TABLEAUX

Tableau 2.1.1 Sommaire de Donnés Climatologiques (1988/89 - 1993/94)

RAINFALL — Unit : mm

NO. STATION	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	Annual
1564 BAB MERZOUKA	14.6	41.0	61.2	39.8	34.2	58.7	68.6	96.9	22.3	11.4	3.9	3.1	455.8
4104 HAD COURT	11.7	55.4	85.8	62.7	31.9	63.8	54.9	59.6	22.1	12.2	0.0	0.8	460.8
5128 M'JAARA	10.3	61.9	102.5	75.4	27.6	71.5	61.5	74.6	23.6	11.2	0.5	1.1	521.5
6153 OULED YAACOUB	14.8	79.8	127.0	98.7	47.4	91.5	64.1	95.7	36.2	6.3	0.2	0.9	662.6
6200 OURTZAGH	10.9	71.1	110.1	74.4	33.6	73.7	75.6	92.8	23.8	12.6	2.0	0.7	581.2
8440 TISSA	8.6	41.2	67.4	43.2	23.4	51.8	54.9	61.5	19.4	7.3	0.0	0.7	379.3

AIR TEMPERATURE — Unit : °C

NO. STATION	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	Annual
1564 BAB MERZOUKA	24.9	19.6	18.4	14.1	12.9	14.5	15.8	18.9	21.1	22.6	27.0	28.4	19.8
4104 HAD COURT	25.1	19.9	15.1	12.3	10.4	11.9	14.7	15.3	18.8	22.4	27.4	27.8	18.4
5128 M'JAARA	25.1	19.0	14.9	11.9	9.3	12.0	14.7	15.0	19.4	23.2	28.7	28.1	18.4
6153 OULED YAACOUB	25.6	20.3	16.5	14.4	12.3	14.3	15.9	16.1	20.5	23.1	29.8	29.1	19.8
6200 OURTZAGH	27.2	20.9	16.4	13.2	11.1	13.5	16.1	16.5	21.6	25.4	31.2	30.5	20.3
8440 TISSA	26.0	19.9	15.4	12.4	10.1	12.4	15.2	15.7	20.3	23.6	30.4	30.0	19.3

EVAPORATION : PAN — Unit : mm/day

NO. STATION	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	Annual
1564 BAB MERZOUKA	8.6	5.8	6.4	4.1	5.0	5.2	6.1	6.4	7.9	9.3	11.2	10.8	7.2
4104 HAD COURT						(N.A.)							
5128 M'JAARA						(N.A.)							
6153 OULED YAACOUB						(N.A.)							
6200 OURTZAGH	7.3	3.8	2.3	1.8	1.8	2.3	3.1	3.2	5.5	7.7	9.9	9.4	4.9
8440 TISSA						(N.A.)							

RELATIVE HUMIDITY — Unit : %

NO. STATION	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	Annual
1564 BAB MERZOUKA	46	54	61	67	69	63	59	56	46	39	35	38	53
4104 HAD COURT	60	67	73	77	78	77	75	72	65	65	57	58	69
5128 M'JAARA	61	74	81	83	82	82	80	77	72	68	61	61	73
6153 OULED YAACOUB	62	70	73	73	70	71	68	74	61	64	51	54	66
6200 OURTZAGH	51	67	77	81	76	70	68	70	59	53	43	45	64
8440 TISSA	53	73	83	84	82	79	73	71	63	53	42	42	67

WIND VELOCITY (MEAN) — Unit : m/sec

NO. STATION	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	Annual
1564 BAB MERZOUKA						(N.A.)							
4104 HAD COURT	2.3	2.1	1.9	1.7	1.4	1.8	1.9	2.0	1.9	1.9	2.3	2.4	2.0
5128 M'JAARA	1.3	1.0	0.6	0.5	0.4	0.8	1.0	1.2	1.3	1.6	1.6	1.6	1.1
6153 OULED YAACOUB	2.2	1.9	2.0	1.5	1.4	2.0	2.0	2.1	2.1	2.1	2.2	2.3	2.0
6200 OURTZAGH	1.6	1.5	1.6	2.0	2.2	2.1	2.0	1.5	1.7	1.5	1.8	1.7	1.8
8440 TISSA	2.4	1.9	1.8	1.9	1.8	2.2	2.2	2.0	2.3	2.3	2.6	2.4	2.1

WIND VELOCITY (AVEERAGE MAX.) — Unit : m/sec

NO. STATION	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	Annual
1564 BAB MERZOUKA						(N.A.)							
4104 HAD COURT	4.2	4.7	4.3	5.0	2.8	4.7	4.5	4.2	3.5	2.9	4.2	3.9	5.0
5128 M'JAARA	2.5	3.1	2.6	2.7	1.7	3.6	3.3	3.4	2.9	2.7	3.0	2.9	3.6
6153 OULED YAACOUB	3.9	4.6	4.6	4.2	3.8	5.3	5.2	4.0	3.6	4.1	3.7	3.8	5.3
6200 OURTZAGH	3.2	3.5	3.7	4.9	4.2	4.1	4.3	3.6	4.1	3.5	3.7	3.5	4.9
8440 TISSA	4.7	4.9	5.2	5.5	4.6	5.0	5.3	5.3	5.0	5.3	5.2	4.9	5.5

Source : ABH

Tableau 2.1.3 Valeurs moyennes de Ruissellement

River System	Gauging Station	Average, 1957/58 - 1993/94 (37 Years)			Typical Drought Year *1 (Corresponding to 10-year Drought)		
		Rainfall (mm)	Runoff Depth (mm)	Runoff Rate	Rainfall (mm)	Runoff Depth (mm)	Runoff Rate
Rdat	Had Kourt	726	129	0.178	532	15	0.027
Ouergha	Bab Ouender	788	319	0.405	485	80	0.164
	Pont du Sker	954	541	0.567	526	152	0.290
	Rhafsai	1124	506	0.450	723	100	0.138
	Ourtzagh	918	401	0.437	569	75	0.132
	Tafrant	1046	550	0.526	620	146	0.236
	M'Jaara	930	418	0.449	574	96	0.167
Lebene	Tissa	723	239	0.330	466	53	0.114
Inaouen	Bab Merzouka	733	144	0.196	474	22	0.047
	El Kouchat	726	162	0.223	470	38	0.081

Note *1 : Typical Drought Year

Rdat	: 1991/92
Ouergha	: 1991/92
Lebene	: 1988/89
Inaouen	: 1988/89

Tableau 2.1.5 Charactéristiques Hydrogéologiques des Structures a Potentiel d'Eau (1/2)

Geological Structures			Structure Coordinates			Water Bearing Formations		Water Potential (estimated)				
									Ground Water Exploration			
No.	Location	Type	X	Y	Z (m)	Epoch or Stage	Lithology	Spring	No. of Wells Proposed	Depth (m)	Estimated Productivity (l/s)	Water Quality
	Mountainous Water potential Structures											
1	J. Tainaste	Flexure	616000 to 617000	440000 to 442500	1100 to 1300	Quaternary Jurassic Bajocian-upper Lias Middle Lias	Recent Alluvium Limestone & Marly Limestone Limestone & Dolomite	5- Springs Flow Rate Ranges between 15-85 m3/d	1 1 1	125 100 75	Ranges between 2 - 5 5 - 7 2 - 5	Chemically Acceptable
2	J. Khamise	Monocline	599000 to 600500	427500 to 428700	700-800	Jurassic Bajocian-upper Lias	Limestone & Marly Limestone Limestone and Dolomite	5- Springs Flow Rate Ranges between 15 - 50 m3/d	1 1	150 125	Ranges between 5 - 10 3 - 7	Ditto
3	J. Lakhdar (Keil Mountain)	Monocline	577200 to 581500	435500 to 440750	600-700	Jurassic Bajocian-upper Lias Middle Lias	Limestone & Marly Limestone Limestone & Dolomite	8- Springs Flow Rate Ranges between 15-60m3/d One Spring w/ Large Flowrate-Bou Adel 220 l/s	1 1 1	150 150 100	Ranges between 3 - 10 10 - 20 2 - 3	Ditto
4	J. Berda	Monocline	547000 to 550500	447000 to 448500	750-850	Jurassic Bajocian-upper Lias Middle Lias	Limestone & Marly Limestone Limestone & Dolomite	3- Springs Flow Rate Ranges between 20-700 m3/d	1 1 1 1	100 125 125 150	Ranges between 1 - 3 2 - 5 3 - 5 5 - 10	Ditto
5	Thar Souk	Syncline	597500 to 602500	449500 to 452000	480-550	Quaternary Miocene (Sahelian)	Recent alluvium Conglomerates	——	2 3	150(each) 30 (each)	Ranges between 3 - 7 1 - 3	Ditto
	Hilly Water Potential Structures											
6	Teroual	Syncline	511000 to 512500	451500 to 453000	400-430	Upper Miocene Oligocene	Conglomerates + Marl Marly Sandy Limestone	2- Springs Flow Rate Ranges between 20-70 m3/d	3 1 1	30 (each) 125 150	Ranges between 1 - 2 5 - 10 8 - 15	Ditto
7	Ourtzarh	Syncline	540000 to 542000	436200 to 438500	150-190	Quaternary Miocene (Tortonian)	Recent Alluvium Karsts & Fissured Conglomerates	5- Springs Flow Rate Ranges Between 1 - 7 m3/d	2	300 (each)	Ranges between 5 - 12	Ditto

Tableau 2.1.5 Charactéristiques Hydrogéologiques des Structures a Potentiel d'Eau (2/2)

Geological Structures			Structure Coordinates			Water Bearing Formations		Water Potentiality (Estimated)				
								Structure's	Ground Water Exploration			
No.	Location	Type	X	Y	Z	Epoch or Stage	Lithology	Springs	No. of Wells Proposed	Depth (m)	Estimated Productivity (l/s)	Water Quality
8	Ain Saddine (Rdat Valley)	Syncline	486500 to 489000	449000 to 453000	110-200	Quaternary Pliocene Miocene	Recent Alluvium Conglomerates + Marl Conglomerates + Marl	1- Spring Flow Rate 90m3/d	3 1 1	30(each) 100 150	Ranges between 1 - 2 2 - 5 3 - 7	Chemically Acceptable
9	Taounate Sra Valley	Syncline	571000 to 573000	440000 to 443000	300-330	Quaternary Miocene-Tortonian	Recent Alluvium Karsts & fissured conglomerates	—	3 1	30(each) 250	Ranges between 5 - 15 15 - 20	Ditto
10	Tissa Lebene Valley	Syncline	569000 to 547000	410000 to 412000	190-200	Quaternary Oligocene	Conglomerates Marly Sandy Limestone	—	3 1 1	30(each) 75 100	Ranges between 3 - 5 4 - 7 5 - 10	Ditto
	Flat Plain water Potenial Structure											
11	Jorf El Malha	Syncline	488500 to 491000	429500 to 431500	40-70	Quaternary Miocene-Tortonian	Recent Alluvium Conglomerates	—	3 1	30(each) 125	Ranges between 5 - 10 7 - 12	Ditto
12	Ain Defali	Syncline	484500 to 487500	443200 to 446500	90-130	Quaternary Miocene	Recent Alluvium Conglomerates	—	3 1	30(each) 125	Ranges between 3 - 5 5-10	Ditto
13	Had Kourt	Depression	468700 to 471300	444000 to 447500	130-150	Quaternary Miocene	Recent Alluvium Conglomerates	—	3 1	30(each) 125	Ranges between 1 - 3 3 - 5	Ditto

Notes : - The numbers and depths of the wells suggested for each structure are based on the hydrogeological field reconnaissance, and are subject to modification in accordance with the geophysical prosoection and logging.
- The estimated productivity of each well is estimated based on the lithological composition of the formations to be penetrated.

Tableau 2.2.6 Projection de la Population (1/3)

Province	Circle	Rural Commue		Type	Population 1994		Percent	Years		
		As of 1986	Present		Previous	Present	Increase	2000	2005	2010
S. Kacem	Ouezzane	Teroual	Teroual	Rural		11740	0.7	12242	12676	13126
			Zghira	Rural	27 488	15748	0.7	16421	17004	17607
		Aïn Dorij	Aïn Dorij	Urban		1258	3.6	1312	1358	1407
			Lamjaara	Rural	479	14479	0.7	15098	15634	16189
		S.Bousber	Sidi Bousber	Rural		11023	0.7	11494	11902	12325
			S. Aed Cherif	Rural	21 271	10248	0.7	10686	11065	11458
		S.Redouane	S. Redouane	Rural		19986	0.7	20840	21580	22346
			Bni Quolla	Rural	37 785	17799	0.7	18560	19219	19901
		Mzefroune	Mzefroune	Rural		8695	0.7	9067	9388	9722
			Masmouda	Rural	26 793	18198	0.7	18976	19649	20347
			Ounnana	Rural	12248	12248	0.7	12772	13225	13694
		Ouezzane	Ouezzane	Urban	52168	52168	3.6	54398	56329	58328
	Total of Circle					193590		201866	209029.3	216450
	Had Kourt	Had kourt	Had Kourt	Urban		4296	3.6	4480	4639	4803
			My.A.kader	Rural		8835	0.7	9213	9540	9878
			Sidi Azzouz	Rural	28 927	15796	0.7	16471	17056	17661
		Aïn Dfali	Aïn Dfali	Rural		23930	0.7	24953	25838	26756
			Bni Oual	Rural	33 944	10014	0.7	10442	10813	11196
		S. A. Al Hadi	S.A. Al Hadi	Rural		11491	0.7	11982	12407	12848
			S.A.B.Aïssa	Rural	20 739	9248	0.7	9643	9986	10340
		Khnichet	Khnichet	Urban		6031	3.6	6289	6512	6743
				Rural		13791	0.7	14380	14891	15419
			Oulad Nouel	Rural		11512	0.7	12004	12430	12871
			S.Med.Chelh	Rural		7527	0.7	7849	8127	8416
			Taoughilt	Rural	50 298	11437	0.7	11926	12349	12787
		Jorf El Melha	Jorf El Melha (M)	Urban		10187	3.6	10622	10999	11390
			Lamrabich	Rural	153 359	19453	0.7	20284	21004	21750
	Total of Circle					163548		170538	176591	182858
Total Province of Sidi Kacem						357138		372404	385620	399308

Tableau 2.2.6 Projection de la Population (2/3)

Province	Circle	Rural Commue		Type	Population 1994		Percent	Years		
		Previous	Present		Previous	Present	Increase	2000	2005	2010
Taounate	K.B. Med	Bouchabel	Bouchabel	Rural		15937	0.7	16618	17208	17819
			Jbabra	Rural	33 935	17998	0.7	18767	19433	20123
		Loulja	Loulja	Rural		15474	0.7	16135	16708	17301
			Sidi Abel	Rural	28 570	13096	0.7	13656	14140	14642
		K. Ba Med.	K.Ba Med	Urban		13271	3.6	13838	14329	14838
			My.A. Karim	Rural		8604	0.7	8972	9290	9620
			Bni Snous	Rural	30 913	9038	0.7	9424	9759	10105
		My. Bouchta	My. Bouchta	Rural	17 235	17235	0.7	17972	18610	19270
		Ghouazi	Ghouazi	Rural	18 876	18876	0.7	19683	20381	21105
		Mekansa	Mekansa	Rural	21 330	21330	0.7	22242	23031	23849
	Total of Circle					150859		157307	162869	168671.9
	Taounate	A. Mediouna	A. Mediouna	Rural	16 693	16693	0.7	17406	18024	18664
		Beni Oulid	Beni Oulid	Rural	11 809	11809	0.7	12314	12751	13203
		B.O. Tafraout	B.O.Tafraout	Rural	8 952	8952	0.7	9335	9666	10009
		Bouadel	Bouadel	Rural	13 393	1393	0.7	1453	1504	1557
		Bouhouda	Bouhouda	Rural	23 257	23257	0.7	24251	25112	26003
		Fennassa	Fennassa	Rural	12 546	12546	0.7	13082	13547	14027
		Zrizar	Zrizar	Rural		7666	0.7	7994	8277	8571
			Khlalfa	Rural	18 549	10883	0.7	11348	11751	12168
		Dhar Souk	Dhar Souk	Urban		3311	3.6	3453	3575	3702
			Tamedit	Rural	25 879	22568	0.7	23533	24368	25233
		Taounate	Taounate	Urban		24378	3.6	25420	26322	27256
			Rghoua	Rural		5528	0.7	5764	5969	6181
			Merzaoua	Rural	39 373	9467	0.7	9872	10222	10585
	Total of Circle					158451		165225	171088	177159
	Tissa	Aïn Aïcha	Aïn Aïcha	Rural		20640	0.7	21522	22286	23077
			Aïn Maatouf	Rural	31 690	17050	0.7	17779	18410	19063
		Aïn Legdah	Aïn Legdah	Rural	12 498	12498	0.7	13032	13495	13974
		Bouarouss	Bouarouss	Rural		17975	0.7	18743	19409	20097
			O.Daoud	Rural	29 982	12007	0.7	12520	12965	13425
		Ras el Ouad	Ras el Oued	Rural	16 280	16280	0.7	16976	17578	18202
		Tissa	Tissa	Urban		7059	3.6	7361	7622	7893
			S.B.Lahcen	Rural	25 523	18464	0.7	19253	19937	20644
		O.Bouabane	O.Bouabane	Rural		10855	0.7	11319	11721	12137
			Messasa	Rural	19 907	9052	0.7	9439	9774	10121
		Oulad Jmaa	Oulad Jmaa	Rural		9818	0.7	10238	10601	10977
			Bsabsa	Rural	17 745	7927	0.7	8266	8559	8863
	Total of Circle					159625		166447.675	172357	178473

Tableau 2.2.6 Projection de la Population (3/3)

Province	Circle	Rural Commue		Type	Population 1994		Percent	Years		
		As of 1986	Present		Previous	Present	Increase	2000	2005	2010
Taounate	Ghafsaï	Galaz	Galaz	Rural	19 047	19047	0.7	19861	20566	21296
		Kissane	Kissane	Rural	14 280	14280	0.7	14890	15419	15966
		Ourtzagh	Ourtzagh	Rural	15 226	15266	0.7	15918	16484	17069
		Ratba	Ratba	Rural		12742	0.7	13287	13758	14247
			S.Lhaj Med.	Rural	19 560	6818	0.7	7109	7362	7623
		Sidi Mokhfi	Sidi Mokhfi	Rural		7100	0.7	7403	7666	7938
			Timezgana	Rural	19 603	12503	0.7	13037	13500	13979
		Tafrant	Tafrant	Rural	13 356	13356	0.7	13927	14421	14933
		Tabouda	Tabouda	Rural	13 570	13570	0.7	14150	14652	15172
		Ghafsaï	Ghafsaï	Urban		4255	3.6	4437	4594	4757
			Oud'ka	Rural		7447	0.7	7765	8041	8326
			S.Y.B.Zeroual	Rural		12750	0.7	13295	13767	14255
			El Bibane	Rural	30 725	6273	0.7	6541	6773	7014
	Total of Cercle					145407		151620	157003	162575
Total Province of Taounate						614342		640600	663337	686879
Taza	Taïnaste	Msila	Msila	Rural		11161	0.7	11638	12051	12479
			Bragha	Rural	20 924	9763	0.7	10180	10542	10916
		Taïnaste	Taïnaste	Urban		2074	3.6	2163	2239	2319
			Taïnaste	Rural		8658	0.7	9028	9348	9680
			El Gouzate	Rural	19 724	8992	0.7	9376	9709	10054
		Beni Ftah	Beni Ftah	Rural	14 246	14246	0.7	14855	15382	15928
		Kaf El Ghar	Kaf el Ghar	Rural	11 229	11229	0.7	11709	12125	12555
		Taïfa	Taïfa	Rural	11 013	11013	0.7	11484	11891	12313
		Traïba	Traïba	Rural	10 034	10034	0.7	10463	10834	11219
	Total of Circle					87170		90896	94121	97463
	Taza	Beni Lent	Beni Lent	Rural		15033	0.7	15676	16232	16808
			Oulad Chrif	Rural		11088	0.7	11562	11972	12397
	Total of Circle					26121		27238	28204	29205
	O. Amlil		Oulad Zbair	Rural		15788	0.7	16463	17047	17652
		Bni Frassen	Bni Frassen	Rural		30683	0.7	31994	33130	34306
			R.El Fouki	Rural	40 401	9718	0.7	10133	10493	10865
	Total of Circle					56189		58590	60670	62823
Total Province of Taza						169480		176724	182995	189491
Grand Total for the Study Area						171474		1189728	182995	189491

Tableau 2.3.1 Realisation de Barrages Moyen, Petits, et Lacs Collinaires

Province	Name of Dam	Scale	Coordinates (km) X	Y	Catchment Area (km2)	Storage (1.000 m3)
Taounate	Sahela	Medium	566.850	441.250	120.00	62,000
Taounate	Essaf	Small	546.900	429.550	5.57	1,000
Taounate	Jorf El Ghrab	Small	534.800	423.950	1.70	900
Al Hoceima	Oued Mobrouk	Hill	609.546	470.334	1.40	170
Taounate	Ain Guettra	Hill	557.150	431.400	0.25	20
Taounate	Ank Jmal	Hill	541.900	430.350	1.70	32
Taounate	Bab Boughazi	Hill	554.650	430.630	0.29	20
Taounate	Chtioui	Hill	551.000	430.000	0.62	58
Taounate	Douar Lakhazayne	Hill	554.500	430.250	0.28	25
Taounate	Douar Trifa	Hill	549.950	430.100	0.95	80
Taounate	El Khmiss Zrayzar	Hill	572.100	443.600	0.90	43
Taounate	Mahadama	Hill	524.850	436.250	3.34	75
Taounate	Ouldiat El Hafa I	Hill	527.100	432.450	0.45	40
Taounate	Ouled Boumaiza	Hill	538.770	429.200	1.65	200
Taounate	Sahelomar	Hill	574.750	428.805	0.87	125
Taounate	Si El Makhfi	Hill	556.250	445.300	1.10	80
Taounate	Sidi Moussa	Hill	562.650	425.750	0.35	35

Source : AH

Tableau 2.3.2 Debits D'étlage Actuels aux Postes de Jaugeages

River System	Gauging Station	Catchment Area (km2)	Average Discharge (m3/sec)	95% Dependable Discharge (m3/sec)
Sebou	Dar El Arsa	7620	24.43	5.86
	Azib Soltane	16450	51.59	10.92
	Bel Ksiri	25980	129.52	13.02
Ouergha	Bab Ouender	1756	17.76	0.86
	Pont du Sker	486	9.26	0.16
	Ain Aicha	2460	32.88	1.06
	Galez	500	10.53	0.03
	Rhafsai	777	12.46	0.08
	Ourtzagh	4392	55.90	1.03
	Tabouda	861	15.99	0.07
	Tafrant	953	16.61	0.06
	M'Jaara	6190	81.99	0.75
Lebene	Tissa	792	6.01	0.03
Inaouen	Bab Merzouka	1500	6.84	0.11
	El Kouchat	2570	13.17	0.34
Rdat	Had Kourt	673	2.74	0.00

Tableau 2.3.3 Barrages Actuels et Recommandés par le Plan Directeur SBO

River System	Name of Dam	Effective Storage (million m^3)	Remarks
Upper Sebou	Foum Kheng	39.0	
	M'Dez	557.5	
	Ain Timedrine	2.8	
	Ait Youb / Allal Fassi	33.8	Existing (1990)
Inaouen	Touahar	60.0	
	Idriss 1er	1,100.0	Existing (1973)
Lebene	Sidi Abbou	60.6	
Middle / Lower Sebou	Sidi Echahed	106.6	Under Construction
	Mechra El Hajra	-	(*)
	Lalla Aicha	-	
Ouergha	Asfalou	88.0	
	Rhafsai	220.0	
	Tafrant	220.0	
	Bab Ouender	300.0	
	Al Wahda	3,000.0	Under Construction
	Koudiat Bourna	-	(*)
Beht	Oujet Es Soltane	175.3	
	El Kansera	266.6	Existing (1935)

Note : (*) - Intake dam for interbasin diversion

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

Tableau 2.3.6 Le Programme de Mise en Oeuvre pour les Barrages à Petite et Moyenne Echelle

Medium Scale Dam (1995 - 1999)

Province	Name of Dam	Coordinates (km) X	Y	Catchment Area (km2)	Storage (1000 m3)	Construction Begining (year)	Period (month)
Taounate	Bouhouda	576.450	445.850	478	50,000	1995	30
Taounate	Tahar Souk	602.950	452.650	468	20,000	1996	24
Taounate	Aoulai	542.150	467.850	490	40,000	1996	27
Taounate	Ain Abdoun	590.550	442.500	58	10,000	1997	36
Taounate	Pont Sker	572.800	441.900	540	41,000	1998	12
Taounate	Zrizer	571.250	444.200	26	6,000	1998	18
Taounate	Sidi Mokfi	558.450	448.300	378	26,000	1999	30

Small Scale Dam (1996 - 2001)

Province	Name of Dam	Coordinates (km) X	Y	Catchment Area (km2)	Storage (1000 m3)	Construction Begining (year)	Period (month)
Chefchaouen	Douahar	506.000	466.800	4.3	1,060	1996	12
Taounate	Gharbia	552.750	492.130	5.2	750	1996	18
Chefchaouen	S. Abdessalem	517.000	471.500	7.6	1,770	1996	18
Al Hoceima	Mrint	575.500	476.200	34.5	5,000	1997	18
Taounate	Bousfoul	554.000	450.150	5.3	2,000	1997	15
Taounate	Addad	539.810	440.900	16.6	887	1997	15
Chefchaouen	Koucha	506.000	465.450	6.6	1,347	1998	18
Al Hoceima	Bouhout	608.200	470.200	3.5	780	1998	18
Chefchaouen	Mokrisset	505.250	482.500	4.1	991	1998	12
Taounate	Ain Daroua	542.750	444.450	2.8	500	1999	15
Taounate	D. Meckour	572.600	447.400	2.3	500	1999	12
Taounate	O. Merzaine	568.300	447.775	2.9	930	1999	18
Al Hoceima	Azila	580.000	473.850	8.0	350	2000	18
Chefchaouen	Kchachda	507.500	468.600	19.5	5,210	2000	15
Chefchaouen	Tillouane	512.015	481.450	2.5	608	2000	24
Taounate	K. Assassa	555.400	444.600	2.7	570	2001	12
Taounate	Gaadiine	568.000	429.100	2.3	270	2001	12
Taza	Amlilis	624.700	465.700	8.4	1,600	2001	12

Source : AH

Tableau 2.5.2 Caractéristiques Techniques des Systèmes d'Alimentation en Eau de Surface

	Technical Specifications	Water Supply System		
		Ain Gdah	Mekansa	Karia Ba Moh.
1	**Establishment**			
	a. Construction	1988	1987	-
	b. Commencement of management by ONEP	1991	1991	1985
2	**Intake and Raw Water Transmission Main**			
	a. Water source	Inaouene river	Sebou river	Sebou river
	b. Pumps			
	Nos. of unit	3	2	2
	Flow rate (m3/s)	0.040	0.028	0.035
	Pump head (m)	18.0	15.2	15.0
	c. Transmission pipe			
	Diameter (mm)	-	-	200
	Pipe material	-	D.I.P	A.C.
	Length (m)	-	-	360
	Flow rate (m3/s)	-	-	0.035
3	**Treatment Plant**			
	a. Capacity			
	Daily Max. (m3/d)	5.500	4.800	2.600
	Average Daily (in winter) (m3/d)	800	2.200	1.300
	Average Daily (in summer) (m3/d)	2.000	-	-
	Served population	-	22.000	-
	b. Number of unit			
	Receiving well	1	1	1
	Mixing basin	1	1	1
	Flocculation basin	1	1	1
	Sedimentation basin	2	2	2
	Filter	4	4	4
	Clear water basin	1	1	1
	c. Raw water quality			
	Turbidity: max (min)	> 1000 (10)	>1000 (15)	>1000 (15)
	pH: max (min)	8.5 (7.5)	8.5 (7.5)	8.5 (7.5)
	Chloride iron: max (min) (mg/l)	450 (65)	7500 (78)	13.500 (64)
	SS: max (min) (mg/l)	-	-	-
	Oxygen Demand: max (min) (mg/l)	-	45 (0.72)	50 (0.72)
4	**Treated Water Transmission Main**	-	-	-
	a. Pipe diameter (mm)	(T/P-R1) 300	(T/P-R1) 200	200
		(R1-R2) 200	(R1-R2) 200	-
	b. Pipe material	S.P. DIP	S.P. DIP	S.P. DIP
	c. Pipe length (m)	(T/P-R1) 2.093	(T/P-R1) 6.500	5.000
	Pipe length (m)	(R1-Head) 6.879	(R1-R2) 2.200	145
	Pipe length (m)	(Head-R2) 4.176	-	-
	d. Pumping head (m)	(T/P-R1) 239	(T/P-R1) 238	170
	Pumping head (m)	(Head-R2) 292	(R1-R2) 200	-
5	**Reservoir**			
	Main reservoir	2	2	-
	Distribution reservoir	27	23	-
	Capacity (main)	1.500 - 3.000	1.100 - 1.800	-
	Capacity (secondary)	30 - 200	30 - 450	-
	Type	Circular, Semi-ground		
6	**Distribution Facilities**			
	a. Public stand pipes			
	meter reading	1 time / month	1 time / month	1 time / month
	b. Pipe material			
	Transmission main	S.P. D.I.P	S.P. D.I.P	S.P. D.I.P
	Distribution main	A.C.	A.C.	A.C.
	Connection pipe	G.S.P. PVC	G.S.P. PVC	G.S.P. PVC

Source: ONEP

Tableau 2.5.5 Projection de la Consommation en Eau préparée par la DRPE pour 1990

Province	Homog. Zone No.	Water Consumed											Level Satisfaction			
		Surface Water		Groundwater		Available on Site			Import	Export	Ttl. Avail. Water		% of localities			
		m3/y	m3/e.w.s.	m3/y	m3/e.w.s.	m3/y	l/c/d(srvd)	l/c/d(totl)	m3/y	m3/y	m3/y	l/c/d	bad	Insuffi.	good	sat.
Sidi Kacem	5	132	148	644,133	955	644,266	37	31	39,396	20,282	663,380	32	1	42	58	0
	6	0	0	723,187	397	723,187	29	25	134,410	79,424	778,173	27	9	39	52	0
	7	481,850	46,758	1,681,122	541	2,162,972	42	26	784,265	742,854	2,204,383	27	10	62	26	2
	Total	481,982	46,906	3,048,442	1,893	3,530,425	(38)	(27)	958,071	842,560	3,645,936	(28)	20	143	136	2
Taounate	6	0	0	3,467,337	397	3,467,337	29	25	644,435	380,800	3,730,972	27	9	39	52	0
	7	601,983	46,758	2,100,250	541	2,702,232	42	26	979,793	928,058	2,753,967	27	10	62	26	2
	Total	601,983	46,758	5,567,587	938	6,169,569	(34)	(26)	1,624,228	1,308,858	6,484,939	(27)	9	49	41	1
Taza	7	632,237	46,758	2,205,804	541	2,838,041	42	26	1,029,035	974,700	2,892,375	27	10	62	26	2
	Total	632,237	46,758	2,205,804	541	2,838,041	(42)	(26)	1,029,035	974,700	2,892,375	(27)	10	62	26	2

Source: The Study on The National Master Plan of Rural Population Potable Water Supply, Mission I, Volume II, March, 1992

Note: e.w.s: equipped water source

s.a.: seasonally acceptable

( ): average

DRPE: Department of Research of Potable Water

Tableau 2.5.6 Les Installations d'Eau des Différents Centres Ruraux Gérés par la Direction Provinciale de l'ONEP à Taounate en juillet 1995

	Center	Water Source	Popula-tion	House Connec-tion	Popu. by H.C. 8 pers/HC (6.3 pers/HC)	Rate of Popu. by H.C. (%)	Available Flow (l/s)	Average Water Production (l/s)	Water Production Facilities	Storage Facilities
1	Taounate	G.W	24,378	3,591	28,728 (22,623)	2) 117.8% (92.8%)	50	26.00	4-P.S. on wells & 2-B.P.	1-RSV 750m3
2	Tissa	G.W	7,059	778	6,224 (4,901)	88.2% (69.4%)	15	6.59	1-P.S. on a well, 2-P.S. on wells & 2-B.P.	1-RSV 150m3 1-RSV 450m3, 1-HT 100m3
3	Karia Ba Mohamed	S.W of Sebou river	13,271	1,263	10,104 (7,957)	76.1% (60.0%)	44	18.90	1-T/P & 1-B.P., 1-P.S on a well	1-RSV 1000m3 1-RSV 500m3
4	Mly Bouchta	G.W	3,143	32	256 (202)	8.1% (6.4%)	1	0.20	1-spring	1-RSV 80m3
5	Ain Gdah	S.W of Sebou river	32,407	375	3,000 (2,363)	9.3% (7.3%)	65	13.38	1-T/P and 2-B.P.	1-RSV 3000m3, 1-RSV 1500m3 57 SRSV 6,825m3
6	M'Kansa	S.W of Sebou river	21,331	261	2,088 (1,644)	9.8% (7.7%)	56	4.74	1-T/P & 2-B.P.	1-RSV 1800m3, 1-RSV1100m3 21 SRSV 2,230m3
7	Ain Aicha	G.W	4,000	202	1,616 (1,273)	40.4% (31.8%)	3	0.65	1-P.S. on a well	1-RSV 50m3
8	Rhafsai	G.W	4,255	737	5,896 (4,643)	1) 138.6% 1) (109.1%)	9	4.17	1-P.S. on a well & 1-B.P.,1-spring	1-RSV 200m3, 1-RSV 80m3 1-RSV 60m3
9	Ourtzagh	G.W	1,660	238	1,904 (1,499)	2) 114.7% (90.3%)	3	2.46	1-T.P. & 1-B.P.	1-RSV 100m3
	Total		111,504	7,477	59,816		246	77.09		19,925 m3

Source: ONEP Taounate

Note: P.S. = Pumping Station
B.P. = Booster Pump
T/P = Treatment Plant
G.W = Groundwater
8 person/house connection = Established by National Master Plan
6.3 person/house connection = Established by CERED

RSV. = Reservoir
SRSV. = Secondary Reservoir
H.C. = House Connection
S.W = Surface Water
1) = Person/House Connection may be less than 6
2) = Person/House Connection may be less than 7

Tableau 2.5.7 Les Quantités d'Eau Produites et Consommées, Province de Taounate, 1994

	Water Supply Center	Popula-tion	House Connect.	Water Produc. (m3)	Water Distribu. (m3)	Water Consum. (m3)	Relative UW Consum. (l/c/d)	Revenue Ratio (%)	Unaccounted for Water (%)
1	Taounate	24,379	3,297	677,686	654,543	531,874	59.8	78.5	21.5
2	Karia Ba Mohamed	13,270	1,234	489,936	450,606	307,308	63.4	62.7	37.3
3	Mly Bouchta	3,140	32	9,934	9,132	6,251	5.5	62.9	37.1
4	M'kansa	21,331	251	143,478	137,652	92,997	11.9	64.8	35.2
5	Ain Gdah	29,478	368	335,065	323,788	151,755	14.1	45.3	54.7
6	Tissa	7,059	680	164,252	156,910	112,630	43.7	68.6	31.4
7	Rhafsai	4,255	737	87,140	82,784	54,363	35.0	62.4	37.6
8	Ouartzagh	2,638	234	27,934	26,538	13,064	13.6	46.8	53.2
9	Ain Aicha	4,000	193	8,500	8,076	5,060	3.5	59.5	40.5
	Total	109,550	7,026	1,943,925	1,850,029	1,275,302	(Ave.)31.9	(Ave.)65.6	(Ave.)34.4

Source: ONEP Taounate
UW: Unit Water

Tableau 2.5.8 Les Quantités d'Eau Produites et Consommées, Province de Taounate, Premier Trimestre de 1995

	Water Supply Center	Popula-tion	House Connect.	Water Produc. (m3)	Water Distribu. (m3)	Water Consum. (m3)	Relative UW Consum. (l/c/d)	Revenue Ratio (%)	Unaccounted for Water (%)
1	Taounate	24,379	3,470	205,383	201,276	125,975	57.4	61.3	38.7
2	Karia Ba Mohamed	13,270	1,234	112,262	104,382	76,633	64.2	68.3	31.7
3	Mly Bouchta	3,140	32	1,820	1,583	1,460	5.2	80.2	19.8
4	M'kansa	21,331	251	27,907	25,100	18,598	9.7	66.6	33.4
5	Ain Gdah	29,478	368	74,192	70,721	29,204	11.0	39.4	60.6
6	Tissa	7,059	749	42,448	38,975	29,504	46.4	69.5	30.5
7	Rhafsai	4,255	737	10,884	10,367	7,680	20.1	70.6	29.4
8	Ouartzagh	2,638	234	11,197	10,636	5,143	21.7	45.9	54.1
9	Ain Aicha	4,000	193	4,116	3,650	2,419	6.7	58.8	41.2
	Total	109,550	7,268	490,209	466,690	296,616	(Ave.) 30.1	(Ave.) 60.5	(Ave.) 39.5

Source: ONEP Taounate
UW: Unit Water

Tableau 2.5.10 Projets en Cours et Proposés par l'ONEP pour la Province de Taounate

Rural Center	Project Description	Cost(DH) (x1,000)	Design Work	Constru. Period	Remarks
*M'kansa	Rehabilitation of water supply facilities and reinforcement of treatment capacity	10,000	completed	12 months	Invitation for tender expected on July 17, 95
*Karia Ba Mohamed	Double the capacity of water supply facilities up to 30 l/s	30,000	completed	12 months	Invitation for tender expected on July 17, 95
*My Bouchta	Construction of transmission line , extension of network to accommodate a flow rate of 10 l/s with reservoir	18,500	to be completed by August 95	12 months	Invitation for tender expected on August 17, 95
*My Bouchta	Provision of facilities to the douars	10,000	to be completed by August 95	12 months	Invitation for tender expected on August 17, 95
*Ain Aicha	Equipping a well for a flow rate of 10 l/s and extension of network including a reservoir	14,000	to be completed by July 95	8 months	Invitation for tender expected on July 17, 95
*Ain Mediouna	Exploitation of a well for a flow rate of 10 l/s and extension of the network, including the construction of a reservoir	14,000	to be completed by July 95	8 months	Invitation for tender expected on July 17, 95
*Rhafsai	Transmission line, extension of network, construction of a reservoir for a flow rate of 5 l/s	10,500	to be completed by July 95	8 months	Invitation for tender expected on July 17, 95
*Taounate	Provision of water production and distribution facilities	77,000 10,000	completed completed	12 months 12 months	Work on production facilities started on July 7, 95 Work on production facilities started on July 24, 95
Laghouazi	Equipping a well for a flow rate of 2 l/s, distribution network and reservoir	6,000	to be completed by August 95	8 months	Selection of water source is under way
*Ourtzagh	Rehabilitation of the force main and the distribution network	2,700	to be completed by August 95	8 months	Invitation for tender for the rehabilitation of the distribution facilities July 17,95
Tafrant	Provision of water production and distribution facilities	12,000	to be completed by August 95	8 months	Selection of the water source is under way and invitation for tender for the distribution facilities on July 17, 95
Bouchabel	Supply of Bouchabel rural center and 18 douars from the proposed transmission line of Mly Bouchta	6,000	to be completed by July 95	12 months	Design work under preparation by the Regional Direction of ONEP
Tahar-souk	Equipping a spring, extension of network and rehabilitation of the reservoir	3,000	to be completed by July 95	12 months	design work under preparation by ONEP
Sidi M'hamed Bel Laheen	Supply of the rural center and 15 douars from the Ain Gdah system	5,700	to be completed by July 95	12 months	Construction started in June 95
Bni Souss	Supply of the rural center and 15 douars from the M'kansa system	2,000	to be completed by July 95	12 months	Construction started in June 95

Source: ONEP Taounate Provincial Office

* : Existing ONEP system

Tableau 2.6.1 Normes de la Qualité de l'Eau Potable

AGENCY/COUNTRY	WHO* Recomm. Standards Maximum	MOROCCO Allowable value		MOROCCO SUITABLE QUALITY FOR LIVESTOCK			
		Recomm.	Acceptable	Good	Passable	Average	Low
PARAMETERS							
1. Total hardness(meg/l)	<10						
1 meg/l = 50 mg/l as CaCO3							
2. Turbidity (NTU)	5	1	5				
3. Color (platinum-cobalt scale)	15	5	20				
4. Iron, as Fe (mg/l)	0.3	0.3					
5. Manganese, as Mn (mg/l)	0.1						
6. pH	6.5 - 8.5	6.5 - 8.5	9.2 (min.6.0)				
7. Nitrate, as N03 (mg/l)	45		50				
8. Sulfate, as SO4 (mg/l)	400	200		0 - 150	150 - 290	290 -580	580 -1150
9. Flouoride, as F (mg/l)	1.5	0.7	1.5				
10. Arsenic, as As (mg/l)		0.05					
11. Magnesium, as Mg (mg/l)	150	100		0 - 30	30 -60	60 -120	> 120
12. Salinity							
a. Dry residual (mg/l) at 180 C		1000	2000	0 - 500	500 -1000	1000 -2000	2000 -4000
b. Electrical Conductivity (µS/cm at 20°C)		1300	2700	0 - 800	800 -1600	1600 -3200	3200 -6400
c. Chloride (mg/l)	250	300	750	0 - 180	180 - 360	360 -710	710 -1420
13. Total Coliforms (no./100 ml)							
a. Piped water supply	0	0	0				
b. Disinfected water at entrance of distribution system	0	0	3 (no two consecutive samples at same point)				

Source: National Master Plan

Note: * World Health Organization

Tableau 2.6.2 Qualité de l'Eau dans les Puits et Forages (1/3)

PROVINCE	COMMUNE	DOUAR	CONDUCTIVITY µS/cm	QUALITY CLASS*
TAZA	BENI FRASEN	OULAD YACOUB		
	B.MARZOUKA	AL HADA		
	BENI LENT	OULAD HAJOUN		
		DHAR DREJRA		
	GUELDAMANE	NAKHLA	1680	AVERAGE
		S.MAM MEFTAH		
	OULAD CHRIF	CENTRE		
		S BOUYADOUR		
	OULAD ZBAIR	TAJAYALT	SALTY	SALINE
	RHIATA RHAR	KASBAT MGARA		
		BAB LAGHNEM	SALTY	SALINE
	TAIFA	KT .BENI	SALTY	SALINE
		OUARIAGHEL		
	TAZA	DPTP		
	MEKNASSA CH	BENI HAITAM		
	B.MARZOUKA	STA. HYDROLO.		
		ASDOUR		
	SMIA	BAB TAZA		
	OULAD CHRIF	BAB RAMLA	1076	PASSABLE
	OULAD CHRIF	BAB RAMLA	970	PASSABLE
	BNI LENT	BNI LENT	1011	PASSABLE
	BNI LENT	BNI LENT	1131	PASSABLE
	BOUCHEFAA	BOUCHEFAA	430	GOOD
	BNI FRASEN	BNI FRASEN	997	PASSABLE
	RBAA FOUKIA	RBAA FOUKIA	777	GOOD
	BENI FETAH	BNI FTAH	2300	AVERAGE
TAOUNATE	TAOUNATE	MEZRAOUA	611	GOOD
		SOUFLA		
		HJAR	9070	SALINE
		MAABID		
		MAABID		
		IMRAGHDEN	BAD	SALINE
		IMRAGHDEN	960	PASSABLE
	BENI OULID	BENI OULID	674	GOOD
	GHAFSAI	AIN BARDA		
	AIN AICHA	OD BOUTIA	298	GOOD
		OULED		
		BOUSLTANE		
		M'HAMDA	593	GOOD
		KALLALINE		
	OD. HAMMOU	FENNASA	263	GOOD
	3eme PONT	LAAZAIB	9990	SALINE
	BSABSA 2KT	KBIB	320	GOOD

* based on conductivity (µS/cm) as below

0 -800	800 - 1600	1600 - 3200	3200 - 6400	> 6400
GOOD	PASSABLE	AVERAGE	LOW	SALINE

Source: National Master Plan

Tableau 2.6.2 Qualité de l'Eau dans les Puits et Forages (2/3)

PROVINCE	COMMUNE	DOUAR	CONDUCTIVITY µS/cm	QUALITY CLASS*
TAOUNATE		CHTUYNE		
		EL ABBADMA	4660	LOW
		BSABSA	4230	LOW
		OULAD ALI		
		SABBAB	540	GOOD
		HAJRAT	13350	SALINE
		LHAYAR		
		OULAD	1490	PASSABLE
		ABDESSLAM		
		BNI HMIED		
		Od MIMOUN	640	GOOD
		OULAD BEN	580	GOOD
		TALHA		
		KRADSA	7790	SALINE
		RZINA	1500	PASSABLE
		BNI OUKIL	2660	LOW
		A.L'HAMRA	710	GOOD
		KHANDEK	1230	PASSABLE
		ISLAN		
		BOUCHAN	640	GOOD
		KELAA		
		OD AZZAME		
		MZRAOUA		
		OULIA	14800	SALINE
		L'HIOUAL	2000	AVERAGE
		TIMZGANA	1540	PASSABLE
		SI.MOKHFI	2510	AVERAGE
		FENNASSA	460	GOOD
		TAMSNIT	990	PASSABLE
		AMEZRI	2270	AVERAGE
		SIDI YAHYA		
		BOUTHAL	3370	LOW
		LAKLAI		
	BOUAROUS	OD.MESSAOUD	714	GOOD
	BOUCHABEL	OULAD ALLAL		
	BSABSA	HOUARA		
		KERAIA	2900	AVERAGE
	OULJA	OD.BEN TAHAR		
	OLD JEMAA	HAMZA		
	OLD AYAD	LEMOUALDA		
	OULJA	B.ZEKIENE		
	SI.MHAMED	NOUAOURA	8900	AVERAGE
	B. LAHCEN			

* based on conductivity (µS/cm) as below

0 -800	800 - 1600	1600 - 3200	3200 - 6400	> 6400
GOOD	PASSABLE	AVERAGE	LOW	SALINE

Source: National Master Plan

Tableau 2.6.2 Qualité de l'Eau dans les Puits et Forages (3/3)

PROVINCE	COMMUNE	DOUAR	CONDUCTIVITY µS/cm	QUALITY CLASS*
SIDI KACEM	SIDI MED	CHEF LIEU		
	SIDI ABED	LAKRADSA 1	5900	SALINE
		LAKRADSA 2	1600	PASSABLE
	JBABRA	OULAD BLIL		
	GALAZ	ZAOUIA		
	A. MAATOUF	OULAD KHRIF		
	BOUCHABEL	OULAD BEN YOUSSEF		
	A. MEDIOUNA	A. MEDIOUNA	500	GOOD
	FIFI	BEN YARZINE		

* based on conductivity (µS/cm) as below

0 -800	800 - 1600	1600 - 3200	3200 - 6400	> 6400
GOOD	PASSABLE	AVERAGE	LOW	SALINE

Source: National Master Plan

Tableau 2.6.3 Classement des Provinces Selon les Incidences de Maladies Hydriques

PROVINCES	CHOLERA (1)			TYPHOID	INFANT MORTALITY	MARK OUT OF 10	MARK OUT OF 2
	1990	1993	TOTAL	(2)	(3)	(4)	
35 KENITRA	2	1	3			6	1.2
05 AZILAL	2		2	2	2	6	1.2
39 KHENIFRA		2	2	1	1	6	1.2
71 TETOUAN	2		2	2	2	6	1.2
60 SIDI KACEM	1	1	2	1	1	5	1
69 TAZA	2		2	1		5	1
27 FES	2		2			4	0.8
37 KHEMISSET		2	2			4	0.8
47 MEKNES	1	1	2			4	0.8
61 TANGER	2	2			2	4	0.8
15 CHEFCHAOUEN	1	1		2		4	0.8
33 IFRANE	1	1	2			4	0.8
45 MARRAKECH	1	1		2		4	0.8
65 TAOUNATE	1	1		2		4	0.8
19 EL KELAA	1	1	1			3	0.6
13 BOULMANE			2	1		3	0.6
07 BENI MELLAL	1	1				2	0.4
41 KHOURIBGA	1	1				2	0.4
55 OUJDA	1	1				2	0.4
59 SETTAT	1	1				2	0.4
21 ERRACHIDIA				2		2	0.4
23 ESSAOUIRA				2		2	0.4
51 OUARZAZATE				2		2	0.4
67 TATA				2		2	0.4
BOUJDOUR			2			2	0.4
03 AL HOCEIMA				1		1	0.2
29 FIGUIG				1		1	0.2
57 SAFI			1			1	0.2
63 TANTAN				1		1	0.2
66 TAROUDANT				1		1	0.2
73 TIZNIT				1		1	0.2
85 RABAT SALE				1		1	0.2
ES SMARA				1		1	0.2
LAAYOUNE				1		1	0.2
OUED EDDAHAB				1		1	0.2
01 AGADIR						0	0
09 BEN SLIMANE						0	0
17 EL JADIDA						0	0
49 NADOR						0	0
72 LARACHE						0	0
79 BEN MSIK SD OT						0	0
75 A.CHOC A						0	0
81 CASA ANFAO						0	0
31 GUELMIM						0	0
83 MOH ZENATA						0	0

Source: National Master Plan

(4) = 2* (1)+1* (2)+1* (3)

(1) 0 = less than 120 cases/provin (2) 0=incidence rate <50/100000 (3) 0=less than 100 cases/1000

1=120 to 200 cases/provinces 1=incidence rate 50 - 150/1000 1=100 to112 cases/1000

2=incidence rate>150/100000 2=more than 112 cases/1000

Tableau 2.6.4 Incidences des Maladies Hydriques dans l'Aire de l'Etude, Cinq Dernières Années

DISEASE/CONDITION	COMMON and SERIOUS	COMMON but not SERIOUS	SERIOUS but not COMMON	REMARKS
1. CHOLERA	X			ALL PROVINCES
2. DIARRHEAS	X			ALL PROVINCES
3. TYPHOID	X			ONLY IN TAZA
4. INTESTINAL WORMS		X		ALL PROVINCES

Source: National Master Plan

Tableau 2.6.5 Sommaire de l'Origine du Problème et le Type d'Intervention

	MAIN SOURCE OF PROBLEM						FOCAL POINT OF INTERVENTION					
DISEASE/CONDITION	WATER QUALITY	WATER QUANTITY	EXCRETA DISPOSAL	WASTE DISPOSAL	HOUSING	EDUCATION	WATER SUPPLY	EXCRETA DISPOSAL	WASTE DISPOSAL	HOUSING	HEALTH CARE	EDUCATION
1. CHOLERA	3	3	3	3	1	3	3	3	3	2	3	3
2. DIARRHEAS	3	3	3	3	1	3	3	3	3	2	3	3
3. TYPHOID	3	3	3	3	1	3	3	3	3	2	3	3
4. INTESTINAL PARASITE RELATED	3	3	3	3	1	3	3	3	3	2	3	3

Source: National Master Plan

Note : 3: MAXIMUM 2: MODERATE 1: LOW

Tableau 2.6.6 Sommaire de la Complexité des Interventions

DISEASE/CONDITION	AREAS OF FOCUS			TIME SPAN				INTEGRATION	CRITICAL MASS	INPUTS :		PERCEIVED PRIORITY	
	USER	ENVIRON-MENT	HEALTH SYSTEM	LONG SHORT	RECU-RRENT	INITIATE	IMPACT	HARD =3 EASY =1	HIGH =3 LOW =1	LABOR SKILLED =3 UNSKILLED =1	MATERIAL OUTSIDE LOCAL	NEED	PROGRAM
1. CHOLERA	3	1	3	2	2	2	2	2	2	1	1	3	1
2. DIARRHEAS	3	1	2	2	2	2	2	2	2	1	1	3	1
3. TYPHOID	3	1	2	2	2	2	2	2	2	1	1	3	1
4. INTESTINAL PARASITE RELATED	3	1	3	2	2	2	2	2	2	1	1	3	1

Source: National Master Plan

Note: 3: MAXIMUM 2: MODERATE 1: LOW

Tableau 3.3.1 Les Caracteristiques Hydrogeologique des Forages de Reconnaissance

Model Area	Coordinates (Approx.)			Drilling		Casing & Screen			Geology	
	X	Y	Z (m)	Dia.	Depth	Dia.	Casing	Screen	Epoch	Strata
Teroual										
IRE 1531/9 (TRA 1)	511300	452550	420	20" 12.25"	10 m 10-250	16"	10 m	—	Miocene Oligocene Triassic	Marl Siltstone Salt
IRE 1514/9 (TRA 2)	510900	552225	335.8	24" 17" 12.25"	10 m 10-170 170-300	20" 14" 14"	10 m 170 m —	36 m 45 to 120 m	Miocene Oligocene	Marl Siltstone Marl lime
IRE 1528/9 (TRA 3)	510650	452150	337.7	20" 15" 12.25"	10 m 10-120 120-150	16" 10" 10"	10 m 120 m	36 m 84 to 120 m	Miocene Oligocene	Marl & Gravel Siltstone
J.Berda										
IRE 1528/9 (JBD 1)	548125	447100	573.5	20" 15"	10 m 10-67	16"	10 m	—	Jurassic Upper Cretaceous	Boulders Marlstone Schist
IRE 1527/9 (JBD 2)	549450	446800	810.5	20" 15"	10 m 10-150	16" 10" 10"	10 m 150 m	60 m 62 to 144 m	Jurassic Upper Cretaceous	Boulders Marlstone Schist
IRE 1526/9 (JBD 3)	550150	446925	810.9	20" 15"	10 m 10-100	16" 10" 10"	10 m 100 m	36 m 32 to 100 m	Jurassic Upper Cretaceous	Boulders Marlstone Schist
Ain Defali										
IRE 3397/8 (ADF 1)	484500	445550	143.9	20" 15"	5 m 5-76	16" 10" 10"	5 m 125 m	36 m 16 to 70 m	Quaternary Villafranchian	Conglomerate
IRE 1537/9 (ADF 2)	485225	445575	459.4	20" 15"	5 m 5-55	16" 10" 10"	5 m 55 m	30 m 13 to 49 m	Quaternary Villafranchian	Conglomerate
IRE 1538/9 (ADF 3)	485925	445550	169.8	20" 15" 12.25"	5 m 5-125 125-150	16" 10" 10"	5 m 125 m	76 m 13 to 119 m	Quaternary Villafranchian	Conglomerate

Table 3.3.2 Details du Test de Pompage au Forages de Reconnaissance

Model Area	Well Reference No.	Pumping Test																
		Development Test							Step Drawdown									
		Well Depth (m)	Date of Test	Time (hr)	Stage (Nos.)	SWL (m)	Yield (l/sec)	Draw-down (m)	Date	Time (hr)	Stage (Nos.)	SWL (m)	Yield (l/sec)	Draw-down (m)	Specific Drawdown (sec/m2)	Well Loss (sec/m5)	Formation Loss (sec/m5)
Teroual	IRE 1531/9 (TRA1)	250	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
	IRE 1514/9 (TRA2)	300	10/9/95 11/9/95	24	1	62.50	10	28.20	12/9/95	8	4 2 hrs each	63.25	2.5 5.0 7.5 10.0	6.67 12.75 18.60 21.12	2668 2550 2480 2112	68000	1080
	IRE 1515/9 (TRA3)	150	20/9/95 21/9/95	10	1	38.36	10	4.02	2/9/95	8	4 2 hrs each	68.46	2.5 5.0 7.5 10.0	0.05 0.12 0.20 0.34	20 24 26.6 34	500	17
J. Berda	IRE 1528/9 (JBD1)	67	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
	IRE 1527/9 (JBD2)	150	13/9/95 14/9/95	24	1	61.45	10	32.52	14/9/95	8	4 2 hrs each	61.38	2.5 5.0 7.5 10.0	4.49 10.57 17.27 26.40	1796 2114 2302 2640	250	25
	IRE 1526/9 (JBD3)	100	16/9/95 19/9/95	64	1	34.68	1.5	0.52	25/8/95	8	4 2 hrs each	34.79	0.5 1.0 1.5 2.0	0.18 0.38 1.01 2.19	360 380 673 1095	360000	90
Ain Defali	IRE 3397/8 (ADF1)	76	23/8/95 24/8/95	24	3 6 hrs each	4.03	10 15 18.5	7.39 12.35 16.14	26/8/95	8	4 2 hrs each	8.51	5.3 10.6 15.0 17.6	10.76 13.85 16.59 18.54	2030 1307 1106 1053	10000	35
	IRE 1537/9 (ADF2)	55	3/8/95 18/8/95	12 12	2 2 x 6 hrs 1 x12 hrs	2.75	4.5 6.0 9.5-7.6	10.12 14.70 44.15	21/8/95	8	4 2 hrs each	3.10	2.0 4.0 6.0 7.6	7.57 15.03 27.38 42.55	3785 3757 4563 4599	270000	250
	IRE 1538/9 (ADF3)	150	15/9/95 16/9/95	24	1	32.38	10	38.28	16/9/95	8	4 2 hrs each	32.50	2.5 5.0 7.5 10.0	2.97 7.28 13.37 32.28	1188 1456 1783 3228	70000	150

Table 3.3.3 Details du test de Pompage a Debit Constant au Forages de Reconnaissance

Model Area	Well Reference No.	Pumping Test – Constant Rate									Recovery	
		Well Depth (m)	Date of Test	Time (hr)	SWL (m)	Yield (l/sec)	Drawdown (m)	Tranmi-ssivity (m2/sec)	Effective Permeability (m/sec)	Storage Coefficient	Original SWL (m)	Tranmi-ssivity (m2/sec)
Teroual	IRE 1531/9 (TRA1)	250	---	---	---	---	---	---	---	---	---	---
	IRE 1514/9 (TRA2)	300	24/6/95 27/9/95	72	63.97	10	21.60	9.8 x 10-4	1.63 x 10-5	4.36 x 10-4	40	6.09 x 10-4
	IRE 1515/9 (TRA3)	150	22/9/95 23/9/95	37	68.52	10	0.68	8.73 x 10-3	2.49 x 10-4	4.8 x 10-3	14	1.81 x 10-2
J. Berda	IRE 1528/9 (JBD1)	67	---	---	---	---	---	---	---	---	---	---
	IRE 1527/9 (JBD2)	150	15/9/95 18/9/95	60 12	61.45	8 11	25.05 31.42	4.88 x 10-4	1.83 x 10-5	2.5 x 10-3 (estimated)	41	1.56 x 10-3
	IRE 1526/9 (JBD3)	100	26/8/95 29/8/95	72 10	34.76	2 2.5	42.64 48.19	9.8 x 10-5	1.50 x 10-6	2.5 x 10-3 (estimated)	21	2.08 x 10-4
Ain Defali	IRE 3397/8 (ADF1)	76	27/8/95 30/8/95	72	8.8	15	14.35	1.8 x 10-3	1.8 x 10-5	1.5 x 10-3 (estimated)	72	1.14 x 10-3
	IRE 1537/9 (ADF2)	55	22/8/95 25/8/95	72	7.43	5	31.82	1.17 x 10-4	1.06 x 10-6	1.5 x 10-3 (estimated)	72	2.03 x 10-4
	IRE 1538/9 (ADF3)	150	17/9/95 20/9/95	72	32.5	10 12	23.45 23.41	9.14 x 10-4	1.08 x 10-5	1.5 x 10-3 (estimated)	26	1.35 x 10-3

Tableau 3.3.4 Donnéens Météo-hydrologiques Adoptées dans l'Analyse du Bilan d'Eau

River Basin	Rdat	Amzaz
Precipitation		
Reference Station	4404 Had Kourt	6400 Rhafsai
Period	1957/58 - 1993/94	1957/58 - 1993/94
Multiplier for Converting into Basin Rainfall	1.40	1.29
Runoff		
Reference Station	1436/8 Had Kourt	607/9 Rhafsai
Period	1957/58 - 1993/94	1957/58 - 1993/94
Catchment Area	673 km2	777 km2
Evapotranspiration		
Reference Station	6200 Ourtzagh	6200 Ourtzagh

Tableau 3.3.5 Application et Données de Précipitation

Objective Area	Ain Defali	Teroual	J. Berda
Catchment Area	12.0 km2	6.1 km2	6.3 km2
Applied Tank Model	Rdat	Rdat	Amzaz
Precipitation			
Reference Station	4404 Had Kourt	5128 M'Jaara	6400 Rhafsai
Period	1957/58 - 1994/95	1957/58 - 1994/95	1957/58 - 1994/95
Multiplier for Converting into Basin Rainfall	1.15	1.29	1.11
Evapotranspiration			
Reference Station	6200 Ourtzagh	6200 Ourtzagh	6200 Ourtzagh

Tableau 3.4.1 Projections Démographiques et Demande en Eau, Zone Modèle Ain Defali, 1995

	Name of Douar	Population	Served Population (80%)	Livestock (converted to large)	Unit Water Demand		Net Water Demand (m3/d)	UFW (%)	Water Demand (m3/d)
					Domestic (l/c/d)	Livestock (l/head/d)			
1	Aaoufat	320	256	282	20	20	6.0	40	10.0
2	Ain Chamia	710	568	316	20	20	12.3	40	20.5
3	Ain Defali	750	600	0	20	20	12.0	40	20.0
4	Ain Seddine	100	80	296	20	20	2.5	40	4.2
5	Ain Sfessef	102	82	36	20	20	1.7	40	2.8
6	Amaina	350	280	64	20	20	5.8	40	9.7
7	Bni Chellah	250	200	123	20	20	4.4	40	7.3
8	Bni Sennana	640	512	172	20	20	10.8	40	18.0
9	Bni Zid	850	680	292	20	20	14.5	40	24.2
10	Bouajajat	74	59	42	20	20	1.3	40	2.2
11	Bouajoulat	261	209	288	20	20	5.0	40	8.3
12	Boukouirat	250	200	74	20	20	4.2	40	7.0
13	Chaouia Bir	730	584	496	20	20	13.2	40	22.0
14	Chaouia Bouryatel	550	440	270	20	20	9.6	40	16.0
15	Chaouia Rmel	1,032	826	870	20	20	19.1	40	31.8
16	Chleuh	140	112	115	20	20	2.6	40	4.3
17	Daaf Lahfira	230	184	210	20	20	4.3	40	7.2
18	Daaf Ould Ali	100	80	170	20	20	2.1	40	3.5
19	Dhar Kharaz	158	126	78	20	20	2.8	40	4.7
20	Driouchat	96	77	99	20	20	1.8	40	3.0
21	Fadilia	345	276	242	20	20	6.2	40	10.3
22	Fssahiyen	224	179	78	20	20	3.8	40	6.3
23	Hjafna Rdat	800	640	370	20	20	13.9	40	23.2
24	Jaaouna	192	154	75	20	20	3.3	40	5.5
25	Jdid	700	560	230	20	20	11.9	40	19.8
26	Jramna	300	240	111	20	20	5.1	40	8.5
27	Kelaa	219	175	40	20	20	3.6	40	6.0
28	Khobzianne	790	632	132	20	20	13.0	40	21.7
29	Kranes	320	256	58	20	20	5.3	40	8.8
30	Kraoucha	720	576	249	20	20	12.3	40	20.5
31	Laamirat	616	493	147	20	20	10.3	40	17.2
32	Laaouaoula	700	560	115	20	20	11.5	40	19.2
33	Lahasba	126	101	96	20	20	2.3	40	3.8
34	Lahjafra Bougedour	720	576	1,006	20	20	14.5	40	24.2
35	Lahjajna	894	715	574	20	20	16.0	40	26.7
36	Lahrahra	250	200	82	20	20	4.2	40	7.0
37	Maadid	60	48	78	20	20	1.2	40	2.0
38	Mkam Mougui	70	56	270	20	20	1.9	40	3.2
39	Moualda	372	298	194	20	20	6.5	40	10.8
40	Mrabih	454	363	293	20	20	8.1	40	13.5
41	Ouled Bouchriha	350	280	200	20	20	6.2	40	10.3
42	Ouled Mahyou	291	233	116	20	20	5.0	40	8.3
43	Ouled Selem	110	88	106	20	20	2.1	40	3.5
44	Ouled Aaroub	0	0	0	20	20	0.0	40	0.0
45	Ouled Benyefou	378	302	520	20	20	7.6	40	12.7
46	Ouled Bouamer	90	72	135	20	20	1.8	40	3.0
47	Ouled Bouayeb	190	152	85	20	20	3.3	40	5.5
48	Ouled Boubker	427	342	135	20	20	7.2	40	12.0
49	Ouled Ghaid	820	656	354	20	20	14.2	40	23.7
50	Ouled Ktir	2,240	1,792	560	20	20	37.5	40	62.5
51	Ouled Noual	200	160	122	20	20	3.6	40	6.0
52	Regada	70	56	64	20	20	1.3	40	2.2
53	Slahna	231	185	209	20	20	4.3	40	7.2
54	Slim	1,536	1,229	122	20	20	24.9	40	41.5
55	Souhati	210	168	350	20	20	4.4	40	7.3
56	Souissat	270	216	69	20	20	4.5	40	7.5
57	Ain Masmouda	20	16	73	20	20	0.5	40	0.8
58	Laoumala Sayed	100	80	44	20	20	1.7	40	2.8
59	Coop El Assira	88	70	200	20	20	2.0	40	3.3
60	R. Center Ain Defali	1,048	838	180	20	20	17.3	40	28.8
	Total	25,234	20,188	12,377	-	-	440.3	-	733.8

Note: Numbers of population and livestock in Ouled Aaroub douar are included in Lahrahara douar, since these douars are alocated very near to each other.

Tableau 3.4.2 Projections Démographiques et Demande en Eau, Zone Modèle Ain Defali, 2000

	Name of Douar	Population	Served Population (80%)	Livestock (converted to large)	Unit Water Demand		Net Water Demand	UFW	Water Demand
					Domestic (l/c/d)	Livestock (l/head/d)	(m3/d)	(%)	(m3/d)
1	Aaoufat	331	265	282	23	20	6.9	35	10.6
2	Ain Chania	735	588	316	23	20	14.5	35	22.3
3	Ain Defali	777	621	0	23	20	14.3	35	22.0
4	Ain Seddine	104	83	296	23	20	2.8	35	4.3
5	Ain Sfessef	106	84	36	23	20	2.0	35	3.1
6	Amama	362	290	64	23	20	6.9	35	10.6
7	Bni Chellah	259	207	123	23	20	5.1	35	7.8
8	Bni Sennana	663	530	172	23	20	12.7	35	19.5
9	Bni Zid	880	704	292	23	20	17.1	35	26.3
10	Bouajajat	77	61	42	23	20	1.5	35	2.3
11	Bouajoulat	270	216	288	23	20	5.8	35	8.9
12	Boukouiratt	259	207	74	23	20	5.0	35	7.7
13	Chaouia Bir	756	605	496	23	20	15.4	35	23.7
14	Chaouia Bouryatel	570	456	270	23	20	11.3	35	17.4
15	Chaouia Rmel	1,069	855	870	23	20	22.3	35	34.3
16	Chleuh	145	116	115	23	20	3.0	35	4.6
17	Daaf Lahfira	238	191	210	23	20	5.0	35	7.7
18	Daaf Ould Ali	104	83	170	23	20	2.4	35	3.7
19	Dhar Kharaz	164	131	78	23	20	3.2	35	4.9
20	Driouchat	99	80	99	23	20	2.1	35	3.2
21	Fadilia	357	286	242	23	20	7.3	35	11.2
22	Fssahiyen	232	186	78	23	20	4.5	35	6.9
23	Hjafna Rdat	828	663	370	23	20	16.4	35	25.2
24	Jaaouna	199	159	75	23	20	3.9	35	6.0
25	Jdid	725	580	230	23	20	14.0	35	21.5
26	Jramna	311	249	111	23	20	6.1	35	9.4
27	Kelaa	227	181	40	23	20	4.3	35	6.6
28	Khobzianne	818	654	132	23	20	15.4	35	23.7
29	Kranes	331	265	58	23	20	6.3	35	9.7
30	Kraoucha	746	596	249	23	20	14.5	35	22.3
31	Laamirat	638	510	147	23	20	12.2	35	18.8
32	Leaouaoula	725	580	115	23	20	13.7	35	21.1
33	Lahasba	130	104	96	23	20	2.7	35	4.2
34	Lahjafra Bougdour	746	596	1,006	23	20	16.7	35	25.7
35	Lahjajma	926	741	574	23	20	18.8	35	28.9
36	Lahrahra	259	207	82	23	20	5.0	35	7.7
37	Maadid	62	50	78	23	20	1.4	35	2.2
38	Mkam Mougui	72	58	270	23	20	2.1	35	3.2
39	Moualda	385	308	194	23	20	7.7	35	11.8
40	Mrabih	470	376	293	23	20	9.5	35	14.6
41	Ouled Bouchriha	362	290	200	23	20	7.3	35	11.2
42	Ouled Mahyou	301	241	116	23	20	5.9	35	9.1
43	Ouled Selem	114	91	106	23	20	2.4	35	3.7
44	Ouled Aaroub	0	0	0	23	20	0.0	35	0.0
45	Ouled Benyefou	391	313	520	23	20	8.8	35	13.5
46	Ouled Bouamer	93	75	135	23	20	2.1	35	3.2
47	Ouled Bouayeb	197	157	85	23	20	3.9	35	6.0
48	Ouled Boubker	442	354	135	23	20	8.5	35	13.1
49	Ouled Ghaid	849	679	354	23	20	16.7	35	25.7
50	Ouled Ktir	2,320	1,856	560	23	20	44.4	35	68.3
51	Ouled Noual	207	166	122	23	20	4.2	35	6.5
52	Regada	72	58	64	23	20	1.5	35	2.3
53	Slahma	239	191	209	23	20	5.0	35	7.7
54	Slim	1,591	1,272	122	23	20	29.6	35	45.5
55	Souhatt	217	174	350	23	20	5.1	35	7.8
56	Souissat	280	224	69	23	20	5.4	35	8.3
57	Ain Masmouda	21	17	73	23	20	0.6	35	0.9
58	Laoumala Sayed	104	83	44	23	20	2.0	35	3.1
59	Coop El Assira	91	73	200	23	20	2.3	35	3.5
60	R. Center Ain Defali	1,085	868	180	23	20	20.5	35	31.5
	Total	26,130	20,904	12,377	-	-	518.0	-	796.9

Note: Numbers of population and livestock in Ouled Aaroub douar are included in Lahrahara douar, since these douars are alocated very near to each other.

Tableau 3.4.3 Projections Démographiques et Demande en Eau, Zone Modèle Ain Defali, 2005

	Name of Douar	Population	Served Population (80%)	Livestock (converted to large)	Unit Water Demand		Net Water Demand (m3/d)	UFW (%)	Water Demand (m3/d)
					Domestic (l/c/d)	Livestock (l/head/d)			
1	Aaoufat	343	274	282	27	20	8.2	30	11.7
2	Ain Chamia	761	609	316	27	20	17.4	30	24.9
3	Ain Defali	804	643	0	27	20	17.4	30	24.9
4	Ain Seddine	107	86	296	27	20	3.2	30	4.6
5	Ain Sfessef	109	87	36	27	20	2.5	30	3.6
6	Amama	375	300	64	27	20	8.3	30	11.9
7	Bni Chellah	268	214	123	27	20	6.1	30	8.7
8	Bni Sennana	686	549	172	27	20	15.3	30	21.9
9	Bni Zid	911	729	292	27	20	20.6	30	29.4
10	Boujajat	79	63	42	27	20	1.8	30	2.6
11	Bouajoulat	280	224	288	27	20	6.9	30	9.9
12	Boukouirat	268	214	74	27	20	6.0	30	8.6
13	Chaouia Bir	783	626	496	27	20	18.4	30	26.3
14	Chaouia Bouryatel	590	472	270	27	20	13.6	30	19.4
15	Chaouia Rmel	1,107	885	870	27	20	26.5	30	37.9
16	Chleuh	150	120	115	27	20	3.6	30	5.1
17	Daaf Lahfira	247	197	210	27	20	5.9	30	8.4
18	Daaf Ould Ali	107	86	170	27	20	2.8	30	4.0
19	Dhar Kharaz	169	136	78	27	20	3.9	30	5.6
20	Driouchat	103	82	99	27	20	2.5	30	3.6
21	Fadilia	370	296	242	27	20	8.7	30	12.4
22	Fssahiyen	240	192	78	27	20	5.4	30	7.7
23	Hjafna Rdat	858	686	370	27	20	19.6	30	28.0
24	Jaaouna	206	165	75	27	20	4.7	30	6.7
25	Jdid	751	600	230	27	20	16.9	30	24.1
26	Jramna	322	257	111	27	20	7.3	30	10.4
27	Kelaa	235	188	40	27	20	5.2	30	7.4
28	Khobzianne	847	678	132	27	20	18.7	30	26.7
29	Kranes	343	274	58	27	20	7.6	30	10.9
30	Kraoucha	772	618	249	27	20	17.4	30	24.9
31	Laamirat	661	528	147	27	20	14.7	30	21.0
32	Laaouaoula	751	600	115	27	20	16.5	30	23.6
33	Lahasba	135	108	96	27	20	3.2	30	4.6
34	Lahjafra Bougdour	772	618	1,006	27	20	19.7	30	28.1
35	Lahjajma	959	767	574	27	20	22.4	30	32.0
36	Lahrahra	268	214	82	27	20	6.0	30	8.6
37	Maadid	64	51	78	27	20	1.6	30	2.3
38	Mkam Mougui	75	60	270	27	20	2.4	30	3.4
39	Moualda	399	319	194	27	20	9.2	30	13.1
40	Mrabih	487	389	293	27	20	11.4	30	16.3
41	Ouled Bouchriha	375	300	200	27	20	8.7	30	12.4
42	Ouled Mahyou	312	250	116	27	20	7.1	30	10.1
43	Ouled Selem	118	94	106	27	20	2.9	30	4.1
44	Ouled Aaroub	0	0	0	27	20	0.0	30	0.0
45	Ouled Benyefou	405	324	520	27	20	10.3	30	14.7
46	Ouled Bouamer	97	77	135	27	20	2.5	30	3.6
47	Ouled Bouayeb	204	163	85	27	20	4.7	30	6.7
48	Ouled Boubker	458	366	135	27	20	10.3	30	14.7
49	Ouled Glaid	879	703	354	27	20	20.0	30	28.6
50	Ouled Kbir	2,402	1,921	560	27	20	53.5	30	76.4
51	Ouled Noual	214	172	122	27	20	5.0	30	7.1
52	Regada	75	60	64	27	20	1.8	30	2.6
53	Slahma	248	198	209	27	20	6.0	30	8.6
54	Slim	1,647	1,318	122	27	20	36.0	30	51.4
55	Souhait	225	180	350	27	20	5.9	30	8.4
56	Souissat	290	232	69	27	20	6.5	30	9.3
57	Ain Masmouda	21	17	73	27	20	0.7	30	1.0
58	Laoumala Sayed	107	86	44	27	20	2.5	30	3.6
59	Coop El Assira	94	75	200	27	20	2.6	30	3.7
60	R. Center Ain Defali	1,124	899	180	27	20	24.8	30	35.4
	Total	27,057	21,639	12,377	-	-	621.3	-	887.6

Note: Numbers of population and livestock in Ouled Aaroub douar are included in Lahrahara douar, since these douars are allocated very near to each other.

Tableau 3.4.4 Projections Démographiques et Demande en Eau, Zone Modèle Ain Defali, 2010

	Name of Douar	Population	Served Population (80%)	Livestock (converted to large)	Unit Water Demand		Net Water Demand (m3/d)	UFW (%)	Water Demand (m3/d)
					Domestic (l/c/d)	Livestock (l/head/d)			
1	Aaoufat	355	284	282	31	20	9.7	26	13.1
2	Ain Chamia	788	631	316	31	20	20.5	26	27.7
3	Ain Defali	833	666	0	31	20	20.6	26	27.8
4	Ain Seddine	111	89	296	31	20	3.6	26	4.9
5	Ain Sfessef	113	91	36	31	20	2.9	26	3.9
6	Amaina	389	311	64	31	20	9.8	26	13.2
7	Bni Chellah	278	222	123	31	20	7.3	26	9.9
8	Bni Sennana	711	568	172	31	20	18.1	26	24.5
9	Bni Zid	944	755	292	31	20	24.3	26	32.8
10	Bouajajat	82	66	42	31	20	2.2	26	3.0
11	Bouajoulat	290	232	288	31	20	8.1	26	10.9
12	Boukouirati	278	222	74	31	20	7.1	26	9.6
13	Chaouia Bir	811	648	496	31	20	21.6	26	29.2
14	Chaouia Bouryatel	611	489	270	31	20	16.0	26	21.6
15	Chaouia Rmel	1,146	917	870	31	20	31.0	26	41.9
16	Chleuh	155	124	115	31	20	4.2	26	5.7
17	Daaf Lahlira	255	204	210	31	20	7.0	26	9.5
18	Daaf Ould Ali	111	89	170	31	20	3.3	26	4.5
19	Dhar Kharaz	175	140	78	31	20	4.6	26	6.2
20	Driouchat	107	85	99	31	20	2.9	26	3.9
21	Fadilia	383	306	242	31	20	10.2	26	13.8
22	Fssahiyen	249	199	78	31	20	6.4	26	8.6
23	Hjafna Rdat	888	711	370	31	20	23.2	26	31.4
24	Jaaouna	213	171	75	31	20	5.5	26	7.4
25	Jdid	777	622	230	31	20	20.0	26	27.0
26	Jramna	333	266	111	31	20	8.6	26	11.6
27	Kelaa	243	195	40	31	20	6.2	26	8.4
28	Khobzianne	877	702	132	31	20	22.2	26	30.0
29	Kranes	355	284	58	31	20	9.0	26	12.2
30	Kraoucha	799	640	249	31	20	20.6	26	27.8
31	Laamirat	684	547	147	31	20	17.4	26	23.5
32	Laaouaoula	777	622	115	31	20	19.6	26	26.5
33	Lahasba	140	112	96	31	20	3.8	26	5.1
34	Lahjafra Bougdour	799	640	1,006	31	20	22.9	26	30.9
35	Lahjajma	993	794	574	31	20	26.3	26	35.5
36	Lahrahra	278	222	82	31	20	7.1	26	9.6
37	Maadid	67	53	78	31	20	1.9	26	2.6
38	Mkam Mougui	78	62	270	31	20	2.7	26	3.6
39	Moualda	413	330	194	31	20	10.8	26	14.6
40	Mrabih	504	403	293	31	20	13.4	26	18.1
41	Ouled Bouchriha	389	311	200	31	20	10.2	26	13.8
42	Ouled Mahyou	323	258	116	31	20	8.3	26	11.2
43	Ouled Selem	122	98	106	31	20	3.4	26	4.6
44	Ouled Aaroub	0	0	0	31	20	0.0	26	0.0
45	Ouled Benyefou	420	336	520	31	20	12.0	26	16.2
46	Ouled Bouamer	100	80	135	31	20	2.9	26	3.9
47	Ouled Bouayeb	211	169	85	31	20	5.5	26	7.4
48	Ouled Boubker	474	379	135	31	20	12.2	26	16.5
49	Ouled Glaid	910	728	354	31	20	23.6	26	31.9
50	Ouled Ktir	2,487	1,990	560	31	20	63.4	26	85.7
51	Ouled Noual	222	178	122	31	20	5.9	26	8.0
52	Regada	78	62	64	31	20	2.1	26	2.8
53	Slahma	256	205	209	31	20	7.0	26	9.5
54	Slim	1,705	1,364	122	31	20	42.7	26	57.7
55	Souhatt	233	187	350	31	20	6.8	26	9.2
56	Souissat	300	240	69	31	20	7.6	26	10.3
57	Ain Masmouda	22	18	73	31	20	0.8	26	1.1
58	Laoumala Sayed	111	89	44	31	20	2.9	26	3.9
59	Coop El Assira	98	78	200	31	20	3.0	26	4.1
60	R. Center Ain Defali	1,164	931	180	31	20	29.4	26	39.7
	Total	28,017	22,415	12,377	-	-	732.3	-	989.6

Note: Numbers of population and livestock in Ouled Aaroub douar are included in Lahrahara douar, since these douars are alocated very near to each other.

Tableau 3.4.5 Projections Démographiques et Demande en Eau, Zone Modèle Teroual, 1995

	Name of Douar	Population	Served Popualtion (80%)	Livestock (converted to large)	Unit Water Demand		Net Water Demand (m3/d)	UFW (%)	Water Demand (m3/d)
					Domestic (l/c/d)	Livestock (l/head/d)			
1	Achira	210	168	170	20	20	3.9	40	6.5
2	Ain Arsa	350	280	186	20	20	6.2	40	10.3
3	Ain Haddad	480	384	151	20	20	8.1	40	13.5
4	Amalou	180	144	62	20	20	3.1	40	5.2
5	Bakkara	320	256	168	20	20	5.6	40	9.3
6	Beriat Rmel	190	152	0	20	20	3.0	40	5.0
7	Ghbalou	1,200	960	1,050	20	20	22.4	40	37.3
8	Glita	300	240	224	20	20	5.5	40	9.2
9	Haddarine	380	304	219	20	20	6.7	40	11.2
10	Hajar Touil	800	640	200	20	20	13.4	40	22.3
11	Houmar	131	105	0	20	20	2.1	40	3.5
12	Inghar	60	48	95	20	20	1.2	40	2.0
13	Khandak Berd	540	432	0	20	20	8.6	40	14.3
14	Koudia	240	192	104	20	20	4.2	40	7.0
15	Lalla Aicha	110	88	69	20	20	2.0	40	3.3
16	Latamna	240	192	87	20	20	4.1	40	6.8
17	Merrakine	150	120	60	20	20	2.6	40	4.3
18	Mguerouel	350	280	190	20	20	6.2	40	10.3
19	Oulad Imrane	100	80	122	20	20	2.0	40	3.3
20	Oulad Bakkal	380	304	92	20	20	6.4	40	10.7
21	Oulad Laheen	110	88	88	20	20	2.0	40	3.3
22	Remila	170	136	133	20	20	3.1	40	5.2
23	Sidi Allal Zghari	900	720	140	20	20	14.8	40	24.7
24	Troual	2,050	1,640	0	20	20	32.8	40	54.7
25	Zlayh	170	136	127	20	20	3.1	40	5.2
26	Zourak	740	592	132	20	20	12.2	40	20.3
27	Oulad Bentahar	110	88	101	20	20	2.1	40	3.5
28	Oulad Hmidou	135	108	67	20	20	2.4	40	4.0
29	Jamae El Ouad	1,000	800	332	20	20	17.0	40	28.3
	Total	**12,096**	**9,677**	**4,369**	-	-	**206.8**	-	**344.7**

Tableau 3.4.6 Projections Démographiques et Demande en Eau, Zone Modèle Teroual, 2000

	Name of Douar	Population	Served Population (80%)	Livestock (converted to large)	Unit Water Demand		Water Demand (m3/d)	UFW (%)	Water Demand (m3/d)
					Domestic (l/c/d)	Livestock (l/head/d)			
1	Achira	217	174	170	23	20	4.5	35	6.9
2	Ain Arsa	362	290	186	23	20	7.2	35	11.1
3	Ain Haddad	497	398	151	23	20	9.6	35	14.8
4	Amalou	186	149	62	23	20	3.6	35	5.5
5	Bakkara	331	265	168	23	20	6.6	35	10.2
6	Beriat Rmel	197	157	0	23	20	3.6	35	5.5
7	Ghbalou	1,243	994	1,050	23	20	26.0	35	40.0
8	Glita	311	249	224	23	20	6.4	35	9.8
9	Haddarine	393	315	219	23	20	7.9	35	12.2
10	Hajar Touil	828	663	200	23	20	15.8	35	24.3
11	Houmar	136	109	0	23	20	2.5	35	3.8
12	Inghar	62	50	95	23	20	1.4	35	2.2
13	Khandak Berd	559	447	0	23	20	10.3	35	15.8
14	Koudia	249	199	104	23	20	4.9	35	7.5
15	Lalla Aicha	114	91	69	23	20	2.3	35	3.5
16	Latamna	249	199	87	23	20	4.8	35	7.4
17	Merrakine	155	124	60	23	20	3.0	35	4.6
18	Meuerouel	362	290	190	23	20	7.2	35	11.1
19	Oulad Imrane	104	83	122	23	20	2.3	35	3.5
20	Oulad Bakkal	393	315	92	23	20	7.5	35	11.5
21	Oulad Lahcen	114	91	88	23	20	2.4	35	3.7
22	Remila	176	141	133	23	20	3.6	35	5.5
23	Sidi Allal Zghari	932	746	140	23	20	17.6	35	27.1
24	Troual	2,123	1,698	0	23	20	39.1	35	60.2
25	Zlayh	176	141	127	23	20	3.6	35	5.5
26	Zourak	766	613	132	23	20	14.5	35	22.3
27	Oulad Bentahar	114	91	101	23	20	2.4	35	3.7
28	Oulad Hmidou	140	112	67	23	20	2.8	35	4.3
29	Jamae El Ouad	1,035	828	332	23	20	20.0	35	30.8
	Total	**12,525**	**10,022**	**4,369**	-	-	**243.4**	-	**374.5**

Tableau 3.4.7 Projections Démographiques et Demande en Eau, Zone Modèle Teroual, 2005

	Name of Douar	Population	Served Population (80%)	Livestock (converted to large)	Unit Water Demand		Water Demand (m3/d)	UFW (%)	Water Demand (m3/d)
					Domestic (l/c/d)	Livestock (l/head/d)			
1	Achira	225	180	170	27	20	5.4	30	7.7
2	Ain Arsa	375	300	186	27	20	8.7	30	12.4
3	Ain Haddad	515	412	151	27	20	11.6	30	16.6
4	Amalou	193	154	62	27	20	4.3	30	6.1
5	Bakkara	343	274	168	27	20	7.9	30	11.3
6	Beriat Rmel	204	163	0	27	20	4.4	30	6.3
7	Ghbalou	1,287	1,029	1,050	27	20	30.9	30	44.1
8	Glita	322	257	224	27	20	7.6	30	10.9
9	Haddarine	407	326	219	27	20	9.5	30	13.6
10	Hajar Touil	858	686	200	27	20	19.1	30	27.3
11	Houmar	140	112	0	27	20	3.0	30	4.3
12	Inghar	64	51	95	27	20	1.7	30	2.4
13	Khandak Berd	579	463	0	27	20	12.5	30	17.9
14	Koudia	257	206	104	27	20	5.9	30	8.4
15	Lalla Aicha	118	94	69	27	20	2.7	30	3.9
16	Latamna	257	206	87	27	20	5.8	30	8.3
17	Merrakine	161	129	60	27	20	3.7	30	5.3
18	Mguerouel	375	300	190	27	20	8.7	30	12.4
19	Oulad Imrane	107	86	122	27	20	2.7	30	3.9
20	Oulad Bakkal	407	326	92	27	20	9.1	30	13.0
21	Oulad Laheen	118	94	88	27	20	2.8	30	4.0
22	Remila	182	146	133	27	20	4.3	30	6.1
23	Sidi Allal Zghari	965	772	140	27	20	21.3	30	30.4
24	Troual	2,198	1,758	0	27	20	47.5	30	67.9
25	Zlayh	182	146	127	27	20	4.3	30	6.1
26	Zourak	793	635	132	27	20	17.5	30	25.0
27	Oulad Bentahar	118	94	101	27	20	2.8	30	4.0
28	Oulad Hmidou	145	116	67	27	20	3.3	30	4.7
29	Jamae El Ouad	1,072	858	332	27	20	24.2	30	34.6
	Total	**12,970**	**10,373**	**4,369**	-	-	**293.2**	-	**418.9**

Tableau 3.4.8 Projections Démographiques et Demande en Eau, Zone Modèle Teroual, 2010

	Name of Douar	Population	Served Population (80%)	Livestock (converted to large)	Unit Water Demand		Water Demand (m3/d)	UFW (%)	Water Demand (m3/d)
					Domestic (l/c/d)	Livestock (l/head/d)			
1	Achira	233	187	170	31	20	6.3	26	8.5
2	Ain Arsa	389	311	186	31	20	10.2	26	13.8
3	Ain Haddad	533	426	151	31	20	13.7	26	18.5
4	Amalou	200	160	62	31	20	5.1	26	6.9
5	Bakkara	355	284	168	31	20	9.3	26	12.6
6	Beriat Rmel	211	169	0	31	20	5.2	26	7.0
7	Ghbalou	1,332	1,066	1,050	31	20	36.2	26	48.9
8	Glita	333	266	224	31	20	8.9	26	12.0
9	Haddarine	422	338	219	31	20	11.1	26	15.0
10	Hajar Touil	888	711	200	31	20	22.6	26	30.5
11	Houmar	145	116	0	31	20	3.6	26	4.9
12	Inghar	67	53	95	31	20	1.9	26	2.6
13	Khandak Berd	600	480	0	31	20	14.9	26	20.1
14	Koudia	266	213	104	31	20	6.9	26	9.3
15	Lalla Aicha	122	98	69	31	20	3.2	26	4.3
16	Latamna	266	213	87	31	20	6.9	26	9.3
17	Merrakine	167	133	60	31	20	4.3	26	5.8
18	Mguerouel	389	311	190	31	20	10.2	26	13.8
19	Oulad Imrane	111	89	122	31	20	3.1	26	4.2
20	Oulad Bakkal	422	338	92	31	20	10.8	26	14.6
21	Oulad Lahcen	122	98	88	31	20	3.3	26	4.5
22	Remila	189	151	133	31	20	5.1	26	6.9
23	Sidi Allal Zehari	999	799	140	31	20	25.2	26	34.1
24	Troual	2,276	1,821	0	31	20	56.5	26	76.4
25	Zlayh	189	151	127	31	20	5.1	26	6.9
26	Zourak	822	657	132	31	20	20.8	26	28.1
27	Oulad Bentahar	122	98	101	31	20	3.3	26	4.5
28	Oulad Hmidou	150	120	67	31	20	3.9	26	5.3
29	Jamae El Ouad	1,110	888	332	31	20	28.5	26	38.5
	Total	**13,430**	**10,745**	**4,369**	-	-	**346.1**	-	**467.7**

Tableau 3.4.9 Projections Démographiques et Demande en Eau, Zone Modèle El Bibane, 1995

	Name of Douar	Population	Served Population (80%)	Livestock (converted to large)	Unit Water Demand		Unit Water Demand (m3/d)	UFW (%)	Water Demand (m3/d)
					Domestic (l/c/d)	Livestock (l/head/d)			
1	Aounane	752	602	85	20	20	12.3	40	20.5
2	Astar	420	336	45	20	20	6.9	40	11.5
3	Babet El Bir	1,203	962	320	20	20	20.2	40	33.7
4	Douehar	287	230	47	20	20	4.7	40	7.8
5	Oulad Ben Jemaa	301	241	42	20	20	4.9	40	8.2
6	Ras Lakbour	307	246	43	20	20	5.0	40	8.3
7	Rif	303	242	91	20	20	5.1	40	8.5
8	Rkiba	1,022	818	132	20	20	16.8	40	28.0
9	Tazghadra	1,636	1,309	491	20	20	27.7	40	46.2
10	Zaouia Sidi Ahmend	280	224	52	20	20	4.6	40	7.7
	Total	**6,511**	**5,210**	**1348**	-	-	**108.2**	-	**180.3**

Tableau 3.4.10 Projections Démographiques et Demande en Eau, Zone Modèle El Bibane, 2000

	Name of Douar	Population	Served Population (80%)	Livestock (converted to large)	Unit Water Demand		Unit Water Demand (m3/d)	UFW (%)	Water Demand (m3/d)
					Domestic (l/c/d)	Livestock (l/head/d)			
1	Aounane	779	623	85	23	20	14.6	35	22.5
2	Astar	435	348	45	23	20	8.1	35	12.5
3	Babet El Bir	1,246	997	320	23	20	23.9	35	36.8
4	Douehar	297	238	47	23	20	5.6	35	8.6
5	Oulad Ben Jemaa	312	249	42	23	20	5.9	35	9.1
6	Ras Lakbour	318	254	43	23	20	6.0	35	9.2
7	Rif	314	251	91	23	20	6.0	35	9.2
8	Rkiba	1,058	847	132	23	20	19.9	35	30.6
9	Tazghadra	1,694	1,355	491	23	20	32.6	35	50.2
10	Zaouia Sidi Ahmend	290	232	52	23	20	5.5	35	8.5
	Total	**6,742**	**5,394**	**1348**	-	-	**128.1**	-	**197.1**

Tableau 3.4.11 Projections Démographiques et Demande en Eau, Zone Modèle El Bibane, 2005

	Name of Douar	Population	Served Popualtion (80%)	Livestock (converted to large)	Unit Water Demand		Unit Water Demand (m3/d)	UFW (%)	Water Demand (m3/d)
					Domestic (l/c/d)	Livestock (l/head/d)			
1	Aounane	806	645	85	27	20	17.7	30	25.3
2	Astar	450	360	45	27	20	9.9	30	14.1
3	Babet El Bir	1,290	1,032	320	27	20	28.8	30	41.1
4	Douehar	308	246	47	27	20	6.8	30	9.7
5	Oulad Ben Jemaa	323	258	42	27	20	7.1	30	10.1
6	Ras Lakbour	329	263	43	27	20	7.2	30	10.3
7	Rif	325	260	91	27	20	7.3	30	10.4
8	Rkiba	1,096	877	132	27	20	24.1	30	34.4
9	Tazghadra	1,754	1,403	491	27	20	39.4	30	56.3
10	Zaouia Sidi Ahmend	300	240	52	27	20	6.6	30	9.4
	Total	**6,981**	**5,584**	**1348**	-	-	**154.9**	-	**221.3**

Tableau 3.4.12 Projections Démographiques et Demande en Eau, Zone Modèle El Bibane, 2010

	Name of Douar	Population	Served Popualtion (80%)	Livestock (converted to large)	Unit Water Demand		Unit Water Demand (m3/d)	UFW (%)	Water Demand (m3/d)
					Domestic (l/c/d)	Livestock (l/head/d)			
1	Aounane	835	668	85	31	20	21.0	26	28.4
2	Astar	466	373	45	31	20	11.7	26	15.8
3	Babet El Bir	1,336	1,069	320	31	20	34.1	26	46.1
4	Douehar	319	255	47	31	20	8.0	26	10.8
5	Oulad Ben Jemaa	334	267	42	31	20	8.4	26	11.4
6	Ras Lakbour	341	273	43	31	20	8.6	26	11.6
7	Rif	336	269	91	31	20	8.6	26	11.6
8	Rkiba	1,135	908	132	31	20	28.5	26	38.5
9	Tazghadra	1,816	1,453	491	31	20	46.5	26	62.8
10	Zaouia Sidi Ahmend	311	249	52	31	20	7.9	26	10.7
	Total	**7,229**	**5,784**	**1348**	-	-	**183.3**	-	**247.7**

Tableau 3.4.13 Conditions d'Alimentation en Eau Actuelles dans Ain Defali

	Douar	No. of Family Surveyed	Popula-tion Surveyed	No. of Livestock		Water Consumption (l/d)				Means of Transport			Person in charge			Time		Distance to carry
				Small	Large	Domestic			Livestock	Vehicle	Mule	Foot	Men	W'men	Child	Sum.	Wint.	
						Summer	Winter	Total	Summer	(%)			(%)			(hr)		(km)
1	Hjaîna	34	270	168	88	6,470	6,780	13,250	4,360	38	62	-	44	3	53	4	1	1
2	Hjajama	9	78	45	41	1,870	1,550	3,420	1,410	-	100	-	17	5	78	3	1	7
3	Benizid	7	70	233	27	775	775	1,550	1,765	-	100	-	-	86	14	3	5	3
4	Ouled Salem	10	84	105	51	775	775	1,550	2,565	-	100	-	50	10	40	5	2	7
5	Chouker	13	179	244	100	1,620	1,720	3,340	5,220	8	92	-	35	-	65	6	-	12
6	C. Fadilia	18	214	158	99	6,055	3,070	9,125	4,750	19	81	-	1	-	19	4	1	8
7	Chawia Bouriatel	15	178	215	106	3,450	1,830	5,280	1,900	6	94	-	27	6	67	3	-	10
8	Laamama	9	77	50	33	1,060	950	2,010	890	-	100	-	39	11	50	5	-	2
9	Chawia Rmel	22	171	138	59	2,720	1,780	4,500	1,210	-	100	-	27	9	64	2	-	1
10	Slim	57	471	426	198	10,070	10,070	20,140	10,050	-	96	4	44	7	49	4	1	10
11	Ouled Boutayeb	21	192	101	54	3,150	1,640	4,790	-	-	100	-	72	14	14	3	-	3
12	Ain Chamia	23	205	145	101	1,905	1,905	3,810	2,845	4	92	4	17	13	70	3	-	5
13	C. Wafa	10	84	147	58	1,045	1,045	2,090	3,055	-	-	-	9	24	67	2	1	1
14	D. Ain Defali	27	207	33	29	1,965	1,965	3,930	485	-	93	7	33	43	24	6		
	Total (Ave)	275	2480	2208	1044	42,930	35,855	78,785	40,505	(6)	(93)	(1)	(35)	(17)	(48)	(3.8)	(1.7)	(5.4)
	Unit Water (l/c/d)					(17.3)	(14.5)											

Note: Livestock is occasionally supplied with water in houses during summer, and this amounts to 15% out of the total consumption.

In winter (rainy season), water is fed to livestocks outdoors.

Water consumption for livestock in winter is assumed to be equal to the one in summer.

Tableau 3.4.14 Conditions d'Alimentation en Eau Actuelles dans Teroual

	Douar	No. of Family Surveyed	Popula-tion Surveyed	No. of Livestock		Water Consumption (l/d)				Means of Transport			Person in charge			Time		Distance to carry
				Small	Large	Domestic			Livestock	Vehicle	Mule	Foot	Men	W'men	Child	Sum.	Wint.	
						Summer	Winter	Total	Summer	(%)			(%)			(hr)		(km)
1	S. Allal Zeghari	23	160	25	16	4,115	2,915	7,030	765	-	26	74	-	67	53	4	1	1
2	Bekala	12	125	90	69	2,910	2,910	5,820	-	-	92	8	-	21	78	3	1	7
3	Khandek El Berd	18	131	57	58	1,310	1,310	2,620	1,140	-	83	17	33	25	14	3	5	3
4	Arbalou	21	153	96	80	1,560	2,640	4,200	3,680	-	72	28	14	67	40	5	2	7
5	Ain Haddad	7	38	24	18	810	810	1,620	840	-	100	-	72	14	65	6	-	12
6	Jamae El Oued	15	98	54	38	2,275	2,060	4,335	1,790	-	100	-	47	30	19	4	1	8
7	Ouled Bekkal	27	217	98	76	2,145	1,910	4,055	1,595	-	89	11	20	34	67	1	4	10
8	Hjar Touil	29	226	95	72	1,905	2,115	4,020	890	-	86	14	48	17	50	5	-	2
9	Zourak	40	266	73	108	4,420	2,650	7,070	-	-	82	18	15	45	64	2	-	1
	Total (Ave)	192	1414	612	535	21,450	19,320	40,770	40,505	(0)	(81)	(11)	(24)	(31)	(44)	(3.7)	(2.3)	(5.7)
	Unit Water (l/c/d)					(15.2)	(13.7)											

Note: Livestock is occasionally supplied with water in houses during summer, and this amounts to 15% out of the total consumption.

In winter (rainy season), water is fed to livestocks outdoors.

Water consumption for livestock in winter is assumed to be equal to the one in summer.

Tableau 3.4.15 Conditions d'Alimentation en Eau Actuelles dans El Bibane

		No. of Family Surveyed	Popula-tion Surveyed	No. of Livestock		Water Consumption (l/d)				Means of Transport			Person in charge			Time		Distance to carry
				Small	Large	Domestic			Livestock	Vehicle	Mule	Foot	Men	W'men	Child	Sum.	Wint.	
						Summer	Winter	Total	Summer	(%)			(%)			(hr)		(km)
1	Babet El Bir	15	91	23	33	1,245	1,280	2,525	1,435	-	53	47	7	70	23	1	-	0.5
2	Douiher	12	47	28	12	730	730	1,460	620	-	100	-	29	8	63	2	-	3
3	Aster	12	99	25	16	1,575	1,020	2,595	245	-	100	-	42	-	58	2	-	3
4	Aounane	8	45	10	9	710	540	1,250	410	-	100	-	12	19	69	1.5	-	2
5	Jamae Rif	5	31	2	10	670	460	1,130	410	-	100	-	-	20	80	1.5	-	3
6	Rkiba	13	96	13	18	1,585	1,100	2,685	785	-	100	-	23	12	65	1.5	-	3
7	Ras Lekbour	7	41	3	10	645	500	1,145	415	-	100	-	7	14	79	1.5	-	2
8	Ouled B. Jamae	11	88	14	17	1,430	1,040	2,470	750	-	-	100	-	35	65	0.5	-	0.5
9	Zaouia	11	78	39	18	965	660	1,625	555	-	64	36	27	36	37	1	-	0.5
10	Tazerharda	11	77	60	36	2,160	1,880	4,040	-	-	73	27	18	9	73	0.5	-	0.5
	Total (Ave)	105	693	217	179	11,715	9,210	20,925	40,505	(0)	(79)	(21)	(17)	(22)	(61)	(1.3)	-	(1.8)
	Unit Water(l/c/d)					(16.9)	(13.3)											

Note: Livestock is occasionally supplied with water in houses during summer, and this amounts to 15% out of the total consumption.

In winter (rainy season), water is fed to livestocks outdoors.

Water consumption for livestock in winter is assumed to be equal to the one in summer.

Tableau 3.6.3 Coûts Unitaires de Construction (1/2)

Cost items	Unit	Total (DH)	FC (US$)	LC (DH)
< Macro Basis Unit Costs >				
Procurement cost, CIF site				
- Deepwell pump & motor, 150 l/min., 3.7 kw, head 60 m, 40 mm dia., 12-stage	set	120360	12600	12000
- Deepwell pump & motor, 110 l/min. 11 kw, head 210 m, 40 mm dia., 19-stage	set	132400	14000	12000
- Deepwell pump & motor, 50 l/min. 1.5 kw, head 60 m, 40 mm dia., 12-stage	set	47300	5000	4300
- Distribution pump & motor, 5.5 kw 40 mm dia.	set	47800	5000	4800
- Distribution pump & motor, 3.7 kw 40 mm dia.	set	34460	3600	3500
- Distribution pump & motor, 2.2 kw 40 mm dia.	set	23900	2500	2400
- Distribution pump & motor, 1.5 kw 40 mm dia.	set	22080	2300	2300
- Diesel generator, 10 kVA	set	55000	5800	6000
- Diesel generator, 30 kVA	set	154000	16100	15000
Construction costs				
- Well development and pumping test	8-hr	4800	419	1120
- Well recharge	8-hr	3200	279	800
- Well logging	unit	112000	9767	28000
- pumping station				
1) electro-mechanical cost, C=75 %-	-	{ C=162.549 * P 0.507 , P=Power, kw}		
2) pump house	m2	6500	567	1625
- Water treatment plant including primary sedimentation and tank settling, 50 l/s	lot	36700000	3200580	9175000
- Water reservoir, semi-burried, 100 m3	place	302000	26337	75500
- Water reservoir, semi-burried, 200 m3	place	524000	45698	131000
- Power line, 22 kV/380 V/50 Hz	km	240000	20930	60000
- Access road, w=4.0 m, asphalt pavement	km	625000	54506	156250
Operation and maintenance costs				
- Operation cost of pumping station (medium scale)	year	180000	-	180000
- Maintenance cost of :				
1) drilled well	year	(2.5 % of investment cost)		
2) dughole	year	(1.0 % of investment cost)		
3) equipment of well or dughole	year	(3.0 % of investment cost)		
4) electro-mech. equipment for pumping station	year	(3.0 % of investment cost)		
5) electro-mech. equipment for water treatment plant	year	(3.0 % of investment cost)		
6) water reservoir	year	(0.5 % of investment cost)		
7) pipes	year	(0.5 % of investment cost)		
8) fittings and valves	year	(1.0 % of investment cost 0		
9) electric and telephone lines	year	(1.0 % of investment cost)		
10) access road	year	(3.0 % of investment cost)		

Tableau 3.6.3 Coûts Unitaires de Construction (2/2)

Cost items	Unit	Total (DH)	FC (US$)	LC (DH)
< Unit Construction Cost Basis >				
Civil works				
1) Bulk excavation, common	cu.m	30	2.5	8.5
2) Trench excavation , rock	cu.m	100	8.7	25
3) Backfill of trench	cu.m	28	2.4	7
4) Plain concrete for thrust blocks and anchors (supply placing & including formwork, re-bar and all necessary works), 150 kg/m3	cu.m	650	56.7	163
5) Foundation concrete (supply placing & including formwork, re-bar and all necessary works), 250 kg/m3	cu.m	1000	87.2	250
6) Masonry work in foundation	cu.m	300	26.2	75
7) Formwork for concrete	sq.m	66	5.8	17
8) Brickwork	sq.m	150	13.1	38
Plumbing				
1) Asbestos cement pipe class 10, dia. 100 mm	lin.m	230	20.1	58
2) Ductile iron pipe, dia. 100 mm	lin.m	530	46.2	133
3) Concrete pipe, dia. 100 mm	lin.m	125	10.9	31
4) Galvanized steel pipe, 125 mm	lin.m	310	32	34
5) Galvanized steel pipe, 89 mm	lin.m	241	25	26
6) Galvanized steel pipe, 75 mm	lin.m	210	22	20
7) PVC pipe, dia. 75 mm	lin.m	150	13.1	38
8) Gate valve, dia 100 mm	unit	18500	1613.4	4625
9) Gate valve for service connection dia. 20 mm	unit	480	41.9	120
10) Isolation valve, dia. 20 mm	unit	180	15.7	45
11) Stop valve, 40 mm	unit	179	15.6	45
Electric work				
1) Cable 4, 1000 R, 4 * 10 mm2	lin.m	92	8	23
2) Distribution box	unit	3886	338.9	972
3) Circuit breaker, 10 to 30 amps	unit	1030	89.8	258
Painting				
1) Vinyl painting	sq.m	26	2.3	7
2) Wood painting	sq.m	32	2.8	8

Tableau 3.6.7 Devis Estimatif des Travaux de Construction et d'Aménagement
(systeme gravitaire 1/5)

US$ 1.0 = DH 8.6 = Y 100 (Jan. 1996)

Work items	Unit	Q'ty	FC portion		LC portion		Total equivalent (DH)
			Unit (US$)	Amount (US$)	Unit (DH)	Amount (DH)	
Construction of facilities							
mobilization & preparatory works, approx. 3 % of total construction & rehabilitation costs excluding T.V.A	LS	-	-	140956	-	251049	1463269
< Ain Defali >							
(1) Well site facilities							
well pump and motor, BS-MF Type, 11.0 kw head 48 m, 80 mm dia., 5-stage, 0.69 m3/min. w/accessaries	set	3	29520	88560	28208	84624	846240
connection tank, RC ,50 m3	set	1	14202	14202	41040	41040	163177
connection pump, SV-JA Type, 15.0 kw 1.38 m3/min. * 35 m w/accessaries	set	2	30240	60480	28896	57792	577920
strainer	set	3	450	1350	430	1290	12900
frange and valve	set	3	450	1350	430	1290	12900
control panel and cable	set	3	2700	8100	2580	7740	77400
galvanized steel pipe, 150 mm dia.,feeder main	m	760	35	26600	38	28880	257640
galvanized steel pipe, 125 mm dia., feeder main	m	530	32	16960	34	18020	163876
water level sensor	set	3	1100	3300	860	2580	30960
fittings, 10 % of feeder main	LS	-	-	4356	-	4690	42152
civil and installation works, 25 % of above	LS	-	-	56315	-	61987	546291
miscellaneous works, 5 % of above	LS	-	-	14079	-	15497	136573
(2) Main distribution tank							
main distribution tank , R.C, 600 m3	set	1	120000	120000	346400	346400	1378400
(3) Distribution pipe (supply, install., and joints)							
distribution pipe, galvanized steel, 200 mm	lin.m	600	40	24000	42	25200	231600
distribution pipe, galvanized steel, 150 mm	lin.m	1500	35	52500	37	55500	507000
distribution pipe, galvanized steel, 125 mm	lin.m	4700	32	150400	34	159800	1453240
distribution pipe, galvanized steel, 100 mm	lin.m	13600	28	380800	30	408000	3683880
distribution pipe, galvanized steel, 89 mm	lin.m	11750	25	293750	26	305500	2831750
distribution pipe, galvanized steel, 75 mm	lin.m	12530	22	275660	20	250600	2621276
fittings, 30 % of above	LS	-	-	353133	-	361380	3398324

Tableau 3.6.7 Devis Estimatif des Travaux de Construction et d'Aménagement
(systeme gravitaire, 2/5)

US$ 1.0 = DH 8.6 = Y 100 (Jan. 1996)

Work items	Unit	Q'ty	FC portion		LC portion		Total equivalent (DH)
			Unit (US$)	Amount (US$)	Unit (DH)	Amount (DH)	
(4) Distribution tank							
distribution tank, R.C, V= 600 m3	set	1	120000	120000	346400	346400	1378400
distribution tank, R.C, V= 400 m3	set	1	84000	84000	242480	242480	964880
distribution tank, R.C, V= 100 m3	set	6	26000	156000	75240	451440	1793040
(5) Stand pipe							
stand pipe, R.C, 42 m2/place	place	25	10500	262500	30000	750000	3007500
(6) Testing and disinfection							
testing and disinfection	LS	-	-	2700	-	2580	25800
(7) Related facilities							
extension of electric cable	km	15	4180	62700	12000	180000	719220
permanent access road, W=4 m, asphalt	km	3	54500	163500	156000	468000	1874100
sub total of Ain Defali				2797294		4678709	28735439
< Teroual >							
(1) Well site facilities							
well pump and motor, BS-MF Type, 5.5 kw head 46 m, 65 mm dia., 10-stage, 0.33 m3/min. w/accessaries	set	2	23040	46080	22010	44020	440308
connection tank, R.C 25 m3	set	1	7101	7101	20520	20520	81589
connection pump, MV-JA Type, 45 kw 185 m * 65 mm , 0.66 m3/min.	set	2	48960	97920	46800	93600	935712
strainer	set	2	450	900	430	860	8600
galvanized steel pipe, 125 mm dia., feeder main	m	630	32	20160	34	21420	194796
galvanized steel pipe, 75 mm dia., feeder main	m	230	22	5060	20	4600	48116
frange and valve	set	2	450	900	430	860	8600
control panel and cable	set	2	2700	5400	2580	5160	51600
water level sensor	set	2	1100	2200	860	1720	20640

Tableau 3.6.7 Devis Estimatif des Travaux de Construction et d'Aménagement
(systeme gravitaire, 3/5)

US$ 1.0 = DH 8.6 = Y 100 (Jan. 1996)

Work items	Unit	Q'ty	FC portion		LC portion		Total equivalent
			Unit (US$)	Amount (US$)	Unit (DH)	Amount (DH)	(DH)
fittiags, 10 % of feeder main	LS	-	-	2522	-	2602	24291
civil & install. works, 25 % of above	LS	-	-	47061	-	48841	453563
miscellaneous works, 5 % of above	LS	-	-	11765	-	12210	113391
(2) Main distribution tank							
main distribution tank , R.C. 280 m3	set	1	60000	60000	170000	170000	686000
(3) Distribution pipe (supply, install., and joints)							
distribution pipe, galvanized steel, 125 mm	lin.m	500	32	16000	34	17000	154600
distribution pipe, galvanized steel, 100 mm	lin.m	250	28	7000	30	7500	67700
distribution pipe, galvanized steel, 89 mm	lin.m	11300	25	282500	26	293800	2723300
fittings, 30 % of above	LS	-	-	91650	-	95490	883680
(4) Distribution tank							
distribution tank , R.C, 280 m3	set	1	60000	60000	170000	170000	686000
distribution tank , R.C, 140 m3	set	2	36000	72000	105000	210000	829200
(5) Stand pipe							
stand pipe, R.C, 42 m2/place	place	9	10500	94500	30000	270000	1082700
(6) Testing and disinfection							
testing and disinfection	LS	-	-	2700	-	2580	25800
(7) Related facilities							
extension of electric cable	km	20	4180	83600	12000	240000	958960
permanent access road	km	0.5	54500	27250	156000	78000	312350
sub total of Trouat				1044269		1810783	10791495
< Ain Berda >							
(1) Well site facilities							
well pump and motor, BS-MF Type, 5.5 kw head 65 m, 50 mm dia., 10-stage, 0.18 m3/min.	set	2	22680	45360	21672	43344	433440
frange and valve	set	2	450	900	430	860	8600
control panel and cable	set	2	2700	5400	2580	5160	51600
galvanized steel pipe, 100 mm dia. feeder main	m	230	28	6440	30	6900	62284
galvanized steel pipe, 75 mm dia. feeder main	m	430	22	9460	20	8600	89956

Tableau 3.6.7 Devis Estimatif des Travaux de Construction et d'Aménagement (systeme gravitaire, 4/5)

US$ 1.0 = DH 8.6 = Y 100 (Jan. 1996)

Work items	Unit	Q'ty	FC portion		LC portion		Total equivalent
			Unit (US$)	Amount (US$)	Unit (DH)	Amount (DH)	(DH)
water level sensor	set	2	1100	2200	860	1720	20640
fittings, 10 % of discharge & feeder main	LS	-	-	1590	-	1550	15224
civil & install., works, 25 % of above	LS	-	-	17838	-	17034	170436
miscellaneous works, 5 % of above	LS	-	-	4459	-	4258	42609
(2) Main distribution tank							
main distribution tank , R.C, 120 m3	set	1	31560	31560	91200	91200	362616
(3) Distribution pipe (supply, install., and joints)							
distribution pipe, galvanized steel, 75 mm	lin.m	900	22	19800	20	18000	188280
distribution pipe, galvanized steel, 64 mm	lin.m	1300	20		18		
distribution pipe, galvanized steel, 50 mm	lin.m	4800	17	81600	16	76800	778560
distribution pipe, galvanized steel, 25 mm	lin.m	4100	12	49200	10	41000	464120
fittings, 30 % of pipe	LS	-	-	45180	-	40740	429288
(4) Distribution tank							
distribution tank, R.C, V= 120 m3	set	1	31200	31200	90300	90300	358620
distribution tank, R.C, V= 30 m3	set	1	7890	7890	22800	22800	90654
distribution tank, R.C, V= 10 m3	set	1	2630	2630	7600	7600	30218
(6) Stand pipe							
stand pipe, R.C, 42 m2/place	place	4	10500	42000	30000	120000	481200
(7) Testing & disinfection							
testing and disinfection	LS	-	-	2700	-	2580	25800
(8) Related facilities							
extension of electric cable	km	2	4180	8360	12000	24000	95896
permanent access road	km	5	54500	272500	156000	780000	3123500
sub total, Ain Berda				688267		1404446	7323541
Total of A (Ain Defali +Troual + Ain Bera)				4529830		7893938	46850475

Tableau 3.6.7 Devis Estimatif des Travaux de Construction et d'Aménagement
(systeme gravitaire, 5/5)

US$ 1.0 = DH 8.6 = Y 100 (Jan. 1996)

Work items	Unit	Q'ty	FC portion		LC portion		Total equivalent
			Unit (US$)	Amount (US$)	Unit (DH)	Amount (DH)	(DH)
Rehabilitation of facilities							
< Ain Defali >							
Dug hole	place	7	2100	14700	5700	39900	166320
Spring	place	19	3100	58900	8750	166250	672790
sub total				73600		206150	839110
< Teroual >							
Dug hole	place	1	2100	2100	5700	5700	23760
Spring	place	23	3100	71300	8750	201250	814430
sub total				73400		206950	838190
< Ain Berda >							
Spring	place	7	3100	21700	8750	61250	247870
sub total				21700		61250	247870
Total for rehabilitation				168700		474350	1925170
Total of construction and rehabilitation				4698530		8368288	48775645
Total of construction and rehabilitation including mobilization and temporary works				4839486		8619336	50238914
Value Added Tax (VAT) 14.0 %				0		7033448	7033448
Grand Total				4839486		15652784	57272362

Tableau 3.6.8 La Répartition Annuelle des Investissements
(systeme gravitaire)

Unit : 1000
US$ 1.0 = DH 8.6 = Y 100.0

No.	Cost items	Total		19 96		19 97		19 98	
		FC (US$)	LC (DH)	F.C (US$)	LC (DH)	FC (US$)	LC (DH)	FC (US$)	LC (DH)
1	Direct construction cost <1	4839	15653	0	0	2420	7827	2420	7827
2	Land acquisition & compensation costs <2	0	0	0	0	0	0	0	0
3	Administration expenses <3	0	5727	0	1145	0	2863	0	1718
4	Engineering srvices expenses <4	932	3436	280	1031	466	1718	186	687
	Total as base cost	5771	24816	280	2176	2886	12408	2606	10232
5	Price contingency <5	411	3618	8	131	170	1534	233	1954
6	Physical contingency <6	927	4265	43	346	458	2091	426	1828
	Project cost	7110	32700	331	2653	3514	16033	3265	14014

Note <1 : Including Value Added Tax of 14.0 % in local currency portion
<2 : No account, the land owned by each commune
<3 : 10 % of total direct construction cost
<4 : 20 % of total direct construction cost for basic design, detailed design and construction supervision, and 70 % for FC and 30 % for LC
<5 : 2.9 % and 6.0 % p.a. for foreign and local currency portion respectively
<6 : 15 % of base cost with price contingency

Tableau 3.6.10 Devis Estimatif des Travaux de Construction et d'Aménagement (systeme gravitaire et pression, 1/5)

US$ 1.0 = DH 8.6 = Y 100 (Jan. 1996)

Work items	Unit	Q'ty	FC portion Unit (US$)	FC portion Amount (US$)	LC portion Unit (DH)	LC portion Amount (DH)	Total equivalent (DH)
Construction of facilities							
mobilization & preparatory works, approx. 3 % of total construction & rehabilitation costs excluding T.V.A	LS	-	-	186448	-	310696	1914148
< Ain Defali >							
(1) Well site facilities							
well pump and motor, BS-MF Type, 11.0 kw head 48 m, 80 mm dia., 5-stage, 0.69 m3/min. w/accessaries	set	3	29520	88560	28208	84624	846240
connection tank, RC ,50 m3	set	1	14202	14202	41040	41040	163177
connection pump, SV-JA Type, 15.0 kw 1.38 m3/min. * 35 m w/accessaries	set	2	30240	60480	28896	57792	577920
strainer	set	3	450	1350	430	1290	12900
frange and valve	set	3	450	1350	430	1290	12900
control panel and cable	set	3	2700	8100	2580	7740	77400
galvanized steel pipe, 150 mm dia.,feeder main	m	760	35	26600	38	28880	257640
galvanized steel pipe, 125 mm dia., feeder main	m	530	32	16960	34	18020	163876
water level sensor	set	3	1100	3300	860	2580	30960
fittings, 10 % of feeder main	LS	-	-	4356	-	4690	42152
civil and installation works, 25 % of above	LS	-	-	56315	-	61987	546291
miscellaneous works, 5 % of above	LS	-	-	14079	-	15497	136573
(2) Main distribution tank							
main distribution tank , R.C, 600 m3	set	1	120000	120000	346400	346400	1378400
(3) Distribution pipe (supply, install., and joints)							
distribution pipe, galvanized steel, 200 mm	lin.m	600	40	24000	42	25200	231600
distribution pipe, galvanized steel, 150 mm	lin.m	1500	35	52500	37	55500	507000
distribution pipe, galvanized steel, 125 mm	lin.m	5500	32	176000	34	187000	1700600
distribution pipe, galvanized steel, 100 mm	lin.m	21400	28	599200	30	642000	5795120
distribution pipe, galvanized steel, 89 mm	lin.m	18050	25	451250	26	469300	4350050
distribution pipe, galvanized steel, 75 mm	lin.m	12530	22	275660	20	250600	2621276
fittings, 30 % of above	LS	-	-	473583	-	488880	4561694

Tableau 3.6.10 Devis Estimatif des Travaux de Construction et d'Aménagement
(systeme gravitaire et pression, 2/5)

US$ 1.0 = DH 8.6 = Y 100 (Jan. 1996)

Work items	Unit	Q'ty	FC portion Unit (US$)	FC portion Amount (US$)	LC portion Unit (DH)	LC portion Amount (DH)	Total equivalent (DH)
(4) Distribution tank							
distribution tank, R.C, V= 600 m3	set	1	120000	120000	346400	346400	1378400
distribution tank, R.C, V= 400 m3	set	1	84000	84000	242480	242480	964880
distribution tank, R.C, V= 100 m3	set	8	26000	208000	75240	601920	2390720
(5) Stand pipe							
stand pipe, R.C, 42 m2/place	place	30	10500	315000	30000	900000	3600000
(6) pumping facilities							
distribution pump, h=100 m, Q=3.8 l/s, 18.5 kw including ancillaries and installation cost	set	4	54400	217600	52000	208000	2079360
distribution pump, h=13 m, Q=1.9 l/s, 1.5 kw including ancillaries and installation cost	set	2	3500	7000	3450	6900	67100
(7) Testing and disinfection							
testing and disinfection	LS	-	-	2700	-	2580	25800
(8) Related facilities							
extension of electric cable	km	15	4180	62700	12000	180000	719220
permanent access road, W=4 m, asphalt	km	3	54500	163500	156000	468000	1874400
sub total of Ain Defali				3648344		5746589	37122349
< Teroual >							
(1) Well site facilities							
well pump and motor, BS-MF Type, 5.5 kw head 46 m, 65 mm dia., 10-stage, 0.33 m3/min. w/accessaries	set	2	23040	46080	22010	44020	440308
connection tank, R.C 25 m3	set	1	7101	7101	20520	20520	81589
connection pump, MV-JA Type, 45 kw 185 m * 65 mm , 0.66 m3/min.	set	2	48960	97920	46800	93600	935712
strainer	set	2	450	900	430	860	8600
galvanized steel pipe, 125 mm dia , feeder main	m	630	32	20160	34	21420	194796
galvanized steel pipe, 75 mm dia , feeder main	m	230	22	5060	20	4600	48116
frange and valve	set	2	450	900	430	860	8600
control panel and cable	set	2	2700	5400	2580	5160	51600
water level sensor	set	2	1100	2200	860	1720	20640

Tableau 3.6.10 Devis Estimatif des Travaux de Construction et d'Aménagement
(systeme gravitaire et pression, 3/5)

US$ 1.0 = DH 8.6 = Y 100 (Jan. 1996)

Work items	Unit	Q'ty	FC portion Unit (US$)	FC portion Amount (US$)	LC portion Unit (DH)	LC portion Amount (DH)	Total equivalent (DH)
fittings, 10 % of feeder main	LS	-	-	2522	-	2602	24291
civil & install. works, 25 % of above	LS	-	-	47061	-	48841	453563
miscellaneous works, 5 % of above	LS	-	-	11765	-	12210	113391
(2) Main distribution tank							
main distribution tank , R.C. 280 m3	set	1	60000	60000	170000	170000	686000
(3) Distribution pipe (supply, install., and joints)							
distribution pipe, galvanized steel, 125 mm	lin.m	500	32	16000	34	17000	154600
distribution pipe, galvanized steel, 100 mm	lin.m	250	28	7000	30	7500	67700
distribution pipe, galvanized steel, 89 mm	lin.m	20000	25	500000	26	520000	4820000
fittings, 30 % of above	LS	-	-	156900	-	163350	1512690
(4) Distribution tank							
distribution tank , R.C. 280 m3	set	1	60000	60000	170000	170000	686000
distribution tank , R.C. 140 m3	set	4	36000	144000	105000	420000	1658400
(5) Stand pipe							
stand pipe, R.C, 42 m2/place	place	15	10500	157500	30000	450000	1804500
(6) distribution pump							
distribution pump, h=130 m, Q=2.7 l/s, 30 kw including ancillaries and installaton	set	4	51400	205600	49000	196000	1964160
distribution pump, h=70 m, Q=2.7 l/s, 7.5 kw including ancillaries and installaton	set	2	10500	21000	10080	20160	200760
distribution pump, h=60 m, Q=2.7 l/s, 7.5 kw including ancillaries and installaton	set	2	10500	21000	10080	20160	200760
(7) Testing and disinfection							
testing and disinfection	LS	-	-	2700	-	2580	25800
(8) Related facilities							
extension of electric cable	km	20	4180	83600	12000	240000	958960
permanent access road	km	0.5	54500	27250	156000	78000	312350
sub total of Troval				1709619		2731163	17433885

Tableau 3.6.10 Devis Estimatif des Travaux de Construction et d'Aménagement
(systeme gravitaire et pression, 4/5)

US$ 1.0 = DH 8.6 = Y 100 (Jan., 1996)

Work items	Unit	Q'ty	FC portion Unit (US$)	FC portion Amount (US$)	LC portion Unit (DH)	LC portion Amount (DH)	Total equivalent (DH)
< Ain Berda >							
(1) Well site facilities							
well pump and motor, BS-MF Type, 5.5 kw head 65 m, 50 mm dia., 10-stage, 0.18 m3/min.	set	2	22680	45360	21672	43344	433440
frange and valve	set	2	450	900	430	860	8600
control panel and cable	set	2	2700	5400	2580	5160	51600
galvanized steel pipe, 100 mm dia. feeder main	m	230	28	6440	30	6900	62284
galvanized steel pipe, 75 mm dia. feeder main	m	430	22	9460	20	8600	89956
water level sensor	set	2	1100	2200	860	1720	20640
fittings, 10 % of discharge & feeder main	LS	-	-	1590	-	1550	15224
civil & install., works, 25 % of above	LS	-	-	17838	-	17034	170436
miscellaneous works, 5 % of above	LS	-	-	4459	-	4258	42609
(2) Main distribution tank							
main distribution tank , R.C, 120 m3	set	1	31560	31560	91200	91200	362616
(3) Distribution pipe (supply, install., and joints)							
distribution pipe, galvanized steel, 75 mm	lin.m	900	22	19800	20	18000	188280
distribution pipe, galvanized steel, 64 mm	lin.m	1300	20		18		
distribution pipe, galvanized steel, 50 mm	lin.m	4800	17	81600	16	76800	778560
distribution pipe, galvanized steel, 25 mm	lin.m	4100	12	49200	10	41000	464120
fittings, 30 % of pipe	LS	-	-	45180	-	40740	429288
(4) Distribution tank							
distribution tank, R.C, V= 120 m3	set	1	31200	31200	90300	90300	358620
distribution tank, R.C, V= 30 m3	set	1	7890	7890	22800	22800	90654
distribution tank, R.C, V= 10 m3	set	1	2630	2630	7600	7600	30218
(6) Stand pipe							
stand pipe, R.C, 42 m2/place	place	4	10500	42000	30000	120000	481200
(7) Testing & disinfection							
testing and disinfection	LS	-	-	2700	-	2580	25800

Tableau 3.6.10 Devis Estimatif des Travaux de Construction et d'Aménagement
(systeme gravitaire et pression, 5/5)

US$ 1.0 = DH 8.6 = Y 100 (Jan. 1996)

Work items	Unit	Q'ty	FC portion		LC portion		Total equivalent
			Unit (US$)	Amount (US$)	Unit (DH)	Amount (DH)	(DH)
(8) Related facilities							
extension of electric cable	km	2	4180	8360	12000	24000	95896
permanent access road	km	5	54500	272500	156000	780000	3123500
sub total, Ain Berda				688267		1404446	7323541
Total of A (Ain Defali +Troual + Ain Bera)				6046230		9882198	61879775
Rehabilitation of facilities							
< Ain Defali >							
Dug hole	place	7	2100	14700	5700	39900	166320
Spring	place	19	3100	58900	8750	166250	672790
sub total				73600		206150	839110
< Teroual >							
Dug hole	place	1	2100	2100	5700	5700	23760
Spring	place	23	3100	71300	8750	201250	814430
sub total				73400		206950	838190
< Ain Berda >							
Spring	place	7	3100	21700	8750	61250	247870
sub total				21700		61250	247870
Total for rehabilitation				168700		474350	1925170
Total of construction and rehabilitation				6214930		10356548	63804945
Total of construction and rehabilitation including mobilization and temporary works				6401378		10667244	65719093
Value Added Tax (VAT) 14.0 %				0		9200673	9200673
Grand Total				6401378		19867917	74919767

Tableau 3.6.11 Programme de Déboursement (systeme gravitaire et pression)

Unit : 1000
US$ 1.0 = DH 8.6 = Y 100.0

Cost items	Total		19 96		19 97		19 98	
	F.C (US$)	L.C (DH)	F.C (US$)	L.C (DH)	F.C (US$)	L.C (DH)	F.C (US$)	L.C (DH)
Direct construction cost <1	6401	19276	0	0	3201	9638	3201	9638
Land acquisition & compensation costs <2	0	0	0	0	0	0	0	0
Administration expenses <3	0	7432	0	1486	0	3716	0	2230
Engineering srvices expenses <4	1210	4459	363	1338	605	2230	242	892
Total as base cost	7611	31168	363	2824	3805	15584	3442	12760
Price contingency <5	542	4533	11	169	224	1926	308	2437
Physical contingency <6	1223	5355	56	449	604	2627	563	2280
Project cost	9376	41056	430	3443	4634	20137	4313	17476

Note <1 : Including Value Added Tax of 14.0 % in local currency portion
<2 : No account, the land owned by each commune
<3 : 10 % of total direct construction cost
<4 : 20 % of total direct construction cost for basic design, detailed design and construction supervision, and 70 % for F.C and 30 % for L.C
<5 : 2.9 % and 6.0 % p.a. for foreign and local currency portion respectively
<6 : 15 % of total cost including price contingency

Tableau 3.6.12 Frais Annuels d'Exploitation pour Systèmes d'Alimentation par Zones Modèles
(systeme gravitaire)

Model area	Cost items	Facilities	Unit	Q'ty	Unit cost (DH)	Amount (DH)	Total Annual Operation cost (DH)
Ain Defali	Electric charge	1) well pump, 11 kw*3 sets	kwh	114048	0.8	91238	
		2) connection pump, 15kw * 2	kwh	103680	0.8	82944	
	Operator charge		m/m	12	4000	48000	
	Total						222182
Teroual	Electric charge	1) well pump, 5.5kw*2 sets	kwh	38016	0.8	30413	
		2) connection pump, 45 kw * 2	kwh	311040	0.8	248832	
	Operator charge		m/m	24	4000	96000	
	Total						375245
Ain Berda	Electric charge	1) well pump, 5.5kw*2 sets	kwh	38016	0.8	30413	
	Operator charge		m/m	12	4000	48000	
	Total						78413
	Total, 3 model areas						675840

Conditions 1) operate by 80 % of rated output
2) anuual operation hour is 4320 hour / unit (12 hr/day * 30 d/m * 12 m/y)

Tableau 3.6.13 Frais Annuels d'Entretien pour Systèmes d'Alimentation par Zones Modèles
(systeme gravitaire)

Model Area	Facilities	Unit	Q'ty	Investment Cost	Annual Maintenance Cost		Total Annual Maintenance Cost
					Ratio to Investment Cost	Cost	
				(DH)	(%)	(DH/Year)	(DH/Year)
Ain Defali	New constructed facilities						
	01) well	set	3	900000	2.5	22500	
	02) equipment for well	set	5	1424160	3.0	42725	
	03) main feeder pipe	m	1290	421516	0.5	2108	
	04) fittings & valves for 2) & 3)	LS		12900	1.0	129	
	05) main distribution tank	set	1	1378400	0.5	6892	
	06) distribution pipe and fittings	m	44880	11327746	0.5	56639	
	07) fittings for above 6)	LS		3398324	1.0	33983	
	08) distribution pump	unit	0	0	3.0	0	
	09) distribution tank	set	8	4136320	0.5	20682	
	10) stand pipe	place	25	3007500	0.5	15038	
	11) electric line	km	15	719220	1.0	7192	
	12) access road	km	3	1874100	3.0	56223	
	sub total						264110
	Rehabilitated facilities						
	13) dug hole	place	7	166320	1.0	1663	
	14) spring	place	19	672790	1.0	6728	
	sub total						8391
	total , Ain Defali						272501
Teroual	New constructed facilities						
	01) well	set	2	600000	2.5	15000	
	02) equipment for well	set	4	1376020	3.0	41281	
	03) main feeder pipe	m	860	242912	0.5	1215	
	04) fittings & valves for 2) & 3)	LS		8600	1.0	86	
	05) main distribution tank	set	1	686000	0.5	3430	
	06) distribution pipe	m	12050	3499900	0.5	17500	
	07) fittings for above 6)	LS		1049970	1.0	10500	
	08) distribution pump	unit	0	0	3.0	0	
	09) distribution tank	set	3	1515200	0.5	7576	
	10) stand pipe	place	9	1082700	0.5	5414	
	11) electric line	km	20	958960	1.0	9590	
	12) access road	km	0.5	312350	3.0	9371	
	sub total						120960
	Rehabilitated facilities						
	13) dug hole	place	1	23760	1.0	238	
	14) spring	place	23	814430	1.0	8144	
	sub total						8382
	total, Teroual						129342
Ain Berda	01) well	set	2	600000	2.5	15000	
	02) equipment for well	set	2	433440	3.0	13003	
	03) main feeder pipe	m	660	152240	0.5	761	
	04) fittings & valves for 2) & 3)	LS		23824	1.0	238	
	05) main distribution tank	set	1	362616	0.5	1813	
	06) distribution pipe	m	11100	1430960	0.5	7155	
	07) fittings for above 6)	LS		429288	1.0	4293	
	08) distribution pump	unit	0	0	3.0	0	
	09) distribution tank	set	3	479492	0.5	2397	
	10) stand pipe	place	4	481200	0.5	2406	
	11) electric line	km	2	95896	1.0	959	
	12) access road	km	5	3123500	3.0	93705	
	sub total						141731
	rehabilitated facilities						
	13) spring	place	7	247870	1.0	2479	
	sub total						2479
	total Ain Berda						144210
	Total for 3 model areas						546052

Tableau 3.6.14 Frais Annuels d'Exploitation pour Systèmes d'Alimentation par Zones Modèles (systeme gravitaire et pression)

Model area	Cost items	Facilities	Unit	Q'ty	Unit cost (DH)	Amount (DH)	Total Annual Operation cost (DH)
Ain Defali	Electric charge	1) well pump. 11 kw*3 sets	kwh	114048	0.8	91238	
		2) connection pump. 15kw * 2	kwh	103680	0.8	82944	
		3) distribution pump. 18.5 kw * 4	kwh	255744	0.8	204595.2	
		4) distribution pump. 1.5 kw * 2	kwh	10368	0.8	8294.4	
	Operator charge		m/m	12	4000	48000	
	Total						435072
Teroual	Electric charge	1) well pump. 5.5kw*2 sets	kwh	38016	0.8	30413	
		2) connection pump. 45 kw * 2	kwh	311040	0.8	248832	
		3) distribution pump. 30 kw * 4	kwh	414720	0.8	331776	
		4) distribution pump. 7.5 kw * 4	kwh	103680	0.8	82944	
	Operator charge		m/m	24	4000	96000	
	Total						789965
Ain Berda	Electric charge	1) well pump. 5.5kw*2 sets	kwh	38016	0.8	30413	
	Operator charge		m/m	12	4000	48000	
	Total						78413
	Total. 3 model areas						1303450

Conditions 1) operate by 80 % of rated output
2) anouat operation hour is 4320 hour / unit (12 hr/day * 30 d/m * 12 m/y)

Tableau 3.6.15 Frais Annuels d'Entretien pour Systèmes d'Alimentation par Zones Modèles
(systeme gravitaire et pression)

Model Area	Facilities	Unit	Q'ty	Investment Cost	Annual Maintenance Cost		Total Annual Maintenance Cost
					Ratio to Investment Cost	Cost	
				(DH)	(%)	(DH/Year)	(DH/Year)
Ain Defali	New constructed facilities						
	01) well	set	3	900000	2.5	22500	
	02) equipment for well	set	5	1424160	3.0	42725	
	03) main feeder pipe	m	1290	421516	0.5	2108	
	04) fittings & valves for 2) & 3)	LS		12900	1.0	129	
	05) main distribution tank	set	1	1378400	0.5	6892	
	06) distribution pipe and fittings	m	59780	15205646	0.5	76028	
	07) fittings for above 6)	LS		3398324	1.0	33983	
	08) distribution pump	unit	6	2146460	3.0	64394	
	09) distribution tank	set	10	4734000	0.5	23670	
	10) stand pipe	place	30	3609000	0.5	18045	
	11) electric line	km	15	719220	1.0	7192	
	12) access road	km	3	1874100	3.0	56223	
	sub total						353889
	Rehabilitated facilities						
	13) dug hole	place	7	166320	1.0	1663	
	14) spring	place	19	672790	1.0	6728	
	sub total						8391
	total , Ain Defali						362280
Teroual	New constructed facilities						
	01) well	set	2	600000	2.5	15000	
	02) equipment for well	set	4	1376020	3.0	41281	
	03) main feeder pipe	m	860	242912	0.5	1215	
	04) fittings & valves for 2) & 3)	LS		8600	1.0	86	
	05) main distribution tank	set	1	686000	0.5	3430	
	06) distribution pipe	m	20750	5042300	0.5	25212	
	07) fittings for above 6)	LS		1512690	1.0	15127	
	08) distribution pump	unit	8	2365680	3.0	70970	
	09) distribution tank	set	5	2344400	0.5	11722	
	10) stand pipe	place	15	1804500	0.5	9023	
	11) electric line	km	20	958960	1.0	9590	
	12) access road	km	0.5	312350	3.0	9371	
	sub total						212025
	Rehabilitated facilities						
	13) dug hole	place	1	23760	1.0	238	
	14) spring	place	23	814430	1.0	8144	
	sub total						8382
	total, Teroual						220406
Ain Berda	01) well	set	2	600000	2.5	15000	
	02) equipment for well	set	2	433440	3.0	13003	
	03) main feeder pipe	m	660	152240	0.5	761	
	04) fittings & valves for 2) & 3)	LS		23824	1.0	238	
	05) main distribution tank	set	1	362616	0.5	1813	
	06) distribution pipe	m	11100	1430960	0.5	7155	
	07) fittings for above 6)	LS		429288	1.0	4293	
	08) distribution pump	unit	0	0	3.0	0	
	09) distribution tank	set	3	479492	0.5	2397	
	10) stand pipe	place	4	481200	0.5	2406	
	11) electric line	km	2	95896	1.0	959	
	12) access road	km	5	3123500	3.0	93705	
	sub total						141731
	rehabilitated facilities						
	13) spring	place	7	247870	1.0	2479	
	sub total						2479
	total Ain Berda						144210
	Total for 3 model areas						726896

Tableau 3.7.1 Les Principales Composantes des Systèmes d'AEP Proposés (systeme gravitaire)

Facilities		Features
< Ain Defali >		
(1)	Intake Well	3 - deepwells with 250 mm dia. and 30 m depth at GL 150 m
(2)	Water Extraction	3 sets of submersible pumps and electric motors of 11 kw each.power from public line carrier upon extension
(3)	Connection tank/pump	1 set RC tank of 50 m3 capacity and 2 sets of pumps of 15 kw each.
(4)	Transmission & Distribution Tank	Galvanized steel pipe of 125 and 150 mm dia. with 1290 m in total length, RC main distribution tank of 600 m^3 in storage capacity at GL 170 m.
(5)	Distribution	Galvanized steel pipes of 75-200 mm dia. with 45 km in total length, 8 sets of distribution tank and 25units of stand pipes of reinforced concrete.
(6)	Related Facilities	Extension of electric power cable of 15 km and permanent access road of 3.0 km
< Teroual >		
(1)	Intake Well	2 - deepwells with 250 mm dia and 30 m depth at GL330 m
(2)	Water Extraction	2 sets of submersible pumps and electric motors of 5.5 kw each.power from public line carrier upon extension
(3)	Connection tank/pump	1 set RC tank of 25 m3, and 2 sets of pump with 45 kw each
(4)	Transmission & Distribution Tank	Galvanized steel pipe of 75 and 125mm dia. with 860 m in total length, main distribution tank of 280 m^3 storage capacity of reinforced concrete at GL 500 m
(5)	Distribution	Galvanized steel pipes of 89, 100 and125 mm dia. with 12 km in total length, 3 sets of distribution tank and 9 units of stand pipes of reinforced concrete.
(6)	Related Facilities	Extension of electric power cable of 20 km and permanent access road of 0.5 km
<Ain Berda>		
(1)	Intake Well	2 - deepwells with 250 mm dia. and 30 m depth at GL 810 m
(2)	Water Extraction	2 sets of submersible pumps and electric motors of 5.5 kw each. power from public line carrier upon extension
(3)	Transmission & Distribution Tank	Galvanized steel pipe of 75 and 100 mm dia. with 660 m in total length, main distribution tank of 120 m^3 storage capacity of reinforced concrete at GL 830 m
(4)	Distribution	Galvanized steel pipe of 25, 50, 64, and 75 mm dia. with 11 km in total length, 3 sets. of distribution tank and 4 units of stand pipes of reinforced concrete.
(5)	Related Facilities	Extension of electric power cable of 2.0 km and permanent access road of 5.0 km

Tableau 3.7.2 L'Avant-métrés des Travaux de Construction des Systèmes d'Alimentation en Eau Potable (1/2)
(systeme gravitaire)

Construction Work Items	Unit	Quantity
A. Construction of facilities		
(1) Mobilization and preparatory works	-	LS
< Ain Defali >		
(2) Well site facilities		
1) well pump, 80 mm dia., 11 kw, head 48 m, 0.69 m3/min.	set	3
2) flange and valve	set	3
3) control panel	set	3
4) connection tank, RC 50 m3	set	1
5) connection pump, 15 kw, 1.38 m3/min., 35 m	set	2
6) galvanized steel pipe, 125 and 150 mm dia.	m	1290
(3) Main distribution tank		
1) main distribution tank, RC 600 m3	set	1
2) water level sensor	set	3
(4) Distribution network		
1) galvanized steel pipe, 75, 89, 100, 125, 150 and 200 mm	km	45
2) distribution tank, RC 100, 400 and 600 m3	set	8
6) stand pipe	place	25
(5) Related facilities		
1) electric cable extension from existing power line	km	15.0
2) permanent access road	km	3.0
< Teroual >		
(6) Well site facilities		
1) well pump, 60 mm dia., 5.5 kw, head 46 m, 0.33 m3/min.	set	2
2) flange and valve	set	2
3) control panel	set	2
4) connection tank, RC 25 m3	set	1
5) connection pump, 45 kw, 185 m * 65 mm dia., 0.66 m3/min.	set	2
6) galvanized steel pipe, 75 and 125 mm dia.	m	860
(7) Main distribution tank		
1) main distribution tank, RC 280 m3	set	1
2) water level sensor	set	2
(8) Distribution network		
1) galvanized steel pipe, 89, 100 and 125 mm	km	12
2) distribution tank, 140 and 280 m3	set	3
3) stand pipes	place	9

Tableau 3.7.2 L'Avant-métrés des Travaux de Construction des Systèmes d'Alimentation en Eau Potable (2/2) (systeme gravitaire)

Construction Work Items	Unit	Quantity
(9) Related facilities		
1) electric cable extension from existing power line	km	20.0
2) permanent access road	km	0.5
< Ain Berda >		
(10) Well site facilities		
1) well pump, 50 mm dia., 5.5 kw, head 65 m, 0.18 m3/min.	set	2
2) flange and valve	set	2
3) control panel	set	2
4) galvanized steel pipe, 75 and 100 mm dia.	m	660
(11) Main distribution tank		
1) main distribution tank, RC 120 m3	set	1
2) water level sensor	set	2
(12) Distribution network		
1) galvanized steel pipe, 25, 50, 64 and 75 mm	km	11
2) distribution tank, 10, 30 and 120 m3	set	3
3) stand pipe	place	4
(13) Related facilities		
1) electric cable extension from existing power line	km	2.0
2) permanent access road	km	5.0
B. Rehabilitation of facilities		
< Ain Defali >		
(1) Dug hole	place	7
(2) Spring	place	19
< Teroual >		
(3) Dug hole	place	1
(4) Spring	place	23
< Ain Berda >		
(5) Spring	place	7

Tableau 3.8.5 TRFI pour la zone Modèle de Aïn Defali
(systeme gravitaire et pression cout direct global)

unt : DH

	Revenue	Capital Cost	O&M Cost	Total Cost	Net Revenue
1995					
96		2,839,828		2,839,828	-2,839,828
97	1,149,577	24,207,700	277,810	24,485,510	-23,335,933
98	2,507,711	22,020,384	588,957	22,609,341	-20,101,630
99	3,037,344	7,333,057	815,434	8,148,491	-5,111,147
2000	3,611,237	7,603,309	1,066,967	8,670,276	-5,059,039
01	3,755,268		1,066,967	1,066,967	2,688,301
02	3,899,299		1,066,967	1,066,967	2,832,332
03	4,043,331		1,066,967	1,066,967	2,976,364
04	4,187,362		1,066,967	1,066,967	3,120,395
05	4,331,393		1,066,967	1,066,967	3,264,426
06	4,486,160		1,066,967	1,066,967	3,419,193
07	4,640,928		1,066,967	1,066,967	3,573,961
08	4,795,695		1,066,967	1,066,967	3,728,728
09	4,950,462		1,066,967	1,066,967	3,883,495
10	5,105,229		1,066,967	1,066,967	4,038,262
11	5,259,997		1,066,967	1,066,967	4,193,030
12	5,414,764		1,066,967	1,066,967	4,347,797
13	5,569,531		1,066,967	1,066,967	4,502,564
14	5,274,299		1,066,967	1,066,967	4,207,332
15	5,879,066		1,066,967	1,066,967	4,812,099
16	6,033,833		1,066,967	1,066,967	4,966,866

FIRR=0.7%

Tableau 3.8.6 TRFI pour la zone Modèle de Aïn Defali (systeme gravitaire et pression cout direct construction seulement)

unit : DH

	Revenue	Capital Cost	O&M Cost	Total Cost	Net Revenue
1995					
96					
97	1,149,577	16,199,745	277,810	16,477,555	-15,327,978
98	2,507,711	16,766,522	588,957	17,355,479	-14,847,768
99	3,037,344	4,871,303	815,434	5,686,737	-2,649,393
2000	3,611,237	5,036,393	1,066,967	6,103,360	-2,492,123
01	3,755,268		1,066,967	1,066,967	2,688,301
02	3,899,299		1,066,967	1,066,967	2,832,332
03	4,043,331		1,066,967	1,066,967	2,976,364
04	4,187,362		1,066,967	1,066,967	3,120,395
05	4,331,393		1,066,967	1,066,967	3,264,426
06	4,486,160		1,066,967	1,066,967	3,419,193
07	4,640,928		1,066,967	1,066,967	3,573,961
08	4,795,695		1,066,967	1,066,967	3,728,728
09	4,950,462		1,066,967	1,066,967	3,883,495
10	5,105,229		1,066,967	1,066,967	4,038,262
11	5,259,997		1,066,967	1,066,967	4,193,030
12	5,414,764		1,066,967	1,066,967	4,347,797
13	5,569,531		1,066,967	1,066,967	4,502,564
14	5,274,299		1,066,967	1,066,967	4,207,332
15	5,879,066		1,066,967	1,066,967	4,812,099
16	6,033,833		1,066,967	1,066,967	4,966,866

FIRR=5.1%

Table 3.8.7 Loan Repayability (Ain Defali, Gravity and Pumping Direct Construction Cost Only)

unit : DH

	Revenue	O&M Cost	External Soft Loan			Domestic (FEC) Loan			Net	Accultation of
			85% of capital cost	Interest	Repayment	15% of capital cost	Interest	Repayment	Revenue	Net Revenue
1995										
96										
97	1,149,577	277,810	13,769,783	413,093		2,429,962	242,996		215,678	215,678
98	2,507,711	588,957	14,251,544	840,640		2,514,978	494,494		583,620	799,298
99	3,037,344	815,434	4,140,608	964,858		730,695	567,564		689,488	1,488,786
2000	3,611,237	1,066,967	4,280,934	1,093,286		755,459		801,700	649,284	2,138,070
01	3,755,268	1,066,967		1,093,286				801,700	793,315	2,931,385
02	3,899,299	1,066,967			2,901,217			801,700	-870,585	2,060,800
03	4,043,331	1,066,967			2,901,217			801,700	-726,553	1,334,247
04	4,187,362	1,066,967			2,901,217			801,700	-582,522	751,725
05	4,331,393	1,066,967			2,901,217			801,700	-438,491	313,234
06	4,486,160	1,066,967			2,901,217			801,700	-283,724	29,510
07	4,640,928	1,066,967			2,901,217			801,700	-128,956	-99,446
08	4,795,695	1,066,967			2,901,217			801,700	25,811	-73,635
09	4,950,462	1,066,967			2,901,217			801,700	180,578	106,943
10	5,105,229	1,066,967			2,901,217			801,700	335,345	442,288
11	5,259,997	1,066,967			2,901,217			801,700	490,113	932,401
12	5,414,764	1,066,967			2,901,217			801,700	644,880	1,577,281
13	5,569,531	1,066,967			2,901,217			801,700	799,647	2,376,928
14	5,274,299	1,066,967			2,901,217			801,700	504,415	2,881,343
15	5,879,066	1,066,967			2,901,217			801,700	1,109,182	3,990,525
16	6,033,833	1,066,967			2,901,217			801,700	1,263,949	5,254,474

Tableau 3.8.10 Le Cash-flow Economique de Aïn Defali

unit : DH

	Benefit	Capital Cost	O&M Cost	Total Cost	Net Revenue
1995					
96		2,720,858		2,720,858	-2,720,858
97	1,125,403	21,826,095	222,525	22,048,620	-20,923,217
98	2,325,009	19,105,236	445,050	19,550,286	-17,225,277
99	2,399,211	6,207,812	581,310	6,789,122	-4,389,911
2000	2,972,086	6,207,812	717,570	6,925,382	-3,953,296
01	3,090,625		717,570	717,570	2,373,055
02	3,209,164		717,570	717,570	2,491,594
03	3,327,703		717,570	717,570	2,610,133
04	3,446,243		717,570	717,570	2,728,673
05	3,564,782		717,570	717,570	2,847,212
06	3,692,157		717,570	717,570	2,974,587
07	3,819,532		717,570	717,570	3,101,962
08	3,946,907		717,570	717,570	3,229,337
09	4,074,282		717,570	717,570	3,356,712
10	4,201,657		717,570	717,570	3,484,087
11	4,329,032		717,570	717,570	3,611,462
12	4,456,408		717,570	717,570	3,738,838
13	4,583,783		717,570	717,570	3,866,213
14	4,711,158		717,570	717,570	3,993,588
15	4,838,533		717,570	717,570	4,120,963
16	4,965,908		717,570	717,570	4,248,338

EIRR=0.6%

Tableau 3.9.1 Localisation et Caractéristiques des Sites d'Echantillonnage por la Qualite de l'Eau (1/2)

Location	No.	Region	Type	Owner's Name	Execution Date	Approximate Coordinates			Period or Epoch	Lithology	Size (m)	Depth (m)	Approx. Flowrate (l / s)	Static Water Level (m) (as of 15/7/95)
						X	Y	Z						
Aïn Defalli	1	El Arba	Dughole (c)	Al Massire	—	487150	444400	110	Quaternary	Alluvium & conglomerate	72	11-75	0-08	11.62
	2	Beni Senana	Dughole (P)	Ayash Riam	1993	485250	444650	155	"	"	1-8	3.91	0.7	3.5
	3	Beni Senana	Spring (c)	Commune	—	485100	444750	180	"	"			0.25 (15-7-95)	
	4	Beni Senana	Dughole (P)	Rayam Abdeslam	1991	484400	444600	170	"	"	1.4	9-35	0.05	9.0
	5	Beni Senana	Dughole (P)	Owni Med.	1980	485100	444850	165	"	"	1-1	11-0	0.05	8.1
	6	Beni Senana	Spring (c)	Commune	—	484600	445500	185	"	"			0.166 (15-7-95)	
	7	Beni Senane	Dughole (P)	Ouezzani Med.	1993	484300	445450	190	"	"	2.0	13.0	0.3	3.6
	8	"	"	"	1986	484500	445650	190	"	"	2.0	23-9	0.5	10.25
	9	"	"	"	1991	484200	445400	190	"	"	2.0	13.0	0.3	3.75
	10	"	"	"	1993	484550	445600	190	"	"	2.0	19.25	0.3	12.76
Teroual	T1	El Jarrarah	Dughole (P)	Ezzehri Mohamed	1985	512950	452760		Quaternary (0 - 1 m) Miocene (1 - 3 m) Oligocene (3 - 6.2 m)	Alluvium deposits Marl & conglomerates Silty marl & siltstone	1.35	6.2	0.08	5.9
	T2	"	"	Hadrouz El Arbi	1993	513000	452750		Ditto	Ditto	1.55	8.3	0.01	7.95

Tableau 3.9.1 Localisation et Caractéristiques des Sites d'Echantillonnage por la Qualite de l'Eau (2/2)

Location	No.	Region	Type	Owner's Name	Execution Date	Approximate Coordinates			Period or Epoch	Lithology	Size (m)	Depth (m)	Approx. Flowrate (l / s)	Static Water Level (m) (as of 15/7/95)
						X	Y	Z						
Teroual	T3	"		Chekri Ahmed	1995	512950	453050		Miocene (0 - 2 m) Oligocene (2 - 13.8 m)	Marl & conglomerates Silty marl & siltstone	1.55	13.8	0.005	13.5
	T4	"	Spring (c)	Commune	—	511500	452600	405	Quaternary Miocene	Alluvium & Marl	—	—	0.73 (15/7/95)	—
J. Berda	AB1	A.Tazrhadra	Spring (c)	Commune	—	547500	447800	550	Cretaceous superior	Marl and Marly limestone	—	—	3.58 (12/7/95)	
	AB2	Aïn Martab	Spring (c)	Commmune	—	548650	446600	590	"	"	—	—	0.405 (15/7/95)	
	AB3	Aïn Berda	Spring (c)	Commune	—	550650	446850	740	"	"	—	—	0.092 (15/7/95)	
	AB4	Aïn Berda	Dughole (c)	A.H.	1983	550850	446950	740	"	"	1.67	15.5	0.005	15.0
	AB5	Aïn Bou Khalfoune	Spring (c)	Commune	—	549850	447500	770	"	"	—	—	0.113	—
	AB6	El Aïn	Dughole (P)	Motasem Med.	1940	550100	446850	765	"	"	1.0 x 1.0 (square)	10-33	0.1	10-28
	AB7	Ras El Koubour	"	Fenassi Med.	1984	550000	446700	775	"	"	2 x 2 (square)	10.94	0.005	11-15

Source JICA Study Team

Tableau 3.9.2 Analyse de la Qualité de l'Eau pour les Puits, Forrages, et Sources dans les Zones Modèles (1/2)

Sampling Site	Type	1 Temp. °C	2 pH	3 EC ms/m	4 Na mg/l	5 K mg/l	6 Ca mg/l	7 Mg mg/l	8 Fe mg/l	9 Mn mg/l	10 NH4 mg/l	11 HCO3 mg/l	12 CO3 mg/l	13 Cl mg/l	14 SO4 mg/l	15 NO3 mg/l	16 Total coliform MPN /100 ml
Recommended value		—	6.5-8.5	130	200	—	75	100	0.3	0.1	0.05	—	500	300	200	45	0
Ain Defali																	
1	Dughole (c)	26.1	6.16	35.1	22.0	1.92	32.1	13.52	0.43	0.21	0.333	42.7	13.6	60.4	6.3	84.0	270
2	Dughole (p)	28.0	6.63	28.3	13.0	0.85	27.3	14.50	0.06	0.02	0.245	97.6	12.8	35.5	3.4	13.4	90
3	Spring (c)	29.2	7.11	22.3	10.0	1.21	30.5	6.74	0.13	0.02	0.034	97.6	10.4	17.8	0.8	12.2	37
4	Dughole (c)	24.2	5.87	99.5	42.0	4.86	77.0	39.60	0.02	0.42	0.058	36.6	35.6	149.1	0.8	258.0	80
5	Dughole (p)	24.2	6.47	21.6	13.0	2.26	24.0	7.72	0.52	0.63	0.010	48.8	9.2	35.5	1.5	32.8	29
6	Spring (c)	25.5	6.88	58.9	25.0	1.59	70.5	11.53	0.02	0.01	0.005	122.0	22.4	78.1	1.9	94.5	90
7	Dughole (p)	24.0	7.93	41.2	25.0	15.01	40.1	9.63	0.07	0.01	0.005	170.8	14.0	24.9	25.9	3.0	0
8	Dughole (p)	24.1	7.71	205.0	276.0	20.53	81.8	41.53	0.02	0.03	0.024	366.0	37.6	482.8	40.5	42.1	510
9	Dughole (p)	24.1	7.03	24.7	12.0	1.24	30.5	4.80	0.02	0.02	0.003	91.5	9.6	28.4	2.8	19.8	380
10	Dughole (p)	24.1	6.91	26.2	12.0	0.34	36.9	6.73	0.02	0.03	0.002	122.0	12.0	23.1	2.7	18.5	0
11	Dughole (c)	24.6	8.30	41.1	16.0	8.03	57.6	3.87	0.20	0.03	0.112	195.2	16.0	21.3	4.7	0.7	50
12	Dughole (p)	22.1	9.81	29.9	16.0	6.59	36.8	18.40	0.07	0.01	0.231	103.7	16.8	39.1	1.5	19.7	90
13	Dughole (p)	23.6	7.54	47.2	27.0	10.93	40.0	12.10	0.13	0.01	0.203	176.9	15.0	32.0	25.6	25.9	29
14	Dughole (p)	22.9	7.13	30.8	15.0	1.67	32.0	4.84	0.07	0.03	0.044	73.2	13.6	32.0	2.6	23.9	0
15	(Existing well)	24.0	7.13	48.2	32.0	0.91	46.4	4.84	0.18	0.03	0.117	91.5	0	67.5	1.0	57.4	5

Note : (c) Owned by the com (p) Private (AH) Developed by the Administration of Hydraulics

Tableau 3.9.2 Analyse de la Qualité de l'Eau pour les Puits, Forrages, et Sources dans les Zones Modèles (2/2)

Sampling Site	Type	1 Temp. °C	2 pH	3 EC ms/m	4 Na mg/l	5 K mg/l	6 Ca mg/l	7 Mg mg/l	8 Fe mg/l	9 Mn mg/l	10 NH4 mg/l	11 HCO3 mg/l	12 CO3 mg/l	13 Cl mg/l	14 SO4 mg/l	15 NO3 mg/l	16 Total coliform MPN/100 ml
Recommended value			6.5-8.5	130	200		75	100	0.3	0.1	0.05	—	500	300	200	45	0
Teroual																	
T1	Dughole (p)	23.4	7.31	59.6	22.0	5.28	70.4	25.17	0.02	0.11	0.593	326.4	28.0	17.8	14.8	0.1	50
T2	Dughole (p)	21.0	7.31	57.4	13.0	2.11	86.4	17.42	0.39	0.09	0.264	335.5	28.8	42.5	7.8	3.0	620
T3	Dughole (p)	23.6	8.02	209.0	423.0	8.70	35.2	13.55	1.28	0.06	0.952	219.6	14.4	241.4	436.8	27.9	600
T4	Spring (c)	23.6	7.22	55.0	16.0	1.16	96.0	11.62	0.03	0.04	0.050	335.5	28.8	31.9	9.1	9.6	5
Ain Berda																	
AB1	Spring (c)	19.9	7.62	51.6	11.0	1.75	70.4	21.30	0.11	0.02	0.120	146.4	24.8	21.3	85.9	13.3	330
AB2	Spring (c)	22.3	7.66	39.1	12.0	1.29	51.2	15.50	0.16	0.02	0.110	183.0	19.2	17.8	11.6	22.0	740
AB3	Spring (c)	23.5	7.92	80.0	31.0	40.52	70.4	25.17	0.19	0.02	0.040	146.4	28.0	63.9	32.6	191.4	150
AB4	Dughole (AH)	20.6	7.52	113.1	28.0	25.96	116.8	58.08	0.25	0.03	0.030	341.6	53.2	67.5	158.7	38.1	790
AB5	Spring (c)	21.8	7.89	33.0	5.0	0.19	51.2	15.50	0.17	0.01	0.090	158.6	19.2	10.7	33.8	25.0	51
AB6	Dughole (p)	19.9	7.73	74.0	29.0	32.34	60.8	25.17	0.26	0.05	0.010	137.3	25.6	53.3	27.6	165.7	600
AB7	Dughole (p)	21.3	7.12	156.0	54.0	5.57	176.0	96.80	0.19	0.07	0.100	478.9	131.8	140.2	215.3	138.1	300
AB8	Dughole (p)	21.5	11.80	475.0	49.0	40.53	522.4	2.90	0.10	0.01	0.444	732.0	80.0	106.5	285.8	1.1	40
AB9	Dughole (p)	22.8	7.30	154.6	18.0	1.03	208.0	67.76	0.33	0.03	0.155	439.2	70.0	78.1	289.0	1.9	60
AB10	Dughole (p)	23.5	7.17	171.5	47.0	5.20	224.0	33.90	0.10	0.05	0.187	366.0	67.0	135.0	89.4	259.8	280
AB11	Dughole (p)	23.7	7.14	137.4	39.0	7.38	160.0	67.76	3.05	0.17	0.033	610.0	0	99.4	63.1	0.3	610

Note : (c) : Owned by the com (p) Private (AH) : Developed by the Administration of Hydraulics

Tableau 3.9.3 Analyse de la Qualité de l'Eau pour les Forrages de Reconnaissance

Sampling Site	1 Temp. °C	2 pH	3 EC ms/m	4 Na mg/l	5 K mg/l	6 Ca mg/l	7 Mg mg/l	8 Fe mg/l	9 Mn mg/l	10 NH4 mg/l	11 HCO3 mg/l	12 CO3 mg/l	13 Cl mg/l	14 SO4 mg/l	15 NO3 mg/l	16 Total coliform MPN /100 ml
Recommended value	—	6.5-8.5	130.00	200.0	—	75	100	0.3	0.1	0.05	—	500	300	200	45	0
JBD2	18.2	8.00	30.4	118.6	0.30	48.1	37.92	0.20	0.05	0.050	.384.3	0.0	38.1	21.2	22.1	15
JBD3	16.1	8.30	87.0	57.0	45.00	56.0	12.58	0.77	0.02	0.216	176.9	3.0	58.6	29.2	151.0	40
ADF1	22.6	7.18	30.0	14.0	0.70	32.0	4.84	0.05	0.03	0.008	85.4	3.0	26.6	0.8	14.6	20
ADF2	21.6	7.39	47.7	30.0	0.45	48.0	9.20	0.20	0.03	0.006	170.8	0.0	42.6	0.8	30.0	12
ADF3	22.1	6.86	42.9	20.36	0.30	14.0	4.86	0.10	0.04	0.0025	54.9	0.0	21.3	1.5	8.8	20
TRA2	21.2	7.07	72.6	57.72	1.36	121.8	13.61	0.20	0.03	0.048	384.3	0.0	51.5	8.1	20.5	10
TRA3	21.8	7.00	68.6	33.93	0.76	118.6	9.72	0.15	0.08	0.0326	366.0	0.0	42.6	3.0	21.4	26

Tableau 4.1.1 La Production d'Eau a l'Usine de Traitement Ain Gdah, 1993 et 1994

Year	Month	Water Production			
		Total	Average	Peak	
		(m3)	(m3/d)	(m3/d)	(l/s)
1993	January	16,866	544	1343	15.5
	February	15,474	553	1620	18.8
	March	15,106	487	1881	21.8
	April	20,904	697	1857	21.5
	May	25,364	818	2903	33.6
	June	30,127	1,004	2170	25.1
	July	40,050	1,292	2661	30.8
	August	51,335	1,656	3300	38.2
	September	32,133	1,071	1898	22.0
	October	19,232	620	1660	19.2
	November	13,687	456	1363	15.8
	December	10,010	323	967	11.2
1994	January	13,700	442	900	10.4
	February	11,200	400	700	8.1
	March	17,100	552	1000	11.6
	April	21,708	724	1152	13.3
	May	28,296	913	1620	18.8
	June	37,600	1,253	1435	16.6
	July	46,600	1,503	1700	19.7
	August	43,470	1,402	1925	22.3
	September	38,016	1,267	1440	16.7
	October	31,335	1,011	2167	25.1
	November	21,446	715	1139	13.2
	December	-	-	-	-
Max.		51,335	1,656	3,300	38.2
Min.		10,010	323	700	8.1
Average		28,171	921	1,779	20.6

Source: ONEP Fes

Tableau 4.1.2 La Production d'Eau a l'Usine de Traitement Mekansa, 1993 et 1994

Year	Month	Water Production			
		Total	Average	Peak	
		(m3)	(m3/d)	(m3/d)	(l/s)
1993	January	9,753	315	545	6.3
	February	9,102	325	709	8.2
	March	7,807	252	709	8.2
	April	9,701	323	785	9.1
	May	8,771	283	853	9.9
	June	10,671	356	667	7.7
	July	14,444	466	818	9.5
	August	13,865	447	681	7.9
	September	10,546	352	699	8.1
	October	8,650	279	553	6.4
	November	7,977	266	893	10.3
	December	6,716	217	637	7.4
1994	January	7,981	257	471	5.5
	February	5,393	193	533	6.2
	March	6,422	207	512	5.9
	April	8,501	283	488	5.6
	May	12,690	409	692	8.0
	June	13,099	437	707	8.2
	July	16,894	545	699	8.1
	August	17,581	567	829	9.6
	September	15,091	503	773	8.9
	October	17,628	569	990	11.5
	November	10,289	343	507	5.9
	December	-	-	-	-
Max.		17,628	569	990	11.5
Min.		5,393	193	471	5.5
Average		11,288	369	704	8.2

Tableau 4.1.4 Production et Consommation d'Eau, province de Taouanate 1994

	Water Supply Center	Popula-tion	House Connect.	Water Produc. (m3)	Water Distribu. (m3)	Water Consum. (m3)	Relative UW Consum. (l/c/d)	Revenue Ratio (%)	Unaccounted for Water (%)
1	Taounate	24,379	3,297	677,686	654,543	531,874	59.8	78.5	21.5
2	Karia Ba Mohamed	13,270	1,234	489,936	450,606	307,308	63.4	62.7	37.3
3	Mly Bouchta	3,140	32	9,934	9,132	6,251	5.5	62.9	37.1
4	M'kansa	21,331	251	143,478	137,652	92,997	11.9	64.8	35.2
5	Ain Gdah	29,478	368	335,065	323,788	151,755	14.1	45.3	54.7
6	Tissa	7,059	680	164,252	156,910	112,630	43.7	68.6	31.4
7	Rhafsai	4,255	737	87,140	82,784	54,363	35.0	62.4	37.6
8	Ouartzagh	2,638	234	27,934	26,538	13,064	13.6	46.8	53.2
9	Ain Aicha	4,000	193	8,500	8,076	5,060	3.5	59.5	40.5
	Total	109,550	7,026	1,943,925	1,850,029	1,275,302	(Ave.)31.9	(Ave.)65.6	(Ave.)34.4

Source: ONEP Taounate
UW: Unit Water

Tableau 4.1.5 Production et Consommation d'Eau, province de Taouanate Premier Trimestre 1995

	Water Supply Center	Popula-tion	House Connect.	Water Produc. (m3)	Water Distribu. (m3)	Water Consum. (m3)	Relative UW Consum. (l/c/d)	Revenue Ratio (%)	Unaccounted for Water (%)
1	Taounate	24,379	3,470	205,383	201,276	125,975	57.4	61.3	38.7
2	Karia Ba Mohamed	13,270	1,234	112,262	104,382	76,633	64.2	68.3	31.7
3	Mly Bouchta	3,140	32	1,820	1,583	1,460	5.2	80.2	19.8
4	M'kansa	21,331	251	27,907	25,100	18,598	9.7	66.6	33.4
5	Ain Gdah	29,478	368	74,192	70,721	29,204	11.0	39.4	60.6
6	Tissa	7,059	749	42,448	38,975	29,504	46.4	69.5	30.5
7	Rhafsai	4,255	737	10,884	10,367	7,680	20.1	70.6	29.4
8	Ouartzagh	2,638	234	11,197	10,636	5,143	21.7	45.9	54.1
9	Ain Aicha	4,000	193	4,116	3,650	2,419	6.7	58.8	41.2
	Total	109,550	7,268	490,209	466,690	296,616	(Ave.) 30.1	(Ave.) 60.5	(Ave.) 39.5

Source: ONEP Taounate
UW: Unit Water

Table 4.1.4&4.1.5*F

Tableau 4.1.6 Besoins et Demande d'Eau, Province de Taounate 1994

		Statistics								Projection				
Year		1982	1983	1984	1985	1986	1987	1988	1989	1991	1995	2000	2010	2020
Population	a	10,800	11,400	12,100	12,700	13,400	14,100	14,700	15,300	16,900	18,900	21,000	26,000	32,300
Rate of Increase (%)	b					5.1				3.6		2.17	2.17	2.17
Rate of Service (%)	c	50	55	58	59	64	68	72	83	85	90	95	97	98
Served Population	d	5,400	6,270	7,018	7,493	8,576	9,588	10,584	12,699	14,365	17,010	19,950	25,220	31,654
Non Served Population	e	5,400	5,130	5,082	5,207	4,824	4,512	4,116	2,601	2,535	1,890	1,050	780	646
Water Consumption (m3/d)														
1) By Served Population	f	520	548	603	877	553	617	658	822	1077	1361	1696	2272	2845
2) By non Served Population	g	0	36	52	55	0	0	0	0	25	19	11	8	6
3) By Administration	h	140	205	192	123	69	181	175	214	254	284	315	390	484
4) Industrial	i	0	82	101	79	74	88	101	126	135	151	168	208	258
5) Others	j	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	k	660	871	948	1134	696	886	934	1162	1491	1815	2190	2878	3593
Unit Water Consumption (l/c/d)														
1) By Served Population (f/d*1000)	l	96	87	86	117	65	64	62	65	75	80	85	90	90
2) By non Served Population (g/e*1000)	m	0	7	10	11	0	0	0	0	10	10	10	10	10
3) By Administration (h/a*1000)	n	13	18	16	10	5	13	12	14	15	15	15	15	15
4) Industrial (i/a*1000)	o	0	7	8	6	6	6	7	8	8	8	8	8	8
Net Water Consumption (k/a*1000)	p	61	76	78	89	52	63	64	76	88	96	104	111	111
Gross Water Consumption (w*86400/a)	q	64	99	110	122	107	102	99	136	145	141	137	146	147
Efficiency(%)														
1) Network	r	95	81	76	78	52	68	69	61	64	71	80	80	80
2) Transmission	s	100	95	94	94	94	91	93	92	95	95	95	95	95
Global Efficiency (k/(w/1000*86400))	t	95	77	71	73	48	62	64	56	61	68	76	76	75
Water Demand at Distribution (l/s)														
1) Average Demand (w*r)	u	8	12	14	17	16	15	16	22	27	29	32	42	52
2) Peak Demand (w*s)	v	10	16	19	22	20	20	20	29	35	38	41	54	68
Water Production (l/s)														
1) Average production	w	8	13	15	18	17	17	17	24	28	31	33	44	55
2) Peak Production	x	10	17	20	23	22	22	22	31	37	40	43	57	71

Source: ONEP Taounate

Table 4.1.6-1

Tableau 4.2.1 Caractéristiques Hydrogéologiques des Ressources d'Eaux Souterraines a Potentiel Passable

Location of Structure	Appox. Coordinates (1000)		Elevation (m)	Outcropping Formations	Water Potential	
	X	Y	Z		Flow	Depth
Mountainous structures						
- Between Oued Azghar and Taïneste	610	440	1300	Jurassic/Cretaceous	2-5 l/s	125 m
- Region of Sebbaba W of Taïneste	610	440	1400	Ditto	2-5 l/s	125 m
- Between Oued Ouergha and Afress	605	455	800	Jurassic/Upper Cretaceous	1-3 l/s	150 m
- S. of Oued Ouergha & E. of Bouadel	585	430	1000	Ditto	1-5 l/s	150 m
Hilly structures						
- Jbel Seddine east of Oued Guejawa	552	407	550	Miocene/Tortonian	1-3 l/s	125 m
- NW of My. Bouchta & E. of J. Khil	525	433	350	Up/Tortonian	1-3 l/s	125 m
- Between O. Ouergha & Dr. Zeroual	508	428	350	Cretaceous/Oligocene	1-2.5 l/s	150 m
- Between Dr. Zeroual & Dr. Skhaskha	505	420	350	Ditto	1-2.5 l/s	150 m
- Jbel Ouannane area NW of Aïn Dorij	505	445	200	Oligocene	1-3 l/s	150 m
- Jbel Hafa Radi north of Teroual	510	455	610	Oligocene	1-3 l/s	150 m
Flat plain Structures						
- O. Ouergha (A. Aïcha to A. Mediouna)	577-565	430-435	250	Quaternary/Alluvium	1-3 l/s	75 m
- O. Ouergha East of Ourtzagh	540-550	437-440	150	Ditto	1-3 l/s	75 m
- O. Ouergha South of Kissane	436-442	523-536	140	Ditto	1-3 l/s	75 m
- O. Ouergha South of Jorf El Melha	495	431	70	Ditto	1-2 l/s	60 m
- O. Ouergha NW of Khnichet	480	428	40	Ditto	1-2 l/s	50 m

Tableau 4.2.2 Caractéristiques Hydrogéologiques des Ressources d'Eaux Souterraines a Potentiel Faible

Location of Structure	Approx. Coordinates (1000)		Elevation (m)	Outcropping Formations	Water Potential	
	X	Y	Z		Flow	Depth
Hilly Structures						
- Between O. Inaouen & Outa Boubane	593	402	450	Cretaceous/Oligocene	1-2.5 l/s	125 m
- Between RS 301 and RS 318	570-580	415-427	500	Oligocene	1-2 l/s	150 m
- Jbel Miyaiha East of Bouarouss	560	420	400	Eocene/Oligocene	1-2 l/s	125 m
- North of Bouarouss include. O. Jemaa	555	420	400	Cretaceous/Oligocene	1-2 l/s	125 m
- North West of Bouarouss	550	425	500	Oligocene	1-2 l/s	125 m
- Bled S. Bou Jemaa West of Bouchabel	534	425	300	Cretaceous/Oligocene	1-2 l/s	125 m
- W of J. Bibane & J. Haikiya, E of Kissane	530	442	500	L/M Miocene	1-2 l/s	125 m
- Between Tafrant, Haddarine & Ghafsai	530-542	450	550	L/M Miocene	1-2 l/s	125 m
Flat Plain Structures						
- O. Marticha (El Ghouzate - Had Msila)	615	420-430	600	Quaternary/Alluvium	1-2 l/s	75 m
- O. Ouergha South of Bouhouda	580-590	440	370	Quaternary	1-1.5 l/s	50 m
- O. Bouaroussa North of Bouhouda	578	450	400	Quaternary/Alluvium	1-2 l/s	50 m
- O. Sra West of Bouhouda	575	450	400	Ditto	Ditto	Ditto
- O. Lebene NE and SW of Ras El Oued	579-584	415-425	250	Ditto	Ditto	Ditto
- O. Inaouen (Oued Amlil - Chebbabat)	590-600	392-399	250	Ditto	Ditto	Ditto
- O. Sra East of Taounate	572	435	400	Ditto	Ditto	Ditto
- O. Sahela West of Taounate	565	435	250	Ditto	Ditto	Ditto
- O. Ouergha (A. Aicha - East of Ghafsai)	550-570	432	200	Ditto	Ditto	Ditto
- O. Jemaa (Bouarouss - O. Jemaa)	570	407-420	200	Ditto	Ditto	Ditto
- O. Sebou South of Oulja	545	405	150	Ditto	1-1.5 l/s	Ditto
- O. Izar North of Oulja	543	410-417	200	Ditto	Ditto	Ditto
- O. Bouchabel South east of Bouchabel	525-538	415-420	130	Ditto	Ditto	Ditto
- O. Habbalat (Karia - My. Bouchta)	525	420-430	130	Ditto	Ditto	Ditto
- O. Aoudour (Tafrant - Tabouda)	526	448-458	120	Ditto	Ditto	Ditto
- O. Aoudiyar (RP 26 and Haddarine)	520	441-455	200	Ditto	Ditto	Ditto
- O. Rdat (Ain Defali - O. Sebou	455-480	440	60	Ditto	Ditto	Ditto
- O. Et Tine (Had Kourt - O. Sebou)	460	430-450	60	Ditto	Ditto	Ditto

Tableau 4.2.4 Evaluation Preliminaire du Potentiel de Developpement de la Nappe Phreatique

Average Year

Structure	Area (sq. km)	Annual Rainfall (mm/yr)	Recharge Rate (%)	Recharge (mm/yr)	Groundwater Resource (Million m3/yr)	(m3/day)
Tainaste	3	769	12	92	0.277	758
J. Khamise	8	724	12	87	0.695	1903
J. Keil	40	796	12	96	3.821	10468
J. Berda	6.3	953	12	114	0.720	1974
Thar Souk	12	724	12	87	1.042	2855
Teroual	6.1	775	9	70	0.425	1166
Ourtzagh	15	729	9	66	0.984	2696
Ain Saddine	10	649	9	58	0.584	1600
Taounate	4	823	9	74	0.296	812
Tissa	5	524	9	47	0.236	646
Jorf El Melha	10	499	9	45	0.449	1231
Ain Defali	12.0	587	9	53	0.634	1737
Had Kourt	6	519	9	47	0.280	768

10-Year Drought

Structure	Area (sq. km)	Annual Rainfall (mm/yr)	Recharge Rate (%)	Recharge (mm/yr)	Groundwater Resource (Million m3/yr)	(m3/day)
Tainaste	3	473	8	38	0.114	311
J. Khamise	8	445	8	36	0.285	781
J. Keil	40	490	8	39	1.568	4296
J. Berda	6.3	622	8	50	0.313	859
Thar Souk	12	445	8	36	0.428	1172
Teroual	6.1	480	6	29	0.176	481
Ourtzagh	15	526	6	32	0.473	1297
Ain Saddine	10	624	6	37	0.374	1025
Taounate	4	454	6	27	0.109	298
Tissa	5	337	6	20	0.101	277
Jorf El Melha	10	480	6	29	0.288	789
Ain Defali	12.0	587	6	35	0.423	1158
Had Kourt	6	499	6	30	0.180	492