.0	0.0	397.2			
81/82	25.1	28.5	19.6	45.4	171.4	22.9	26.0	43.6	39.4	0.0	0.0	0.0	421.9			
82/83	48.0	256.8	166.9	64.9	44.4	0.0	48.5	0.0	13.4	2.5	0.0	0.0	645.4			
83/84	33.5	54.0	17.0	25.7	24.7	43.8	32.2	11.4	18.9	5.1	0.0	7.3	273.6			
84/85	34.6	75.1	16.4	176.8	63.1	52.1	74.8	45.8	48.1	0.0	0.0	0.6	587.4			
85/86	1.5	61.9	15.0	3.6	33.7	29.8	109.6	47.5	22.6	14.0	5.4	1.8	346.4			
86/87	87.9	83.9	42.5	47.6	39.8	92.6	50.2	42.8	26.2	0.0	5.0	5.0	525.5			
87/88	8.0	7.0	9.5	19.6	34.9	24.9	39.1	25.1	99.9		0.3	0.0				
88/89	16.8	8.1	12.9	27.9	10.8	26.8	33.2	46.1	21.9	7.3	6.4	79.7	297.9			
89/90	12.3	51.1	27.9	27.5	108.7	10.4	28.3	20.6			0.0	22.2				
90/91	0.0	16.0	61.1	101.4	106.6	50.4	69.7	76.9	22.3	0.5	0.0	0.0	504.9			
91/92																
Data	21	21	21	21	21	21	22	21	20	18	20	20	18			
Ave.	28.6	52.2	42.4	48.1	49.9	46.7	43.3	35.6	29.2	11.8	1.8	10.9	413.2			

Source : "Annuaire Pluviométrique de Tunisie", Direction General des Ressources en Eau

Table 3.15 Monthly Rainfall in Tunis (3/5)

Station: 42248		DOMAINE DECHAMUNE												Unit : (mm)		
Year	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Total			
66/67	77.1		46.8		28.8	72.4	19.2	11.5	27.3		0.0					
67/68		14.7	93.0	49.0	74.3	67.7	17.6	35.0	8.0	57.9	0.0	0.0	417.2			
68/69	0.0	12.5	46.3	16.5	42.6	32.6	54.8	49.0	38.5	0.0	4.9	3.6	301.3			
69/70	35.9	158.1	1.0	29.5	35.0	11.0	22.0	35.0	15.5	1.0	0.0	0.0	344.0			
70/71	49.8	4.5	0.0	173.8	78.1	159.5	44.0	23.4	7.8	6.6	0.0	0.0	547.5			
71/72	28.4	173.6	5.5	28.8	52.1	21.0	55.8	102.7	20.0	0.0	0.0	0.0	487.9			
72/73	43.8	70.8	39.2	117.7	140.7	78.3	219.5	16.4	0.0	8.7	0.0	0.0	735.1			
73/74	2.5	212.5	27.3	301.2	15.3	86.0	14.5	38.7	2.0	0.0	0.0	0.0	700.0			
74/75	24.8	52.6	61.2	19.4	7.7	243.0	78.6	21.8	28.5	0.2	0.0	50.9	588.7			
75/76	37.4	23.5	237.6	40.0	53.8	31.1	52.7	19.8	57.9	31.0	8.2	12.5	605.5			
76/77	26.8	82.5	119.3	26.0	53.9	9.1	51.2	61.8	10.0	17.5	0.0	9.0	467.1			
77/78																
78/79	1.7	42.5	63.6	5.7	30.0	98.4	61.2	42.6	2.2	0.3	0.0	0.0	348.2			
79/80	56.5	25.8	109.2	4.7	53.4	54.0	50.5	36.4	52.0	5.2	0.0	13.7	461.4			
80/81	3.3	18.7	27.2	217.8	67.5	44.5	20.8	22.7	21.0	5.0	0.0	0.0	448.5			
81/82	12.5	25.0	14.5	46.5	182.7	41.6	56.6	42.0	29.5	0.0	0.0	0.0	450.9			
82/83	33.5	197.5	153.5	55.0		0.0	58.0	0.0	10.0	5.0	0.0	0.0	512.5			
83/84	36.5	141.5	83.0	44.5	24.5	30.0	33.0	39.0	0.0	0.0	0.0	0.0	432.0			
84/85	17.0	29.5	33.0			47.0	72.0	67.0	44.0	0.0	0.0	0.0	309.5			
85/86	41.0	59.0		12.0				44.5	24.0	10.0	5.0	0.0				
86/87	158.0	119.0	38.0	43.6	45.0	71.5	50.5	23.7	8.0	0.0	0.0	0.0	557.3			
87/88			2.3	20.9	28.8	8.8	19.8	30.3	9.4		0.0					
88/89	10.9	10.3	21.3	41.6	25.0	19.8	32.7	43.9	3.3	1.0	11.6					
89/90	1.8	42.4	31.0	77.3	180.1	0.0	22.0				3.2	59.9				
90/91	0.0	10.1	152.3	111.0	120.6	88.5	23.5			14.3	0.0	0.0				
91/92																
Data	22	22	23	22	21	23	23	22	22	21	24	21	18			
Ave.	31.8	69.4	61.1	67.4	63.8	56.3	49.1	36.7	19.0	7.8	1.4	7.1	484.1			

Source : "Annuaire Pluviométrique de Tunisie", Direction General des Ressources en Eau

Table 3.15 Monthly Rainfall in Tunis (4/5)

Year	Station: 45416 ROBAA GN												Total			
	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.				
66/67																
67/68																
68/69																
69/70	232.1	446.2	12.0	72.3	37.5	17.9	2.8	28.2	35.5	0.0	27.2	18.0				929.7
70/71	9.9	58.9	0.0	86.0	76.7	207.3	31.1	22.0	17.9	14.9	0.0	0.0				524.7
71/72	52.5	75.3	5.7	97.8	36.4	20.0	0.0	151.0	20.0	33.0	0.0	0.0				491.8
72/73	41.0	84.5	7.5													
73/74																
74/75	54.0	44.0	59.0	14.1	24.0	150.0	39.5	39.0	26.0	26.0	1.0	50.0				526.5
75/76	70.0	12.0	149.0	20.0	102.0	54.0	62.0	40.0	148.0	86.0	22.0	9.0				774.0
76/77	25.0	60.0	83.0	24.0	70.0	14.0	67.0	51.0	8.0	16.0	4.0	21.0				443.0
77/78																
78/79	10.0	41.5	38.5	23.5	13.2	76.0	68.0	75.5	25.0	18.0	0.0	16.0				405.2
79/80	87.0	23.1	99.5	15.0	17.0	51.5	124.5	47.0	12.5	3.5	0.0	28.5				509.1
80/81																
81/82	63.0	40.0	26.5	22.5	135.5	31.5	47.0	85.5	28.0	0.0	0.0	4.0				483.5
82/83	22.0	78.0	142.0	66.0	62.0	1.0	47.0	3.0	18.0	8.0	0.0	13.5				460.5
83/84	12.7	58.0	24.0	31.5	39.0	42.0	24.0	16.0	4.0	4.5	0.0	41.0				298.7
84/85	61.0	81.0	24.0	182.5	50.5	28.0	67.0	102.0	35.0	0.0	0.0	33.0				664.0
85/86	13.0	12.0	14.5	11.0	47.0	43.0	117.0	42.0	29.0	35.0	12.0	10.0				365.5
86/87	91.0	103.2	59.0	44.5	50.0	50.5	57.2	39.4	26.5	1.0	18.0	8.0				548.3
87/88		24.0	27.0	9.2	53.5	17.0	71.5				0.0					
88/89	18.0	3.0	56.5	46.0	15.0	40.0	42.0	42.0	9.5			19.0				
89/90	19.0	41.2	13.5	29.0	190.5	1.0	76.5	32.0			0.0	63.0				
90/91	3.0	47.0	84.0	112.5	113.5	77.0	88.4	53.5	18.5	0.0	0.0	53.0				650.4
91/92																
Data	18	19	19	18	18	18	18	17	16	15	17	17				15
Ave.	49.1	70.2	48.7	50.4	63.0	51.2	57.4	51.1	28.8	16.4	5.0	22.8				539.5

Source : "Annuaire Pluviometrique de Tunisie", Direction General des Ressources en Eau



Table 3.15 Monthly Rainfall in Tunis (5/5)

Year	Station: 47932 TUNIS CARTHAGE SM												Unit : (mm)				
	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Total				
66/67	28.9	46.7	45.1	53.7	34.6	59.8	27.7	41.4	17.1								
67/68							22.1				0.0						
68/69	2.5	17.7	47.5	39.9	44.3	47.1	45.6	22.9	32.6	1.0	5.2	4.7	311.0				
69/70	39.5	179.4	1.4	74.6	56.5	19.6	24.6	24.6	29.4	19.9	0.0	0.7	470.2				
70/71	13.2	69.9	4.8	96.2	49.3	134.0	45.5	24.0	9.3	7.7	0.7	0.0	454.6				
71/72	91.4	78.6	16.3	24.6	68.5	39.1	59.8	94.0	22.6	5.9	0.3	5.1	506.2				
72/73																	
73/74	14.2	134.8	21.2	196.2	19.5	85.5	18.7	44.4	12.7	3.6		4.5					
74/75	19.4	47.4	76.6	29.6	5.1	188.3	78.5	25.1	59.9	0.7	0.0	12.8	543.4				
75/76	4.2	14.9	228.5	25.9	51.8	26.9	41.2	22.3	66.6	38.4	7.6	14.7	543.0				
76/77	27.1	113.0	151.5	34.8	84.0	8.2	29.2	89.8	17.8	9.9	0.0	18.3	583.6				
77/78	19.0	27.0	46.7	11.0	35.0	77.9	41.2	47.9	42.3	1.4	0.0	0.0	349.4				
78/79	7.6	102.7	85.5	18.6	27.8	17.1	49.4	42.3	2.1	0.3	2.6	1.3	457.3				
79/80	142.3	64.8	94.3	10.2	37.7	24.4	46.1	41.6	37.5	3.4	0.9	6.1	509.3				
80/81	0.4	27.5	45.6	147.3	68.4	34.7	21.1	30.5	15.6	8.4	0.0	0.0	399.5				
81/82	15.9	29.1	19.8	50.8	120.3	57.3	40.7	65.2	28.0	0.0	0.0	18.3	445.4				
82/83	52.0	122.5	126.6	100.3	30.4	1.5	44.3	2.7	11.4	9.6	0.0	0.0	501.3				
83/84	30.0	138.2	66.8	59.7	36.8	65.2	29.4	32.8	1.4	7.8	0.0	7.9	476.0				
84/85	26.7	64.1	34.5	193.4	41.3	36.3	69.3	42.6	38.9	0.0	0.0	2.2	549.3				
85/86	4.4	8.5	26.4	7.1	33.5	23.6	73.2	52.2	29.4	13.5	9.3	0.0	281.1				
86/87	166.0	63.6	66.2	54.6	73.4	88.2	48.4	29.1	25.8	1.0	12.3	0.0	628.6				
87/88	66.5	5.2	46.5	8.8	48.9	28.1	42.1	34.0	4.9	19.4	0.0						
88/89	13.5	33.8	26.3	51.8	14.3	52.0	21.9	76.7	10.4	4.9	9.1	14.0	328.7				
89/90	17.9	51.4	45.1	114.0	132.2	13.0	25.2					17.5					
90/91	0.0	25.4	133.9	168.3	46.3		35.8		14.9	0.2	0.0	0.6					
91/92																	
Data	23	23	23	23	23	22	24	21	22	21	21	21	18				
Ave.	34.9	64.2	63.4	68.3	50.4	55.8	40.9	42.2	24.1	7.5	2.3	6.1	463.2				

Source : "Annuaire Pluviométrique de Tunisie", Direction General des Ressources en Eau

Table 3.16 Discharge Record in Maliyan Basin

No.	Year	Station : K08			Station : K18			Station : K27					
		Max. Instane (cu.m/s)	Date	Max. Journaler (cu.m/s)	Date	Max. Instane (cu.m/s)	Date	Max. Journaler (cu.m/s)	Date				
1	1974/75	105.400	03/08	30.000	03/08	60.600	02/05	23.600	02/05	27.500	09/30	1.860	09/30
2	1975/76	-	-	-	-	605.000	11/04	157.000	11/04	136.000	11/04	40.800	11/04
3	1976/77	-	-	-	-	89.300	10/26	42.800	10/26	13.800	11/19	3.080	11/19
4	1977/78	42.300	09/26	N/C	09/26	35.300	09/26	8.600	09/26	N/C	09/07	4.430	09/07
5	1978/79	0.490	03/16	0.486	03/16	6.920	11/13	1.680	03/16	74.000	01/12	4.380	01/12
6	1979/80	N/C	03/06	0.868	03/06	48.100	02/22	22.300	02/22	9.110	02/22	0.433	02/22
7	1980/81	95.700	12/18	26.200	12/18	N/C	10/01	16.400	10/01	N/C	12/30	1.420	12/30
8	1981/82	73.100	01/16	29.900	01/16	75.100	01/17	42.000	01/17	2.770	03/19	0.422	03/19
9	1982/83	136.000	01/10	30.400	11/12	125.000	10/29	55.500	11/12	171.000	11/12	81.300	11/12
10	1983/84	43.800	11/08	7.910	11/08	80.000	10/02	5.990	10/02	0.730	02/10	0.167	02/10
11	1984/85	N/C	N/C	N/C	N/C	128.000	10/19	36.900	10/19	30.000	03/06	4.910	03/06
12	1985/86	33.300	03/10	2.830	03/16	82.700	03/07	27.500	03/16	20.800	03/15	3.330	03/15
13	1986/87	12.400	12/25	0.981	12/25	476.000	09/30	105.100	09/30	160.000	09/30	23.800	09/30
14	1987/88	0.022	04/28	0.110	04/28	42.900	08/18	3.130	08/20	-	-	-	-

Source : "ANNUAIRE HYDROLOGIQUE DE TUNISIE", 1974/75 - 1978/88

Note : Max. Instane = Annual maximum of peak discharge  
 Max. Journaler = Annual maximum of daily mean discharge  
 N/C = Data printing is not clear.

Table 3.17 Calculated Basic Flood Runoff in Tunis (1/6)

Oued Mayzette Basin (Runoff Calculation by Rational Formula)										
Calc. Point	Sub-basin Combination	Total Area (sq.km)	Present Land Use Condition				Future Land Use Condition			
			Runoff Coeff. f	Design tc (min)	Calc. Q(100) (cu.m/s)	Calc. Q(10) (cu.m/s)	Runoff Coeff. f	Design tc (min)	Calc. Q(100) (cu.m/s)	Calc. Q(10) (cu.m/s)
1	1	0.50	0.40	40	4.4	2.1	0.80	36	9.6	4.7
2	1,2	0.81	0.37	46	5.8	2.9	0.80	46	12.6	6.2
3	3	0.47	0.32	46	2.9	1.4	0.80	46	7.3	3.6
4	1,2,3	1.28	0.35	46	8.7	4.3	0.80	46	20.0	9.8
5	1,2,3,4	1.88	0.34	70	8.7	4.3	0.71	63	19.8	9.7
6	5	0.79	0.24	35	4.6	2.3	0.26	35	5.0	2.5
7	1,2,3,4,5	2.65	0.31	70	11.3	5.5	0.57	63	22.7	11.1
8	1,2,3,4,5,6	3.97	0.29	87	13.2	6.5	0.47	79	23.2	11.4
9	1,2,3,4,5,6,7	5.08	0.28	104	14.1	6.9	0.42	96	22.6	11.1
10	8	1.24	0.52	74	8.5	4.1	0.80	74	13.0	6.4
11	1,2,3,4,5,6,7,8	6.32	0.32	104	20.0	9.8	0.50	96	33.4	16.4
12	1,2,3,4,5,6,7,8,9	6.98	0.34	114	21.8	10.7	0.50	107	33.7	16.5

Table 3.17 Calculated Basic Flood Runoff in Tunis (2/6)

Oued Ennkhilet Basin (Runoff Calculation by Rational Formula)										
Calc. Point	Sub-basin Combination	Total Area (sq.km)	Present Land Use Condition				Future Land Use Condition			
			Runoff Coeff. f	Design tc (min)	Calc. Q(100) (cu.m/s)	Calc. Q(10) (cu.m/s)	Runoff Coeff. f	Design tc (min)	Calc. Q(100) (cu.m/s)	Calc. Q(10) (cu.m/s)
1	1	0.32	0.28	20	3.5	1.7	0.39	20	4.9	2.4
2	2	0.35	0.33	11	7.4	3.6	0.44	11	9.8	4.8
3	1-2	0.67	0.31	20	8.1	4.0	0.42	20	10.9	5.4
4	1-3	0.89	0.35	28	9.2	4.5	0.50	28	13.1	6.4
5	6	1.56	0.24	30	10.4	5.1	0.26	30	11.3	5.5
6	4	0.60	0.32	13	10.7	5.2	0.50	13	16.7	8.2
7	4-5	1.22	0.32	34	9.8	4.8	0.53	34	16.2	7.9
8	1-6	3.67	0.29	34	26.7	13.0	0.41	34	37.7	18.4
9	1-7	4.72	0.31	67	20.9	10.2	0.50	67	33.7	16.5
10	9	1.14	0.20	10	15.8	7.7	0.20	10	15.8	7.7
11	Dam No. 1	1.14	0.20	10	15.8	7.7	0.20	10	15.8	7.7
12	9-10	1.87	0.25	18	19.8	9.7	0.27	18	21.4	10.5
13	9-11	2.16	0.26	23	19.5	9.5	0.34	23	25.4	12.5
14	8	0.25	0.20	8	4.2	2.0	0.27	8	5.6	2.8
15	8-18	0.29	0.20	11	3.7	1.8	0.34	11	6.3	3.1
16	8-11-18	2.45	0.26	23	22.1	10.8	0.34	23	28.9	14.1
17	8-12-18	2.74	0.28	41	16.4	8.1	0.39	41	22.9	11.2
18	1-12-18	7.46	0.30	67	31.9	15.6	0.46	67	48.9	24.0
19	1-13-18	7.62	0.30	73	30.4	14.9	0.46	73	46.6	22.8
20	14	0.96	0.24	12	13.7	6.7	0.26	12	14.8	7.3
21	Dam No. 2	0.96	0.24	12	13.7	6.7	0.26	12	14.8	7.3
22	14-15	1.70	0.29	27	14.9	7.3	0.36	27	18.6	9.1
23	14-16	2.36	0.36	47	16.3	8.0	0.47	47	21.2	10.4
24	1-16-18	9.98	0.31	73	41.1	20.1	0.47	73	62.3	30.5
25	1-16-17-18	12.13	0.30	83	43.4	21.3	0.47	83	68.1	33.3
26	20	1.41	0.28	25	12.8	6.2	0.32	25	14.6	7.1
27	19-20	2.39	0.28	38	15.3	7.5	0.39	38	21.3	10.4
28	1-20	14.32	0.30	83	52.0	25.5	0.46	83	79.7	39.0
29	1-20-23	15.12	0.30	101	46.0	22.5	0.47	101	72.1	35.3
30	21	0.51	0.28	69	2.0	1.0	0.80	69	5.7	2.8
31	22	0.57	0.24	69	1.9	0.9	0.80	69	6.3	3.1
32	21-22	1.08	0.26	69	3.9	1.9	0.80	69	12.0	5.9
33	21-22-25	1.46	0.26	83	4.5	2.2	0.80	83	13.9	6.8
34	1-23-25	16.59	0.30	101	50.5	24.7	0.50	101	84.1	41.2
35	1-25	17.12	0.29	118	44.3	21.7	0.51	118	77.8	38.1
36	26	73.58	0.32	118	209.9	102.8	0.50	118	328.0	160.6
37	27	33.73	1.00	118	300.7	147.2	1.00	118	300.7	147.2
38	1-27	124.43	0.50	118	554.6	271.6	0.64	118	709.9	347.6

Table 3.17 Calculated Basic Flood Runoff in Tunis (3/6)

Oued Greb Basin		(Runoff Calculation by Rational Formula)									
Calc. Point	Sub-basin Combination	Total Area (sq.km)	Present Land Use Condition				Future Land Use Condition				
			Runoff Coeff. f	Design tc (min)	Calc. Q(100) (cu.m/s)	Calc. Q(10) (cu.m/s)	Runoff Coeff. f	Design tc (min)	Calc. Q(100) (cu.m/s)	Calc. Q(10) (cu.m/s)	
1	1	1.10	0.20	15	10.9	5.3	0.20	15	10.9	5.3	
2	Dam 1 (B.greb)	1.10	0.20	15	10.9	5.3	0.20	15	10.9	5.3	
3	1,2	1.99	0.25	22	17.9	8.8	0.39	22	27.9	13.7	
4	Dam 2 (R.B. A)	1.99	0.25	22	17.9	8.8	0.39	22	27.9	13.7	
5	1,2,3	2.50	0.26	30	19.4	9.5	0.44	30	30.6	15.0	
6	4	0.83	0.36	15	14.8	7.2	0.62	15	25.4	12.4	
7	Dam 3 (Ennasr)	0.83	0.36	15	14.8	7.2	0.62	15	25.4	12.4	
8	4,5	1.03	0.37	20	14.8	7.3	0.65	20	26.0	12.8	
9	1,2,3,4,5	3.33	0.30	30	29.4	14.4	0.50	30	49.0	24.0	
10	Dam 4 (EGU-4)	3.33	0.30	30	29.4	14.4	0.50	30	49.0	24.0	
11	1,2,3,4,5,6	5.05	0.38	42	40.3	19.7	0.59	42	62.6	30.7	
12	1,2,3,4,5,6,7	6.02	0.41	59	39.1	19.2	0.62	59	59.2	29.0	
13	1,2,3,4,5,6,7,8	7.06	0.43	74	39.9	19.5	0.64	74	59.3	29.1	
14	Dam 5 (EGU-7)	7.06	0.43	74	39.9	19.5	0.64	74	59.3	29.1	
15	1,2,3,4,5,6,7,8,9	8.23	0.43	97	37.1	18.2	0.65	97	56.1	27.5	
16	11	1.14	0.20	19	9.3	4.5	0.20	19	9.3	4.5	
17	Dam 6 (B.Roriche)	1.14	0.20	19	9.3	4.5	0.20	19	9.3	4.5	
18	11,12	3.29	0.28	32	24.3	11.9	0.47	32	40.7	19.9	
19	Dam 7 (ERO-3)	3.29	0.28	32	24.3	11.9	0.47	32	40.7	19.9	
20	11,12,13	3.60	0.28	34	25.2	12.4	0.50	34	45.1	22.1	
21	Dam 8 (ERO-3b)	3.60	0.28	34	25.2	12.4	0.50	34	45.1	22.1	
22	11,12,13,14	6.20	0.35	68	30.6	15.0	0.63	68	55.0	26.9	
23	11,12,13,14,15	7.43	0.38	76	36.3	17.8	0.66	76	63.0	30.8	
24	11,12,13,14,15,16	9.44	0.41	101	39.3	19.2	0.67	101	64.2	31.4	
25	Dam 9 (ERO-5)	9.44	0.41	101	39.3	19.2	0.67	101	64.2	31.4	
26	11,12,13,14,15,16,17	9.78	0.41	112	37.3	18.3	0.68	112	61.9	30.3	
27	1-9,11-17	18.01	0.42	112	70.4	34.5	0.67	112	112.3	55.0	
28	1-17	18.87	0.42	130	65.2	31.9	0.67	130	104.0	50.9	

Table 3.17 Calculated Basic Flood Runoff in Tunis (4/6)

Oued Gariana Basin (Runoff Calculation by Rational Formula)										
Calc. Point	Sub-basin Combination	Total Area (sq.km)	Present Land Use Condition				Future Land Use Condition			
			Runoff Coeff. f	Design tc (min)	Calc. Q(100) (cu.m/s)	Calc. Q(10) (cu.m/s)	Runoff Coeff. f	Design tc (min)	Calc. Q(100) (cu.m/s)	Calc. Q(10) (cu.m/s)
1	1	2.36	0.20	30	13.1	6.4	0.68	30	44.6	21.8
2	Dam 1 (EGE-5)	2.36	0.20	30	13.1	6.4	0.68	30	44.6	21.8
3	1-2	3.99	0.20	33	20.5	10.0	0.68	33	69.6	34.1
4	15	4.47	0.24	37	25.0	12.3	0.62	37	64.7	31.7
5	Dam 2 (EGE-4)	4.47	0.24	37	25.0	12.3	0.62	37	64.7	31.7
6	3-15	5.80	0.23	45	26.5	13.0	0.65	45	74.8	36.6
7	1-3,15	9.79	0.22	45	42.7	20.9	0.66	45	128.2	62.8
8	1-4,15	13.26	0.22	51	52.2	25.5	0.68	51	161.3	79.0
9	Dam 3 (EGE-3)	13.26	0.22	51	52.2	25.5	0.68	51	161.3	79.0
10	1-5,15	13.63	0.22	54	51.1	25.0	0.68	54	158.1	77.4
11	6	9.94	0.24	57	38.9	19.0	0.32	57	51.9	25.4
12	Dam 4 (EGE-2)	9.94	0.24	57	38.9	19.0	0.32	57	51.9	25.4
13	6-7	10.26	0.24	60	38.5	18.8	0.33	60	52.9	25.9
14	1-7,15	23.89	0.23	60	85.9	42.0	0.53	60	197.9	96.9
15	1-8,15	27.26	0.23	65	91.7	44.9	0.53	65	211.3	103.4
16	9	1.59	0.52	30	23.0	11.2	0.80	30	35.3	17.3
17	Dam 5 (D.Hicher)	1.59	0.52	30	23.0	11.2	0.80	30	35.3	17.3
18	1-9,15	28.85	0.25	65	105.5	51.6	0.54	65	227.8	111.5
19	1-10,15	33.72	0.26	74	115.1	56.4	0.55	74	243.5	119.2
20	Dam 6 (EGE-6)	33.72	0.26	74	115.1	56.4	0.55	74	243.5	119.2
21	1-11,15	41.60	0.28	79	144.9	70.9	0.55	79	284.6	139.3
22	1-12, 15	42.65	0.29	88	140.7	68.9	0.56	88	271.6	133.0
23	Dam 7 (EBA-1)	42.65	0.29	88	140.7	68.9	0.56	88	271.6	133.0
24	16	3.47	0.20	31	18.8	9.2	0.38	31	35.7	17.5
25	Dam 8 (EBA-5)	3.47	0.20	31	18.8	9.2	0.38	31	35.7	17.5
26	17	3.23	0.24	30	21.5	10.5	0.50	30	44.9	22.0
27	16-17	6.70	0.22	36	35.2	17.2	0.44	36	70.4	34.5
28	Dam 9 (EBA-6)	6.70	0.22	36	35.2	17.2	0.44	36	70.4	34.5
29	16-18	15.84	0.25	47	75.8	37.1	0.58	47	175.8	86.1
30	Dam 10 (EBA-6)	15.84	0.25	47	75.8	37.1	0.58	47	175.8	86.1
31	16-19	19.11	0.31	56	98.0	48.0	0.62	56	196.1	96.0
32	20	3.11	0.32	42	20.9	10.2	0.80	42	52.3	25.6
33	20-21	5.43	0.39	47	40.5	19.8	0.80	47	83.1	40.7
34	Dam 11 (EBA-3)	5.43	0.39	47	40.5	19.8	0.80	47	83.1	40.7
35	16-21	24.54	0.32	56	130.0	63.6	0.66	56	268.0	131.2
36	16-22	24.90	0.33	61	126.7	62.0	0.66	61	253.3	124.0
37	23	1.15	0.44	28	14.9	7.3	0.80	28	27.1	13.3
38	Dam 12 (Ettamhden)	1.15	0.44	28	14.9	7.3	0.80	28	27.1	13.3
39	23-24	3.39	0.49	31	44.9	22.0	0.80	31	73.3	35.9
40	23-25	4.20	0.46	39	43.2	21.1	0.74	39	69.5	34.0
41	Dam 13 (EBA-2)	4.20	0.46	39	43.2	21.1	0.74	39	69.5	34.0
42	16-25	29.10	0.35	61	157.0	78.9	0.67	61	300.6	147.2
43	16-26	29.98	0.35	70	144.3	70.6	0.67	70	276.2	135.2
44	1-12,15,26	72.63	0.31	88	256.1	125.4	0.60	88	495.6	242.6
45	1-13,15,26	72.80	0.31	90	251.9	123.3	0.60	90	487.6	238.7
46	27	3.83	0.56	61	33.1	16.2	0.80	61	47.2	23.1
47	1-13,15,27	76.63	0.33	90	282.3	138.2	0.61	90	521.8	255.5
48	1-27	86.52	0.34	96	311.2	152.4	0.62	96	567.8	277.9
49	28	128.78	0.24	96	327.0	160.1	0.44	96	599.5	293.5
50	29	25.84	1.00	96	273.4	133.9	1.00	96	273.4	133.9
51	1-29	241.14	0.36	96	918.5	449.7	0.57	96	1454.3	712.0

Table 3.17 Calculated Basic Flood Runoff in Tunis (5/6)

Oued Bou Khemsa Basin (Runoff Calculation by Rational Formula)											
Calc. Point	Sub-basin Combination	Total Area (sq.km)	Present Land Use Condition				Future Land Use Condition				
			Runoff Coeff. f	Design tc (min)	Calc. Q(100) (cu.m/s)	Calc. Q(10) (cu.m/s)	Runoff Coeff. f	Design tc (min)	Calc. Q(100) (cu.m/s)	Calc. Q(10) (cu.m/s)	
1	1	0.82	0.24	16	9.2	4.5	0.44	16	16.9	8.3	
2	1,2	1.36	0.24	29	9.3	4.6	0.54	29	21.0	10.3	
3	3	0.29	0.24	10	4.8	2.4	0.55	10	11.0	5.4	
4	1,2,3	1.85	0.24	29	11.3	5.5	0.54	29	25.5	12.5	
5	1,2,3,4	2.17	0.24	37	12.2	6.0	0.54	37	27.4	13.4	
6	5	0.79	0.28	44	4.5	2.2	0.80	44	12.8	6.3	
7	1,2,3,4,5	2.96	0.25	44	15.0	7.3	0.61	44	36.5	17.9	
8	1,2,3,4,5,6	3.05	0.26	47	15.2	7.4	0.62	47	36.2	17.7	
9	7	0.50	0.52	83	3.1	1.5	0.74	83	4.4	2.2	
10	1,2,3,4,5,6,7	3.55	0.29	83	12.3	6.0	0.63	83	26.7	13.1	
11	1,2,3,4,5,6,7,8	3.67	0.30	91	12.2	6.0	0.64	91	26.0	12.7	
12	14	0.61	0.20	9	9.2	4.5	0.20	9	9.2	4.5	
13	Dam No.1	0.61	0.20	9	9.2	4.5	0.20	9	9.2	4.5	
14	13,14	1.22	0.24	14	15.3	7.5	0.29	14	18.5	9.1	
15	12,13,14	1.42	0.27	15	18.9	8.3	0.34	15	23.8	11.7	
16	11,12,13,14	1.52	0.28	29	12.2	6.0	0.35	29	15.2	7.4	
17	9	0.78	0.60	56	7.7	3.8	0.80	56	10.3	5.1	
18	1-9,11-14	5.97	0.33	91	21.8	10.7	0.59	91	39.0	19.1	
19	1-14	6.20	0.34	100	21.6	10.6	0.59	100	37.4	18.3	

Table 3.17 Calculated Basic Flood Runoff in Tunis (6/6)

Oued Ain Zerga Basin (Runoff Calculation by Rational Formule)										
Calc. Point	Sub-basin Combination	Total Area (sq.km)	Present Land Use Condition				Future Land Use Condition			
			Runoff Coeff. f	Design tc (min)	Calc. Q(100) (cu.m/s)	Calc. Q(10) (cu.m/s)	Runoff Coeff. f	Design tc (min)	Calc. Q(100) (cu.m/s)	Calc. Q(10) (cu.m/s)
1	1	2.52	0.20	15	24.9	12.2	0.20	15	24.9	12.2
2	Dam No.1	2.52	0.20	15	24.9	12.2	0.20	15	24.9	12.2
3	1,2	2.64	0.20	18	22.4	11.0	0.21	18	23.5	11.5
4	3	0.27	0.20	14	2.8	1.4	0.31	14	4.4	2.1
5	1,2,3	2.91	0.20	18	24.7	12.1	0.22	18	27.2	13.3
6	Dam No.2	2.91	0.20	18	24.7	12.1	0.22	18	27.2	13.3
7	1,2,3,4	3.05	0.21	23	22.2	10.9	0.25	23	26.4	12.9
8	1,2,3,4,5	3.17	0.21	35	16.3	8.0	0.27	35	20.9	10.2
9	8	0.73	0.20	15	7.2	3.5	0.50	15	18.0	8.8
10	8,7	1.00	0.21	21	7.8	3.8	0.58	21	21.7	10.6
11	1,2,3,4,5,7,8	4.17	0.21	35	21.4	10.5	0.34	35	34.7	17.0
12	1,2,3,4,5,6,7,8	4.20	0.21	39	19.7	9.6	0.35	39	32.8	16.1



Table 3.18 Calculated Flood Runoff in Tunis (1/5)

Oued Ennkhilet Basin							
Calc. Point	Sub-basin Combination	Future Land Use Condition					
		Basic Q(100) (cu.m/s)	Basic Q(10) (cu.m/s)	ENK-1 Q(100) (cu.m/s)	ENK-1 Q(10) (cu.m/s)	ENK-2 Q(100) (cu.m/s)	ENK-2 Q(10) (cu.m/s)
1	1	4.9	2.4	4.9	2.4	4.9	2.4
2	2	9.8	4.8	9.8	4.8	9.8	4.8
3	1-2	10.9	5.4	10.9	5.4	10.9	5.4
4	1-3	13.1	6.4	13.1	6.4	13.1	6.4
5	6	11.3	5.5	11.3	5.5	11.3	5.5
6	4	16.7	8.2	16.7	8.2	16.7	8.2
7	4-5	16.2	7.9	16.2	7.9	16.2	7.9
8	1-6	37.7	18.4	37.7	18.4	37.7	18.4
9	1-7	33.7	16.5	33.7	16.5	33.7	16.5
10	9	15.8	7.7	15.8	7.7	15.8	7.7
11	Dam No. 1	15.8	7.7	0.0	0.0	0.0	0.0
12	9-10	21.4	10.5	8.4	4.1	8.4	4.1
13	9-11	25.4	12.5	12.2	5.8	12.2	5.8
14	8	5.6	2.8	5.6	2.8	5.6	2.8
15	8,18	6.3	3.1	6.3	3.1	6.3	3.1
16	8-11,18	28.9	14.1	15.6	7.6	15.6	7.6
17	8-12,18	22.9	11.2	13.7	6.5	13.7	6.5
18	1-12,18	48.9	24.0	42.4	20.3	42.4	20.3
19	1-13,18	46.6	22.8	40.5	19.4	40.5	19.4
20	14	14.8	7.3	14.8	7.3	14.8	7.3
21	Dam No. 2	14.8	7.3	0.0	0.0	14.8	7.3
22	14-15	18.6	9.1	8.4	4.0	18.6	9.1
23	14-16	21.2	10.4	13.9	6.2	21.2	10.4
24	1-16,18	62.3	30.5	51.5	24.0	56.2	27.0
25	1-16,17-18	68.1	33.3	58.5	27.6	62.7	30.2
26	20	14.6	7.1	14.6	7.1	14.6	7.1
27	19-20	21.3	10.4	21.3	10.4	21.3	10.4
28	1-20	79.7	39.0	70.2	33.4	74.4	35.0
29	1-20,23	72.1	35.3	60.2	30.4	67.7	32.6
30	21	5.7	2.8	5.7	2.8	5.7	2.8
31	22	6.3	3.1	6.3	3.1	6.3	3.1
32	21-22	12.0	5.9	12.0	5.9	12.0	5.9
33	21-22,25	13.9	6.8	13.9	6.8	13.9	6.8
34	1-23,25	84.1	41.2	76.2	36.0	79.7	38.3
35	1-25	77.8	38.1	71.1	33.5	74.0	35.6
36	26	328.0	160.6	328.0	160.6	328.0	160.6
37	27	300.7	147.2	300.7	147.2	300.7	147.2
38	1-27	706.5	345.9	689.8	341.3	702.7	343.4

Table 3.18 Calculated Flood Runoff in Tunis (2/5)

Oued Greb Basin		Future Land Use Condition							
Calc. Point	Sub-basin Combination	Basic	Basic	GB-1	GB-1	GB-2	GB-2	GB-3'	GB-3'
		Q(100) (cu.m/s)	Q(10) (cu.m/s)	Q(100) (cu.m/s)	Q(10) (cu.m/s)	Q(100) (cu.m/s)	Q(10) (cu.m/s)	Q(100) (cu.m/s)	Q(10) (cu.m/s)
1	1	10.9	5.3	10.9	5.3	10.9	5.3	10.9	5.3
2	Dam 1 (B.greb)	10.9	5.3	0.0	0.0	0.0	0.0	0.0	0.0
3	1,2	27.9	13.7	12.5	6.1	12.5	6.1	12.5	6.1
4	Dam 2 (R.B. A)	27.9	13.7	12.5	6.1	0.0	0.0	0.0	0.0
5	1,2,3	30.6	15.0	17.2	8.4	6.4	3.1	6.2	3.1
6	4	25.4	12.4	25.4	12.4	25.4	12.4	25.4	12.4
7	Dam 3 (Ennasr)	25.4	12.4	5.6	0.2	5.6	0.2	5.6	0.2
8	4,5	26.0	12.8	10.9	2.7	10.9	2.7	10.9	2.7
9	1,2,3,4,5	49.0	24.0	24.9	10.9	12.6	4.9	12.3	4.9
10	Dam 4 (EGU-4)	49.0	24.0	11.3	0.7	2.4	0.0	2.0	0.0
11	1,2,3,4,5,6	62.6	30.7	32.9	10.9	23.6	9.3	22.7	9.3
12	1,2,3,4,5,6,7	59.2	29.0	37.5	14.0	29.8	12.1	28.5	12.1
13	1,2,3,4,5,6,7,8	59.3	29.1	41.9	16.6	35.3	14.6	33.7	14.6
14	Dam 5 (EGU-7)	59.3	29.1	29.9	8.4	24.8	6.8	23.3	6.8
15	1,2,3,4,5,6,7,8,9	56.1	27.5	34.7	11.6	30.3	10.0	28.7	10.0
16	11	9.3	4.5	9.3	4.5	9.3	4.5	9.3	4.5
17	Dam 6 (B.Roriche)	9.3	4.5	0.0	0.0	0.0	0.0	0.0	0.0
18	11,12	40.7	19.9	26.9	13.0	26.9	13.0	26.6	13.0
19	Dam 7 (ERO-3)	40.7	19.9	7.2	0.2	7.2	0.2	0.2	0.0
20	11,12,13	45.1	22.1	12.4	2.1	12.4	2.1	4.2	1.9
21	Dam 8 (ERO-3b)	45.1	22.1	8.7	0.2	8.7	0.2	0.8	0.0
22	11,12,13,14	55.0	26.9	35.0	12.1	35.0	12.1	25.3	11.3
23	11,12,13,14,15	63.0	30.8	45.0	17.0	45.0	17.0	35.1	15.9
24	11,12,13,14,15,16	64.2	31.4	50.7	20.6	50.7	20.6	42.3	19.5
25	Dam 9 (ERO-5)	64.2	31.4	44.8	16.6	44.8	16.6	34.1	13.0
26	11,12,13,14,15,16,17	61.9	30.3	45.2	17.0	45.2	17.0	34.9	13.6
27	1-9,11-17	112.3	55.0	77.5	27.9	73.4	26.2	61.4	22.9
28	1-17	104.0	50.9	75.1	27.8	71.4	26.2	60.5	23.2

Table 3.18 Calculated Flood Runoff in Tunis (3/5)

Oued Gariana Basin							
Calc. Point	Sub-basin Combination	Future Land Use Condition					
		Basic Q(100)	Basic Q(10)	GR-1 Q(100)	GR-1 Q(10)	GR-2' Q(100)	GR-2' Q(10)
		(cu.m/s)	(cu.m/s)	(cu.m/s)	(cu.m/s)	(cu.m/s)	(cu.m/s)
1	1	44.6	21.8	44.6	21.8	44.6	21.8
2	Dam 1 (EGE-5)	44.6	21.8	44.6	21.8	0.0	0.0
3	1-2	69.6	34.1	69.6	34.1	28.5	13.9
4	15	64.7	31.7	64.7	31.7	64.7	31.7
5	Dam 2 (EGE-4)	64.7	31.7	64.7	31.7	0.0	0.0
6	3,15	74.8	36.6	74.8	36.6	17.2	8.4
7	1-3,15	128.2	62.8	128.2	62.8	38.8	19.0
8	1-4,15	161.3	79.0	161.3	79.0	78.2	39.3
9	Dam 3 (EGE-3)	161.3	79.0	115.5	47.6	60.9	22.7
10	1-5,15	158.1	77.4	117.7	48.8	62.8	24.0
11	6	51.9	25.4	51.9	25.4	51.9	25.4
12	Dam 4 (EGE-2)	51.9	25.4	29.0	9.4	29.0	9.4
13	6-7	52.9	25.9	31.4	10.6	31.4	10.6
14	1-7,15	197.9	96.9	141.8	56.0	100.7	37.5
15	1-8,15	211.3	103.4	162.9	67.0	122.5	48.9
16	9	35.3	17.3	35.3	17.3	35.3	17.3
17	Dam 5 (D.Hicher)	35.3	17.3	12.5	1.4	8.5	0.3
18	1-9,15	227.8	111.5	170.6	68.8	127.1	50.1
19	1-10,15	243.5	119.2	197.5	83.1	155.1	64.8
20	Dam 6 (EGE-6)	243.5	119.2	163.1	60.2	126.4	44.8
21	1-11,15	284.6	139.3	212.8	85.2	176.1	70.0
22	1-12, 15	271.6	133.0	211.6	85.8	175.0	70.6
23	Dam 7 (EBA-1)	271.6	133.0	203.9	80.7	169.2	66.2
24	16	35.7	17.5	35.7	17.5	35.7	17.5
25	Dam 8 (EBA-5)	35.7	17.5	35.7	17.5	0.0	0.0
26	17	44.9	22.0	44.9	22.0	44.9	22.0
27	16-17	70.4	34.5	70.4	34.5	33.9	16.6
28	Dam 9 (EBA-6)	70.4	34.5	70.4	34.5	0.0	0.0
29	16-18	175.8	86.1	175.8	86.1	101.5	49.7
30	Dam 10 (EBA-6)	175.8	86.1	145.7	64.7	87.0	35.8
31	16-19	196.1	96.0	174.3	79.4	115.6	51.0
32	20	52.3	25.6	52.3	25.6	52.3	25.6
33	20-21	83.1	40.7	83.1	40.7	83.1	40.7
34	Dam 11 (EBA-3)	83.1	40.7	46.1	14.8	46.1	14.8
35	16-21	268.0	131.2	219.1	94.7	156.5	64.4
36	16-22	253.3	124.0	210.9	91.3	150.8	62.5
37	23	27.1	13.3	27.1	13.3	27.1	13.3
38	Dam 12 (Ettamhden)	27.1	13.3	14.3	4.4	14.3	4.4
39	23-24	73.3	35.9	62.3	27.9	62.3	27.9
40	23-25	69.5	34.0	61.6	28.0	61.6	28.0
41	Dam 13 (EBA-2)	69.5	34.0	61.6	28.0	49.0	18.0
42	16-25	300.6	147.2	253.6	110.7	185.4	75.3
43	16-26	276.2	135.2	238.5	104.7	175.9	72.4
44	1-12,15-26	495.6	242.6	400.1	166.6	314.5	125.9
45	1-13,15-26	487.6	238.7	395.6	164.9	310.9	124.7
46	27	47.2	23.1	47.2	23.1	47.2	23.1
47	1-13,15-27	521.8	255.5	429.3	181.3	343.2	140.4
48	1-27	567.6	277.9	484.2	209.4	399.5	169.3
49	28	599.5	293.5	599.5	293.5	599.5	293.5
50	29	273.4	133.9	273.4	133.9	273.4	133.9
51	1-29	1440.5	705.3	1357.1	636.8	1272.4	596.6

Table 3.18 Calculated Flood Runoff in Tunis (4/5)

Oued Bou Khamsa Basin					
Calc. Point	Sub-basin Combination	Future Land Use Condition			
		Basic Q(100) (cu.m/s)	Basic Q(10) (cu.m/s)	Alt. Q(100) (cu.m/s)	Alt. Q(10) (cu.m/s)
1	1	16.9	8.3	16.9	8.3
2	1,2	21.0	10.3	21.0	10.3
3	3	11.0	5.4	11.0	5.4
4	1,2,3	25.5	12.5	25.5	12.5
5	1,2,3,4	27.4	13.4	27.4	13.4
6	5	12.8	6.3	12.8	6.3
7	1,2,3,4,5	36.5	17.9	36.5	17.9
8	1,2,3,4,5,6	36.2	17.7	36.2	17.7
9	7	4.4	2.2	4.4	2.2
10	1,2,3,4,5,6,7	26.7	13.1	26.7	13.1
11	1,2,3,4,5,6,7,8	26.0	12.7	26.0	12.7
12	14	9.2	4.5	9.2	4.5
13	Dam No.1	9.2	4.5	0.1	0.0
14	13,14	18.5	9.1	7.8	3.7
15	12,13,14	23.8	11.7	11.1	5.3
16	11,12,13,14	15.2	7.4	7.7	3.6
17	9	10.3	5.1	10.3	5.1
18	1-9,11-14	39.0	19.1	20.3	9.6
19	1-14	37.4	18.3	20.2	9.5

Table 3.18 Calculated Flood Runoff in Tunis (5/5)

Oued Ain Zerga Basin									
Calc. Point	Sub-basin Combination	Future Land Use Condition							
		Basic Q(100) (cu.m/s)	Basic Q(10) (cu.m/s)	AZ-2 Q(100) (cu.m/s)	AZ-2 Q(10) (cu.m/s)	AZ-3 Q(100) (cu.m/s)	AZ-3 Q(10) (cu.m/s)	AZ-4 Q(100) (cu.m/s)	AZ-4 Q(10) (cu.m/s)
1	1	24.9	12.2	24.9	12.2	24.9	12.2	24.9	12.2
2	Dam No.1	24.9	12.2	0.0	0.0	24.9	12.2	0.0	0.0
3	1,2	23.5	11.5	1.1	0.5	23.5	11.5	1.1	0.5
4	3	4.4	2.1	4.4	2.1	4.4	2.1	4.4	2.1
5	1,2,3	27.2	13.3	3.6	1.8	27.2	13.3	3.6	1.8
6	Dam No.2	27.2	13.3	3.6	1.8	0.1	0.0	0.0	0.0
7	1,2,3,4	26.4	12.9	4.6	2.2	1.4	0.6	1.2	0.6
8	1,2,3,4,5	20.9	10.2	4.4	2.2	2.1	0.8	1.7	0.8
9	8	18.0	8.8	18.0	8.8	18.0	8.8	18.0	8.8
10	8,7	21.7	10.6	21.7	10.6	21.7	10.6	21.7	10.6
11	1,2,3,4,5,7,8	34.7	17.0	14.2	6.7	11.9	5.1	10.5	5.1
12	1,2,3,4,5,6,7,8	32.8	16.1	13.7	6.4	11.7	4.9	10.1	4.5

Table 3.19 Probability Analysis (One Day Rainfall)

Station : Tunis-Manoubia (47836)  
 Year : 1968/69 - 1986/87

Return Period (year)	Unit : (mm)				Design Rainfall Ratio			Design Rainfall Ratio		
	Weibull Plot	Hazen Plot	Gumbel Method	Used	26-Mar-73 Upper-1	26-Mar-73 Lower-1	26-Mar-73 Whole-1	29-Sep-86 Upper-1	30-Sep-86 Lower-1	30-Sep-86 Whole-1
1000	231.69	196.25	189.41	189	86.6	37.8	71.5	51.5	113.3	50.0
500	207.97	178.17	174.55	175						
400	200.57	172.49	169.76	170						
300	191.20	165.26	163.59	164						
250	185.35	160.73	159.67	160						
200	178.29	155.25	154.88	155						
150	169.35	148.26	148.70	149						
100	157.02	138.57	139.97	140	1.617	3.704	1.958	2.718	1.236	2.800
80	150.37	133.31	135.16	135						
60	141.93	126.60	128.95	129						
50	136.66	122.38	125.01	125	1.443	3.307	1.748	2.427	1.103	2.500
40	130.29	117.27	120.18	120						
30	122.19	110.72	113.92	114						
25	117.12	106.60	109.94	110	1.270	2.910	1.538	2.136	0.971	2.200
20	110.97	101.58	105.05	105						
15	103.14	95.14	98.69	99						
10	92.22	86.09	89.62	90	1.039	2.381	1.259	1.748	0.794	1.800
8	86.26	81.09	84.54	85						
5	73.71	70.45	73.54	74	0.855	1.958	1.035	1.437	0.653	1.480
4	67.70	65.29	68.10	68						
3	59.79	58.43	60.74	61						
2	48.02	48.02	49.25	49	0.566	1.296	0.685	0.951	0.432	0.980

Note :

- 73 Upper : Upper basin of Bir M'cherga Dam;
- 73 Lower : Lower basin of Bir M'cherga Dam;
- 73 Whole : Whole basin;
- 86 Upper : Upper basin of Bir M'cherga Dam;
- 86 Lower : Lower basin of Bir M'cherga Dam;
- 86 Whole : Whole basin;
- weighted average of 1-day rainfall at 46232 and 45246
- 1-day rainfall at 47836
- weighted average of 1-day rainfall at 46232, 45246 and 47836
- 1-day rainfall at 40961
- 1-day rainfall at 44542
- weighted average of 1-day rainfall at 40961 and 44542

Table 3.20 Results of Model Calibration

	Calculation Point	Peak Discharge (cu.m/s)			
		Mar. 27 '73 Flood		Sep. 30 '86 Flood	
		Observed	Model (ML-1)	Observed	Model (ML-1)
1	Upstream of Channel No.1		88.86		185.23
2	Downstream of Channel No.1		88.12		174.22
3	Outflow of Kebir Dam		69.83		174.22
4	Upstream of Channel No.2		96.55		231.29
5	Downstream of Channel No.2		94.06		228.17
6	Upstream of Channel No.3		94.65		229.13
7	Downstream of Channel No.3		94.32		221.58
8	Upstream of Channel No.13		105.70		273.34
9	Downstream of Channel No.13		85.40		179.62
10	After confluence of Basin No.8		123.04		262.40
11	Upstream of Channel No.14		151.07		295.92
12	Downstream of Channel No.14		121.85		126.61
13	K12		215.09		317.31
14	Upstream of Channel No.4		217.75		318.54
15	Downstream of Channel No.4		217.62		314.95
16	Upstream of Channel No.15		72.45		172.44
17	Downstream of Channel No.15		72.12		147.33
18	Upstream of Channel No.16		73.79		147.70
19	Downstream of Channel No.16		74.54		154.49
20	K18		282.78	476	415.59
21	Upstream of Channel No.5		420.79		721.08
22	Downstream of Channel No.5	416	407.17	693	592.64
23	Outflow of Bir M'cherga Dam		62.49		592.64
24	Upstream of Channel No.6		62.63		592.74
25	Downstream of Channel No.6		62.63		600.24
26	Upstream of Channel No.7		63.64		627.33
27	Downstream of Channel No.7		63.61		563.07
28	(Outflow of Retarding Basin A)		63.61		563.07
29	Upstream of Channel No.8		66.79		598.12
30	Downstream of Channel No.8		65.88		582.49
31	Upstream of Channel No.9		69.80		591.74
32	Downstream of Channel No.9		69.16		572.41
33	(Outflow of El Hamma Dam)		27.08		360.36
34	Upstream of Channel No.17		54.62		660.04
35	Downstream of Channel No.17 (K08)	70	51.66	500 - 600	678.20
36	Upstream of Channel No.18		54.66		731.10
37	Downstream of Channel No.18		53.21		716.35
38	Upstream of Channel No.10		102.35		957.84
39	Downstream of Channel No.10 (K05)		102.05		1000.24
40	Upstream of Channel No.11		103.19		1022.12
41	Downstream of Channel No.11		102.09		970.50
42	(Inflow from Sijoumi Basin)		0.00		0.00
43	(After confluence of Sijoumi Basin)		102.09		970.50
44	After confluence of Basin No.24		105.44		1040.72
45	Upstream of Channel No.12		105.87		1049.58
46	Downstream of Channel No.12		105.30		1056.44

Table 3.21 Calculated Basic Flood Runoff in Maliyan Basin

(Unit : cu.m/s)

	Calculation Point	Catchment Area (sq.km)	w/o Dam (100)		Basic Q (100)	w/o Dam (10)		Basic Q (10)
			'73-W1	'86-L1		'73-W1	'86-L1	
1	Upstream of Channel No.1	272	209		209	122		122
2	Downstream of Channel No.1	272	212		212	122		122
3	Outflow of Kebir Dam	272	212		212	122		122
4	Upstream of Channel No.2	365	272		272	162		162
5	Downstream of Channel No.2	365	270		270	155		155
6	Upstream of Channel No.3	367	272		272	156		156
7	Downstream of Channel No.3	367	268		268	157		157
8	Upstream of Channel No.13	267	255		255	140		140
9	Downstream of Channel No.13	267	220		220	117		117
10	After confluence of Basin No.8	380	299		299	169		169
11	Upstream of Channel No.14	449	383		383	205		205
12	Downstream of Channel No.14	449	379		379	196		196
13	K12	816	644		644	354		354
14	Upstream of Channel No.4	827	654		654	357		357
15	Downstream of Channel No.4	827	650		650	359		359
16	Upstream of Channel No.15	188	283		283	96		96
17	Downstream of Channel No.15	188	308		308	96		96
18	Upstream of Channel No.16	192	312		312	98		98
19	Downstream of Channel No.16	192	311		311	98		98
20	K18	1,019	944		944	445		445
21	Upstream of Channel No.5	1,398	1,636		1,636	626		626
22	Downstream of Channel No.5	1,398	1,556		1,556	610		610
23	Outflow of Bir M'cherga Dam	1,398	1,556	938	1,556	610	487	610
24	Upstream of Channel No.6	1,419	1,577	939	1,577	615	488	615
25	Downstream of Channel No.6	1,419	1,574	945	1,574	614	470	614
26	Upstream of Channel No.7	1,551	1,601	974	1,601	637	489	637
27	Downstream of Channel No.7	1,551	1,529	878	1,529	626	451	626
28	(Outflow of Retarding Basin A)	1,551	1,529	878	1,529	626	451	626
29	Upstream of Channel No.8	1,643	1,545	963	1,545	639	471	639
30	Downstream of Channel No.8	1,643	1,506	904	1,506	636	455	636
31	Upstream of Channel No.9	1,684	1,512	930	1,512	641	460	641
32	Downstream of Channel No.9	1,684	1,518	934	1,518	640	447	640
33	(Outflow of El Hamma Dam)	123	76	455	455	40	272	272
34	Upstream of Channel No.17	222	144	827	827	79	508	508
35	Downstream of Channel No.17 (K08)	222	131	877	877	74	493	493
36	Upstream of Channel No.18	242	140	948	948	79	530	530
37	Downstream of Channel No.18	242	144	929	929	76	502	502
38	Upstream of Channel No.10	1,946	1,561	1,366	1,561	678	728	728
39	Downstream of Channel No.10 (K05)	1,946	1,537	1,372	1,537	677	702	702
40	Upstream of Channel No.11	1,957	1,539	1,404	1,539	678	718	718
41	Downstream of Channel No.11	1,957	1,544	1,402	1,544	678	705	705
42	(Inflow from Sijoumi Basin)	1,957	0	0	0	0	0	0
43	(After confluence of Sijoumi Basin)	1,957	1,544	1,402	1,544	678	705	705
44	After confluence of Basin No.24	1,991	1,548	1,480	1,548	685	732	732
45	Upstream of Channel No.12	1,996	1,549	1,491	1,549	686	734	734
46	Downstream of Channel No.12	1,996	1,555	1,569	1,569	685	754	754



Table 3.22 Calculated Flood Runoff in Maliyan Basin

(Unit : cu.m/s)

Calcu. Point	ALT.- ML-1 (100)	ALT.- ML-1 (10)	ALT.- ML-2 (100)	ALT.- ML-2 (10)	ALT.- ML-3 (100)	ALT.- ML-3 (10)	ALT.- ML-4 (100)	ALT.- ML-4 (10)
1	209	122	209	122	209	122	209	122
2	212	122	212	122	212	122	212	122
3	171	87	171	87	171	87	171	87
4	255	120	255	120	255	120	255	120
5	251	117	251	117	251	117	251	117
6	253	118	253	118	253	118	253	118
7	252	117	252	117	252	117	252	117
8	255	140	255	140	255	140	255	140
9	220	117	220	117	220	117	220	117
10	299	169	299	169	299	169	299	169
11	383	205	383	205	383	205	383	205
12	379	196	379	196	379	196	379	196
13	628	297	628	297	628	297	628	297
14	638	300	638	300	638	300	638	300
15	637	301	637	301	637	301	637	301
16	283	96	283	96	283	96	283	96
17	308	96	308	96	308	96	308	96
18	312	98	312	98	312	98	312	98
19	311	98	311	98	311	98	311	98
20	930	387	930	387	930	387	930	387
21	1,623	589	1,623	589	1,623	589	1,623	589
22	1,537	556	1,537	556	1,537	556	1,537	556
23	111	72	111	72	111	72	111	72
24	178	74	178	74	178	74	178	74
25	136	74	136	74	136	74	136	74
26	194	108	194	108	194	108	194	108
27	136	75	136	75	136	75	136	75
28	136	75	136	75	105	74	105	74
29	390	218	390	218	366	209	366	209
30	363	190	363	190	343	185	343	185
31	513	252	513	252	492	248	492	248
32	482	230	482	230	457	226	457	226
33	455	272	139	68	455	272	139	68
34	827	508	518	265	827	508	518	265
35	877	493	477	245	877	493	477	245
36	946	530	538	282	946	530	538	282
37	929	502	549	294	929	502	549	294
38	1,346	724	1,016	517	1,335	722	1,004	515
39	1,361	700	1,025	485	1,353	698	1,005	482
40	1,392	716	1,043	495	1,384	714	1,024	492
41	1,356	696	1,063	513	1,339	694	1,047	510
42	0	0	0	0	0	0	0	0
43	1,356	696	1,063	513	1,339	694	1,047	510
44	1,433	723	1,140	540	1,424	721	1,124	537
45	1,454	726	1,151	542	1,447	723	1,135	539
46	1,536	749	1,147	508	1,523	746	1,134	506

Table 3.23 Monthly Rainfall in Sousse (1/2)

Station: 73510		KALAA SEGHIRA												Unit : (mm)		
Year	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Total			
66/67		41.0	11.0	7.0		39.5	3.0	7.5	15.0			6.0				
67/68	95.0				46.0	75.2	39.5	0.0	19.5		0.0	0.0				
68/69	10.0	4.5	0.0	7.0	21.0	17.0	15.0	10.0	22.0	0.0	0.0	7.0	113.5			
69/70	134.0	629.0	0.0	13.5	10.0	0.0	9.0	13.0	6.6	0.0	0.0	1.0	816.3			
70/71	7.5	9.0	0.0	126.0	47.5	93.5	5.0	7.0	12.5	0.0	0.0					
71/72	36.5	144.5	23.2	126.0	37.5	12.5	49.5	60.4	20.0	0.0	4.0	7.5	521.6			
72/73	9.0	94.0	3.5			35.5	93.0	23.5	0.0	0.0	0.0	35.0				
73/74	0.0	69.0	41.0	364.5	5.0	25.0		24.5	0.0		0.0	5.0				
74/75	54.5	41.5	10.0	7.0	10.0		22.5	10.0	10.0	0.0	0.0	27.0				
75/76	0.0	72.0	34.0	31.0	78.0	45.0	53.0	0.0	44.0	4.0	0.0	0.0	361.0			
76/77	37.0	16.2	160.2	7.5	53.0	5.0	15.0	24.5	6.2	0.0	0.0	0.0	324.6			
77/78	42.7	14.7	38.1	19.6	10.3	25.2	20.2	11.4	17.7	0.0	0.0	2.0	201.9			
78/79	0.0	75.5	72.1	4.6	6.3	60.7	56.7	14.7	14.0	0.0	0.0	0.0	304.6			
79/80	100.7	5.7	29.6	0.0	1.5	8.2	44.6	48.8	7.5	0.0	0.0	4.5	251.1			
80/81	3.8	6.5	5.4	24.1	27.7	33.8	7.1	6.5	6.6	3.3	0.0	3.0	127.8			
81/82	3.3	28.7	1.4	15.7	109.0	10.9	10.9	38.8	15.3	0.0	4.5	2.5	241.0			
82/83	6.4	215.0	102.9	42.7	16.8	0.0	20.1	0.0	11.0	7.5	0.0	0.0	422.4			
83/84	13.2	85.7	16.6	15.0	5.0	18.3	42.7	13.1	0.0	0.0	0.0	10.2	219.8			
84/85	21.1	127.9	5.8	153.0	25.9	56.7	27.4	10.2	28.7	1.0	0.0	0.0	457.7			
85/86	35.5	32.6	2.2	0.5	4.1	6.6	86.9	12.0	1.2	3.1	2.1	0.0	186.8			
86/87	3.4	69.7	57.0	178.3	8.1	12.5	29.0	27.1	9.8	0.0	0.0	0.0	394.9			
87/88	37.0	12.0	41.2	25.0	2.0		0.0	29.0		12.2	0.0	0.0				
88/89	14.6	7.0	107.2	24.7	69.3	44.1	6.1	10.8	0.0	8.3	0.0	2.8	294.9			
89/90	19.2	113.0	17.2	91.0	140.0	0.0	42.0	82.6			4.0	10.2				
90/91		10.0	39.0	66.0	39.5	59.5	64.9	35.5	12.0	5.5	0.0					
91/92																
Data	23	24	24	23	23	23	24	25	23	21	24	23	16			
Ave.	29.8	80.2	34.1	58.7	33.6	29.8	31.8	20.8	12.2	2.1	0.6	5.4	327.5			

Source : "Annuaire Pluviometrique de Tunisie", Direction General des Ressources en Eau

Table 3.23 Monthly Rainfall in Sousse (2/2)

Year	Station: 74603 MASAKEN DELG SM												Unit : (mm)		
	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Total		
66/67	10.0	49.3	15.0	7.0	0.0	43.5	13.1	10.7	15.5	0.0	0.0	24.0	188.1		
67/68	60.7	45.8	56.8	2.0	42.0	57.0	27.5	23.8	13.5	33.5	0.0	0.0	362.6		
68/69	23.5	4.5	4.3	23.9	28.1	11.5	28.0	32.0	19.0	4.0	0.0	0.0	178.8		
69/70	187.6	424.5	17.5	21.1	9.5	0.0	8.3	11.7	4.5	2.5	0.0	2.5	689.7		
70/71	18.0	6.5	0.0	189.2	40.6	72.0	11.0	11.0	1.0	0.0	0.0	0.0	349.3		
71/72	67.5	182.6	20.1	1.5	18.7	15.5	55.0	88.3	4.0	0.0	0.0	2.1	455.3		
72/73	10.1	34.5	8.6	88.1	41.0	49.5	84.5	26.5	3.0	6.5	1.0	30.0	383.3		
73/74	0.0	67.5	83.0	403.6	5.1	30.5	24.0	33.5	0.0	10.0	1.6	9.5	668.3		
74/75	28.6	30.1	9.2	17.1	6.9	139.7	33.5	31.9	17.5	0.0	0.0	19.6	334.1		
75/76	15.0	37.1	112.2	43.8	42.1	28.7	54.1	37.3	81.1	35.6	9.5	49.9	546.4		
76/77	58.5	65.6	100.0	9.5	43.7	5.0	19.6	43.9	8.7	0.0	0.0	0.0	354.5		
77/78	73.4	2.0	46.5	10.6	18.3	31.6	19.0	17.4	15.4	16.9	0.0	8.0	259.1		
78/79	403.0		57.2	5.0	7.3	58.1	68.2	28.8	18.1	0.2	0.0	20.7			
79/80	94.1	28.0	16.8	0.0	0.2	10.4	122.0	50.5	11.9	0.0	0.0	0.1	334.0		
80/81	14.6	0.5	4.5	33.5	4.8	17.3	6.6	5.8	4.4	4.0	0.0	0.5	96.5		
81/82	4.5	21.2	2.3	17.5	88.7	17.0	8.4	23.0	10.2	0.0	0.0	0.0	192.8		
82/83	10.9	155.2	123.0	40.1	11.7	0.0	22.7	9.0	15.3	4.5	0.0	0.0	392.4		
83/84	16.5	22.5	12.0	13.5	7.0	16.5	46.0	20.0	0.0	0.0	0.0	10.0	164.0		
84/85	15.5	109.5	7.5	98.5	31.0	29.0	27.0	17.0	19.0	0.0	0.0	0.0	354.0		
85/86	44.0	45.5	1.0	8.0	7.0	5.0	88.0	7.5	4.0	11.4	5.0	0.0	226.4		
86/87	1.0	96.4	61.5	111.6	8.5	13.5	24.5	10.0	10.0	0.0	0.0	0.0	337.0		
87/88	28.0	11.0	45.0	9.5	0.0		0.0	12.0	1.0	9.0	0.0	0.0			
88/89	15.0	0.0	126.0	32.0	59.5	29.5	2.0	9.0	0.0	2.0	0.0	26.0	301.0		
89/90	15.0	105.0	13.5	87.0	161.5	0.0	20.0	69.0			2.0	3.0			
90/91	14.0	33.0	73.5	53.5	36.5	43.5	73.0	38.0	5.5	7.0	0.0	0.0	377.5		
91/92															
Data	25	24	25	25	25	24	25	25	24	24	25	25	22		
Ave.	49.2	65.7	40.7	53.1	28.8	30.2	35.4	26.5	11.8	6.1	0.8	8.2	343.0		

Source : "Annuaire Pluviométrique de Tunisie", Direction General des Ressources en Eau

Table 3.24 Water Level Record in Hammam Basin

Station : Kalaa Sghira				Station : Hammam Soussse			
Date	Time	Water Level (cm)	Water Depth (m)	Estimated Discharge (cu.m/s)	Date	Time	Water Level (cm)
26-Sep-89	21:30	106	0.56	4.4	04-Feb-91	08:20	136
25-Oct-89	08:30	160	1.10	24.8	16-Mar-91	02:30	169
04-Dec-89	00:30	127	0.77	11.1	25-Apr-91	20:00	147
22-Jan-90	11:00	103	0.53	3.5	04-Sep-91	19:00	163
15-Mar-91	21:00	104	0.54	3.8	07-Sep-91	17:00	172
23-Nov-91	20:00	110	0.60	5.5	23-Nov-91	23:00	215
22-Feb-92	08:40	97	0.47	2.3	28-Feb-92	17:00	201
06-Nov-92	01:10	114	0.64	6.7	06-Nov-92	00:40	182
18-Dec-92	08:00	85	0.35	0.8	18-Dec-92	15:45	197
					28-Dec-92	01:10	182