APPENDIX G

WATER DEMAND

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WATER DEMAND

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1. INTRODUCTION

This chapter presents the population projection and the water demand forecast from 1996 up to 2015 in the Study area. The population projection and the water demand forecast was analyzed based on the examination of the data and information from the Damascus Water Supply and Sewerage Authority (DAWSSA), the 1994 census, the 2nd phase report on the Damascus City Master Plan in 2020 prepared by the Municipality of Damascus. The present water use and household income in the Damascus City (the City) was reconfirmed by the spot interview survey carried out during July and August, to grasp the existing water supply conditions in the City and to identify the area facing water shortage.

The population served and water demand to be supplied water by DAWSSA is determined according the service area identified by the City Master Plan as described in Appendix B. The water demand forecast was examined by the both methods of the past trend and the water use classification as shown in Figure G-1.1. National consumption statistics are presented in Table G-1.1. Water consumption for the whole of Syria reached 6,880 MCM per year while per capita domestic consumption reached 102 lpcd. The table provides comparisons to other Arab countries and shows that in general there is a direct relationship between GDP and per capita consumption. In general, consumption in Arab countries is much lower than those of a developed country like Japan where advances in water conservation practices have limited average per capita consumption between 250 to 350 lpcd.

2. POPULATION PROJECTION

2.1 General

Population projections are for Damascus City Governate, areas along the Barada river valley that are serviced by DAWSSA and new development areas which will require servicing in the future. The projections are based on census data obtained from the Central Bureau of Statistics (CBS). Reference is also made to the Master Plan being prepared by the Municipality of Damascus for new development areas. The population projections are used to estimate domestic water consumption demands and plan for the appropriate development of the water supply system until the year 2015.

2.2 National Trends

In 1960,1970,1981 and 1994, Syria conducted a detailed census across the country. Syria's population reached 13.8 million in 1994. It's annual growth rate of 3.3% follows the same high growth trends experienced in other Middle Eastern countries as show in Table G-2.1. Syria had the third highest growth rate in the Middle East & North Africa (MENA) region, equal to Jordan, Yemen and Saudi. The population growth rate has declined slightly over the last decade following a drop in the fertility rate, and an increase in the use of contraceptives. A comparison between MENA countries, shown in Table G-2.2, indicates that the average number of children per women is relatively low at 4.3. About 40% of the women use contraceptives which is a relatively high percentage compared to other MENA countries. Nevertheless, the country's rapid population growth will likely continue for some time because of the population momentum created by it's young age distribution. About 60% of the population are under the age of twenty as shown in Table G-2.3.

Over 50% of the population live in cities. Government programs to limit the expansion of cities over the last ten years appear to be having a positive effect. The country's urban growth rate has been decreasing since 1960 from 5.3% to about 4.0% in 1994. Aleppo, Damascus, and Homs, which are the country's largest cities have experienced flat or declining growth rates.

2.3 Growth Trends in Service Area

2.3.1 Central Bureau of Statistics (CBS) Population Projections

In Damascus City, the average annual growth rate has declined steadily over the past 15 years to an average of 1.75% per annum over the 1981-94 period. This is one of the lowest in the country for urban centers. Census information for Damascus City Governate and other areas serviced by DAWSSA is presented in Table G-2.4. The total population located within DAWSSA's current jurisdiction is 1.57 million. This population includes all

inhabitants of informal settlements and rural areas along the Barada river served by DAWSSA. The population recorded by the census for each district within Damascus City Governate is presented in Table G-2.5.

While growth rates for Damascus City have declined, growth rates in rural Damascus have increased rapidly over the same period by an average of about 5% per year. This large difference in growth rates strongly suggest that people are migrating out of Damascus City towards new residential developments on the outskirts. Figures showing in and out migration for Damascus are unfortunately unavailable. Although rents are controlled, the costs of housing in Syria has increased dramatically in recent years. The retail price index for rent has increased steadily by 11%, 13% and 15% in 1992, 1993 and 1994 respectively. It is likely that the migratory trend out of Damascus City to the suburbs is related to the search for more affordable housing. Statistics on the cost of housing in Damascus are unfortunately not available to confirm this hypothesis.

Based on the results of the 1994 census, the CBS projects a continued decline in growth rates for Damascus City and growth rates for rural Damascus which will continue to be higher than the national average. The CBS is projecting a population of 1.673 million for Damascus City in the year 2005. The CBS forecasts that the average growth rate between the year 1995 and 2000 will be 1.71%, then decrease to 1.68% per annum between 2000 and 2005. The CBS has not made official projections beyond the year 2005. Unofficially the CBS estimates the average growth rates will likely decline to 1.5% and hold steady at this rate from the year 2005 to 2015. Based on this average rate of growth the population of Damascus City would reach 1.942 million in the year 2015. CBS population projections are shown in Table G-2.6.

2.3.2 Damascus Municipality Master Plan Population Projections

(1) Damascus city

The first modern urban Master Plan was prepared in 1936 by the French architect M. Ecochard. He was again commissioned in 1963 with G. Banshoya by the Municipality of Damascus to produce an overall plan for the development of the City to 1984. This Master Plan, which was completed in 1968, provided for zoned development on the pattern of the existing City while preserving the Ghouta. The maximum population projections on which the plan was based show an annual growth rate of 4.5% and a total population of 980,000 in 1984. Unfortunately, the implementation of the plan has not kept pace with the proposed program. For example, in 1974, areas capable of housing 200,000 people had not yet been developed, particularly those on the outskirts of the City. As a result, urban densities have risen sharply and a considerable number of informal dwellings have been constructed.

The 1968 plan is now outdated and the rate of population growth in Damascus City has stimulated the need to plan for the development of new urban areas. The Municipality of Damascus is currently preparing a new master plan for development to the year 2020. The basic concept is to provide new development areas along the pattern of the existing City, and extend the City's limits to include existing informal areas. New residential development areas are proposed inside these new City limits to accommodate population growth. The plan promotes population growth in urban centers outside the City to curtail increasing population densities inside the City. The plan assumes a vigorously distributive population growth and projects average growth rates in Damascus City will continue to decline to a low 0.6 % per year by 2015 with a population reaching 1.934 million. Population projections made in the master plan for Damascus City Governate are presented in Table G-2.7.

The new master plan is not yet complete. To date, the draft master plan does not appear to make any allowance for increasing population densities inside the existing Damascus City Governate administrative boundary. There is also no strategy proposed for dealing with the construction of unauthorized dwellings. Based on the outcome of the last master plan, it is not unreasonable to expect that population densities inside the City Governate will likely continue to increase, especially if unauthorized construction continues. Therefore, the low growth rates anticipated by the master plan for Damascus City appear to be slightly optimistic. For these reasons, the Water Supply Master Plan assumes a slightly higher growth rate scenario based on an average of 2% per annum as shown in Table G-2.8.

(2) Rural Damascus

The Municipal Master Plan projects that growth rates for population centers outside Damascus will remain high, increasing from 4.5% in 1995 to 5.78 % in 2015. The master plan does not yet identify populations projections for the individual development areas outside the Governate. Therefore, the study team has estimated the total populations for suburbs and rural areas served by DAWSSA in the future based on the growth rates developed in the municipal master plan. On this basis, DAWSSA's service population outside of the existing administrative boundary would reach approximately 393,746 in the year 2015. These projections are presented in Table G-2.9.

2.3.3 Informal Population

In order to estimate water demand, unaccounted for water and impact on revenues, it is important to estimate the informally connected population. Unfortunately, official statistics identifying this component of the population are unavailable. The JICA study team has, with DAWSSA's assistance, estimated the informally connected population based on two calculation methods as shown in Table G-2.10 .

The first method compares the total number of households reported by the census for all of Damascus City to the total number of domestic subscribers reported by DAWSSA. Taking the difference between these two figures provides 42,512 unmetered households. It is assumed that all of these households are informally connected to the network. A review of CBS census data indicates that the average number of persons per household is around 7 in districts which include informal areas. Since this average includes formal dwellings it is assumed that the number of persons per household is slightly higher for informal dwellings. Therefore 8 persons per household is assumed to be a reasonable estimate. Multiplying the estimated number of unmetered households by the assumed number of persons per household provides an informal population of 340,096. When adjusted to include the informal areas of Takadom and Kudsaya located outside Damascus City Governate, which are not included in census figures, the informal population becomes 400,000.

The second calculation method, preferred by DAWSSA, consists of calculating the ratio of informal dwellings to the total number of dwellings in a district reported by census. The number of informal dwellings is the difference between the total number of dwellings and the number of service connections estimated by DAWSSA for each census district. The informal population is then calculated by multiplying the ratio by the total census population for the district. This method yields an informal population of 398,922 based on 1994 census data. Applying a growth factor of 2% for 1995 gives a total informally serviced population of 406,900. Both calculation methods yield similar results

2.4 Impact of National Economic Development on Population Growth

Although there is no clear consensus on the relationship between population growth and economic development, countries that have successfully accommodated expansion of their populations have had economic growth rates at least a few percentage points ahead of population growth. The introduction of investment law 10 in 1991 has stimulated economic growth and the role of the private sector is expected to continue to expand, adding to the demand for labor. In the longer term, the government's policies on economic growth are expected to increase per capita income. This increase in affluence of individuals and families generally results in healthier better educated families who are more likely to have fewer children - thus slowing population growth rates and placing less stress on natural resources.

2.5 Population Projections for the Water Supply Master Plan

The total service population for water demand projections is estimated for existing and future development sites proposed by the municipality's master plan. It is assumed that the existing administrative area will be enlarged to include new development sites. Therefore DAWSSA's mandate will also expand to include servicing these new population growth areas.

This study examines three possible population growth scenarios as shown in Table G-2.11:

Scenario 1. A high growth forecast based on the population momentum created by a young age distribution. This scenario forecasts a service population increasing along an exponential growth curve. The result is a total service population of 3.2 million by the year 2015.

Scenario 2. A moderate growth forecast which shows de-concentration to other urban centers outside existing Damascus City Governate. A stable average annual growth rate of 2 % is assumed for Damascus City Governate and growth rates established by the municipal master plan are assumed for new development areas and existing rural service areas along the Barada river. This forecast results in a population of 2.5 million by the year 2015.

Scenario 3. A slightly lower growth forecast based on the municipal master plan which assumes a high level of migration from Damascus City to new development sites outside Damascus and a sharply declining growth rate for Damascus City. This forecast results in a service population of 2.3 million by the year 2015.

There is no strong indication from current trends that population growth rates in Damascus City will suddenly increase over the master plan period. Past urban growth trends indicate stable or slightly declining growth rates in large urban centers are likely to continue. Therefore the exponential growth scenario of alternative 1 does not appear to be likely.

The population forecast provided by the municipal master plan is based on annual growth rates which decline from 2% to 0.6 % within a 20 year period. This reduction is considered optimistic. The master planning strategy to distribute growth in new development sites could be difficult to implement unless appropriate measures are implemented by the municipality to limit growth and especially the construction of unauthorized buildings in the informal areas inside Damascus City. Based on the results of the previous master plan, delays in implementing the new master plan should be expected. Although birth rates will likely continue to decline in response to rising education levels, the momentum created by the relatively young population distribution makes a continued sharp decline in growth rates highly unlikely. It is therefore likely that the growth rates inside Damascus City will be higher than anticipated in the Municipal Master Plan

The present study assumes that scenario 2 with it's moderately distributive growth forecast is the most likely growth scenario. This growth forecast results in a service population of 2.5 million by the year 2015. Population projections by service district for this growth scenario are presented in Table G-2.12 .

3. INTERVIEW SURVEY ON PRESENT WATER USE AND HOUSEHOLD INCOME IN THE CITY

3.1 General

The interview survey is aimed to grasp the existing water supply conditions in the City and to identify the area facing water shortage. The survey was carried out to more than 600 families in the City consisting 15 districts including the informal areas during July and August in 1996 as described in the interview survey report attached in the Data Book.

The interview survey was conducted by the interviewers with the questionnaire written in both English and Arabic attached hereinafter. Total number of the samples is 650 and effective number of the samples, what was selected based on the answer condition, is 600.

3.2 Survey Area

The interview survey covered the whole area in the City as shown in Figure G-3.1. Interviewees were selected the following 15 districts including informal connection areas;

1) Dummar including Informal connection area
2) Mouhajreen including Informal connection area
3) Ruku Aldyn including Informal connection area
4) Berze including Informal connection area
5) Jobar including Informal connection area
6) Sarouja
7) Old City
8) Kanawat including Informal connection area
9) Kadam including Informal connection area
10) Shaghour including Informal connection area
11) Midan including Informal connection area
12) Mezze including Informal connection area
13) Kaboon including Informal connection area
14) Kafar Souse including Informal connection area
15) Yarmouk including Informal connection area

For grasping the present water use and household income in Damascus City, the interviewees were selected among the above-mentioned districts in consideration with economical situation and location of the informal areas prior to commencing the survey.

3.3 Survey Methods

(1) Preparation of questionnaire

The questionnaire attached hereinafter was prepared in a style appropriate to the present conditions in Damascus City. The questionnaire was written in both English and Arabic.

(2) Selection of interviewees

Interviewees for the survey was selected in cooperation with Damascus Municipality. Damascus Municipality has conducted the general study for the formulation of the Urban Development Plan in 1968 and income level was classified into three categories, High, Middle and Low. In 1972, the economic study was carried out by the General Company for Technical Studies & Constancy (G.C.T.&C.) according to the same categories in 1968. In addition, G.C.T.& C. has been conducting the study on the New Urban Development M/P in 2020 as described in Appendix B. The study proposed the future income level by three categories.

Income level Classification (% to total population) at each study are summarized as follows;

Income Level	1968 Study	1972 Study	1996Study for 2020	
			Syria	Damascus
High	18	20	18	20
Middle	31	40	34	40
Low	51	40	48	40

The existing income level classification in the City was adopted with the average percentage in Syria proposed by the 1996 Study for 2020, after discussed with Damascus Municipality. Monthly income at each category is assumed based on the 1994 Census and information from DAWSSA. A percentage of informal residents to total population in the City is estimated approximately 25 % based on the 1994 Census and information from Damascus Municipality, and majority (70 %) of informal residents, are supposed to belong to the category of low income level.

The residents in the City were classified into 4 categories, High income, Middle income, Low income and Informal residents for the interview survey. The percentage of each categories to the total population was assumed that 18 % of High income level, 26 % of Middle income level, 33 % of Low income level and 23 % of Informal residents.

Interviewees were selected on the assumption that each interviewee stands for one of the four categories. Number of families at each category was determined as follows ;

		Number of Samples	Assumed Monthly Income
1)	High Class	100 families	more than SL 50,000
2)	Middle Class	100 families	SL 10,000 to 50,000
3)	Low Class	200 families	less than SL 10,000
4)	Informal resident	200 families	
Total		600 families	

(3) Interview survey

The interview survey was carried out by six teams consisting of two interviewers with the questionnaire from July to August as shown in Figure G-3.2. One team carried out 10 interview surveys per day as average. A meeting was held everyday with the interviewers for checking the questionnaires filled out by the interviewers.

3.4 Survey Results

Data obtained from the interview survey was analyzed by data processing. 600 samples of the interview survey were analyzed by data processing and the following results were obtained mainly to grasp the present water use and household income ;

(1) Family size and number of households

An average family size in the City is 6.1 persons per family as summarized in Table G-3.1. This figure is almost similar to the result of 1994 Census. Number of households including the informal households is estimated 237,000 from the total population of 1,422,000 persons in the City. 18 % of households in the City are supposed to be unbilled consumers or unconnected households to DAWSSA water supply system, since the number of the billed domestic connections was recorded about 195,000 in 1995.

The family size in Kadam and Kafar Souseh shows the highest figure with 7.26 and 7.25 respectively, and the size of Kaboon and Mezze are the lowest one with 4.83 and 4.86. As for the family size at each income level, the middle and informal classes show the highest figure with 6.33 persons. It shows that the population of the middle income class will increase in the future.

(2) Monthly average income per family

Monthly average income per family in the City is estimated with SL 16,254 as shown in Table G-3.2. Income level classification in the City is summarized from the result of the interview survey as follows;

	(Unit : % to the Total Population)
High Class	16.7
Middle Class	18.0
Low Class	39.3
Informal Residents	(26.0)
- Middle Class	4.5
- Low Class	21.5
Total	100.0

In consequence of the above classification in the City, the existing residents including the informal areas consist of 16.7 % of High class, 22.5 % of Middle class and 60.8 % of Low class.

(3) Major water source and informal water users

90 % of residents in the City have used water supplied from DAWSSA as shown in Table G-3.3. In the low pressure zone, such as Kadam, Kaboon, Yomouk and Midan especially, the residents used private water of bottled water, spring and well for drinking and cooking as shown in Table G-3.4.

Table G-3.4 shows that 78.5 % of the informal residents unofficially used water supplied by DAWSSA. Informal water users of DAWSSA system consist of 69 % with a valve, 13 % without a valve and 18 % with a booster pump. 53 % of residents in informal areas get water all day. 22 % get water for less than 4 hours per day, 12 % for less than 8 hours per day and 14 % for less than 12 hours per day. Almost residents in informal areas want to get water stably and safely.

(4) Consciousness of inhabitants for existing water supply

Table G-3.5 shows that 71 % of residents are satisfied with the existing water supply by DAWSSA. Jobar, Kadam, Midan, Yarmouk, Kafar Souse and Mezze show spatially the high percentage of unsatisfactory. The reasons of unsatisfactory to the existing water supply are poor quality of 13.5 % and low pressure of 9.3 %. These areas belong to the Low Pressure Zone of DAWSSA system and is supplied water mainly from the wells of DAWSSA in the City, and moreover the informal areas are located at these areas. Water storage devises with 1 m^3 capacity are installed at 85 % of residents.

Result of water use condition at house is summarized as follows;

a) 90 % of residents drink directly water from tap without boil excepting Jobar which 75 % of resident use boiled water. It shows that quality of supplied water is good enough for drinking.

b) 73 % of resident consider that water pressure is average, it means that pressure is satisfactory for their needs. While 11 % is high and low is 13 %. Low pressure is mainly Midan with 46 %, Yarmouk with 43 % and Kafar Souse with 30 %.

c) 92 % of resident do not use water purifiers. As for income classes, high class and informal residents show as the highest users of purifiers with 12 %. The limited use of purifiers indicates that water quality is good for their use.

d) House pumps are used by 29 % of residents at average. Residents in the low pressure zone show the high percentage, such as Yarmouk (79 %), Midan (62 %), Kadam (46 %) and Kafar Souse (43 %). Informal residents are the highest users with 45 %.

(5) Availability of DAWSSA water supply

The majority of consumers get water everyday (83 %) as shown in Table G-3.6. However, only 55 % of consumers are supplied water over 12 hours per day in dry season. 5 % get water for less than 4 hours per day, 5 % for less than 8 hours per day and 35 % for less than 12 hours per day. About 9 % of residents took counter measures against the shortage water in the dry season as shown in Table G-3.7. Kafar Souse, Kaboon and Mezze seem to have the least daily water availability. Almost resident installed water stored devices against water suspension.

(6) Waterborne diseases

Table G-3.8 indicates that few residents get waterborne diseases, Typhoid (2.5 %), Cholera (0.2 %) and 15 % for other diseases in spite of drinking unboiled water. Other diseases seem to occur from the lack of hygiene by people. Water is supplied with good hygienic standard.

(7) Monthly water consumption

Monthly water consumption is summarized in Table G-3.9. Average monthly water consumption is 32 m^3/m (177 lpcd) in Damascus. The highest consumers are in Rukn Aldyn with 50 m^3/m and Kadam is next with 46 m^3/m. The lowest is Midan with 22 m^3/m. Monthly water consumption at each class is estimated below;

- High Class : 35 m^3/m (194 lpcd)
- Middle Class : 33 m^3/m (183 lpcd)
- Low Class : 32 m^3/m (177 lpcd)
- Informal Residents : 31 m^3/m (172 lpcd)

As for desirable water consumption, 95% of formal users are satisfied with the present quantity of water consumption. 5% of users want 1.5 times of the present consumption and only 1% of users desire 2 times. The higher demand areas are Yarmouk with 32% for 1.5 times, Kadam with 18 %, Midan with 9%, and Sarouja, Kafar Souse with 7%.

(8) Water cost and willingness to pay

Monthly average payments for water, sewerage and electricity (see Table G-3.10) are estimated roughly as follows;

- Water : 147 SL/month/family (0.9 % to Average Income)
- Garbage & Drainage : 75 SL/month/family (0.5 % to Average Income)
- Electricity : 450 SL/month/family (2.8 % to Average Income)

72 % of official consumers for water consider that the present payments are reasonable as shown in Table G-3.11. It is remarkable that resident in Kadam, Kafar Souse, Jobar, Shagour and Midan complained with the high ratio of more than 40 % due to poor quality of water and expensive payments comparing theirs income. Residents in Yormouk claimed to the existing payments due to the less quantity and pressure. Income Class assessment descends from 84 % of high class to 65 % of low class.

As for willingness to pay for water in the informal areas, 93 % of informal residents show their willingness to pay if supplied water from DAWSSA. Few residents (7 %) in the informal areas answered no pay from high tariff comparing with their income.

The interview survey carried out the consumers opinion on affordable tariffs in case that infrastructures are improved such as water supply, sewerage system and electricity supply. Affordable tariffs to the following infrastructures is summarized below ;

- Water Tariff : 151 SL (147 SL/month at present)
- Garbage & Drainage Tariff : 77 SL (75 SL/month at present)
- Electricity Tariff : 433 SL (450 SL/month at present)

The above figures indicate obviously that residents have no intention of paying the

higher tariffs to the infrastructures comparing with the present payments.

The above-mentioned main results are summarized in Table G-3.9.

4. WATER DEMAND

4.1 Service Area and Population Served

4.1.1. Service Area

The areas to be served by future water supply system of DAWSSA are determined, as described below taking into account following information and data from DAWSSA, and by the field investigation carried by the Study Team.

(1) City Master Plan and land use plan

Damascus Municipality has been preparing the New Damascus City and Regional Master Plan for the targeted year 2020. The conceptual development plan for the Damascus City (the City) is proposed by the Damascus Municipality as shown in Figure G-4.1. The administrative area of the City is expanded from 106 km^2 in 1995 to 180 km^2 according the conceptual development plan of the City in the year 2020.

The Master Plan has prepared a general land use plan for the year 2020 which covers the city administrative area as shown in Table G-4.1. While this land use plan is not approved yet by the Government, this is considered to provide a basic guideline in identifying the direction of development, which would give general concept in future service area.

The service area to be supplied water by the DAWSSA will be determined with the implementation plan for the enlargement and development of the City. The implementation plan, however, has not prepared yet by Damascus Municipality. The Study Team and DAWSSA, proposed the tentative implementation schedule for the enlargement and development of the City, considering the probability of water resource development within the area of DAWSAA's water right in the future, as shown in Table G-4.2.

(2) Informal areas

Informal connection areas were identified with the survey conducted by the Study Team and DAWSSA as shown in Figure G-3.1. Total informal area is estimated 10.5 km^2 with approximately 10 % of total area of the City (106 km^2), as shown in Table G-4.3. The Damascus Municipality has been started to improve infrastructures in the informal areas, such as water supply, electricity supply and sewerage. The future service area shall include the informal areas according to the improvement schedule to be prepared by the Damascus Municipality and DAWSSA.

(3) Service area

Based on the City Master Plan, Land Use Plan in the Future, and Tentative Implementation Schedule, together with consideration on the improvement of informal areas,

the projection of the future service area up to the year 2015 is proposed as shown in Table G-4.2. The served area up to the year 2015 is summarized below;

(Unit : km²)

	1995	2000	2005	2010	2015
Villages	5.12	5.12	5.12	5.12	5.12
New development Area	0.25	1.49	4.49	12.12	23.80
The Existing City	106.25	106.25	106.25	106.25	106.25
Total	111.62	112.86	115.86	123.49	135.17

Land use in the water served area is classified by Damascus Municipality as shown in Table G-4.1. Land use of the existing city and villages served by DAWSSA will not be changed so mach from the existing conditions according to the New Damascus City Master Plan. Service area covered by DAWSSA is recommended as shown in Figure G-4.2.

4.1.2 Population Served

(1) Population and population density in the service area

Population and population dencity in the service area is summarized in Table G-4.2. Population in the informal areas is estimated from 1994 Census and the interview survey as described in the chapter 2. Number of persons per family is 6 persons as average based on the results from the 1994 Census and the interview survey.

Total population in the informal areas is estimated approximately 407,000 persons in 1995 as shown in Table G-4.3. The population in the informal areas will be supposed to be decreased according to the improvement plan for the informal areas as follows;

	1995	2000	2005	2010	2015
Number of Informal Residents (1000 persons)	407	157	17	0	0
Percentage of Informal residents to Total population (%)	26	10	1	0	0

(2) Population served and service level

Population projection in the Existing Damascus City, Villages and the New Development Area is estimated based on the census as shown in Table G-4.2. The existing population in the service area is 1,239,000.

The existing population served is estimated with 1,150,000 by the total number of billed domestic connections and average persons per domestic connection with 6 persons per

family from the result of the interview survey carried out by the JICA Study Team.

Targeted population served and percentage of population served to the total population is proposed as follows;

	1995	2000	2005	2010	2015
Served Level (%)	74	90	100	100	100
Population Served (1000 persons)	1,150	1,563	1,949	2,205	2,501

The residents have served the water supply from DAWSSA with 100 % excepting the number of the informal residents, in 1995. Total population of the informal areas is estimated tentatively with 407,000 persons based on the Census and the results of the interview survey as shown in Table G-4.4.

Income level of consumers is estimated based on the results of the interview survey (refer to the Chapter 3) as follows ;

	(Unit : % to the Total Population)
High Class	16.7
Middle Class*	22.5
Low Class*	60.8
Total	100.0

(* : including Informal residents)

4.2 Water Consumption

DAWSSA, at present classified their consumers to 5 categories, Water Right Obligations, Public & Religious Use, Domestic Use, Governmental Use and Commercial & Industrial Use mainly as shown in Table G-4.5. Public & Religious Use seem to including Uncounted for Water (UFW), since almost mosques and churches have no meter or no meter reading. Domestic Use in the past 5 years indicated approximately 70 % to the total water consumption without Public & Religious Use as shown in Table G-4.5. Table G-4.6 shows the existing water consumption without UFW in 1995 from the account section. Billed water consists of Domestic Use with 73 %, Commercial Use with 4 %, Industrial Use with 1 % and Government Use with 22 %.

As the present domestic consumption has the majority with 70 % in total water consumption, it is proposed, for the purpose of projection of future water consumption to

classify consumers to major categories, Domestic Use and Non-Domestic Use. Non-Domestic Use is further classified into 14 categories as described the Section 4.2.2. For this Study, the projection of future water consumption is forecasted by the water use classification analysis instead of the past trend analysis.

Proposed categories are as follows;

A. Domestic Use
B. Non Domestic Use
B-1. Governmental Use
    a. Government offices & facilities
    b. Schools
    c. Universities
    d. Hospitals
    e. Sport facilities
B-2. Commercial Use
    a. Hotels
    b. Commercial Users
    d. Theaters
B-3. Industrial Use
    a. Factories
    b. Manufacturing
B-4. Water Right Obligations
B-5. Religious & Public Use (Un-billed Consumption)
    a. Mosques & Churches
    b. Public Taps/Special Area Zones

4.2.1 Domestic Use

As discussed in the Section 4.1.2, the population served is classified to three income groups and one informal group. The informal group is divided into two income group, Middle income with 17.5 % and Low income with 82.5 %. All groups are able to afford to have a connection and willingness to pay for water according to the result of the interview survey. It is supposed that all groups will received pipe water from residential service connection.

(1) Future distribution of income class

Future distribution of income level in the year 2020 is forecasted by the Damascus Municipality with High income (20 %), Middle income (40 %) and Low income (40 %). As detail information on this distribution is not available, the Study Team and DAWSSA is

assumed the future distribution of income level based on the interview survey and the past trend of economical conditions as follows;

(Unit : % to the Total Population)

	1995	2000	2005	2010	2015
High Class	16.7	17.5	18.4	19.2	20.0
Middle Class	18.0	23.5	29.0	34.5	40.0
Low Class	39.3	49.0	52.7	46.3	40.0
Informal Residents	26.0	10.0	0.0	0.0	0.0

This assumption for the distribution of income class has a tendency to be increased the ratio of Low income Class, since majority of informal residents are converted to the Low class. At the present, the problems of the informal areas has interrupted the economical development in the City. The economical conditions, therefore, are supposed to be improved after the year 2005.

(2) Unit water consumption per capita

Unit water consumption per capita was studied by the interview survey, the meter reading and billing records. The result of average unit domestic water consumption at each group is summarized below;

(Unit : lpcd)

Class	Interview Survey	Meter Reading	Billing Records
High	194	212 - 236	-
Middle	183	143 - 173	-
Low	177	-	
Average	177	110	

Taking into account average consumption per residential connection of 674 l/connection/day which is derived from billing record of the year 1995, per capita consumption is estimated as 110 lpcd in assuming household of 6 persons. Table G-4.7 shows the ratio of water supply suspension from 1991 to 1995. Average suspension day is 4 days per month during July to February. Interview survey also indicated the water suspension which 45 % of residents was unable to get water less than 12 hours per day. Potential water demand shall be higher than the billed consumption of 110 lpcd. Considering water supply conditions and water meter malfunction (see Table G-4.6), the existing potential water demand is assumed as 170 lpcd and this per capita consumption is applied as the standard per capita consumption for forecast of future domestic water demand.

(3) Alternative of unit water consumption and recommendation

Unit domestic water consumption has three alternatives depending on future economical conditions, Alternative 1 is in case of normal economic development from the recently past trend, Alternative 2 is the case of increasing water consumption according high economic development, and Alternative 3 is the case of increasing water consumption after 2005. These alternatives are determined on the following assumptions;

- Water demand is increasing gradually according to the forecasted economic trend based on the information of the 1994 Census and Damascus Municipality.
- At the present, the problems of informal areas has interrupted the economic development in the City.
- Economic conditions are improved with high level after the year 2005, when the issue of the informal areas is supposed to be settled completely.
- Unit consumption at each income level is estimated base on the results of the interview survey, meter reading and billing data.
- Future percentage of each income level to total population is distributed according the forecast of Damascus Municipality.

Unit water consumption per capita in the future is proposed the following three alternatives classified as follows:

(Alternative 1)
- Water demand is increasing gradually according population projection from 1995 up to 2015.
- Unit consumption of the both Middle and Low income levels is estimated considering potential water demand and willingness to pay.
- Unit consumption at each income level is not changed even in the future.

(Alternative 2)
- Increasing ratio of water demand is changed during 1995 to 2000 and after 2000 water demand is increasing gradually according population projection.
- Potential water demand of Middle and Low is estimated highly disregarding the willingness to pay.
- Unit consumption each income level is not changed even in the future.

(Alternative 3)
- Water demand is increasing gradually according population projection from 1995 up to 2005 and increasing ratio of water demand is changed after 2005, since informal areas are improved by 2005.

- Potential water demand of Middle and Low is estimated considering potential water demand and willingness to pay during 1995 to 2005 and after 2005 disregarding the willingness to pay.
- Unit consumption of Middle and Low income level is increasing gradually after 2005 according the economic development.

What are the (3) alternatives, described from here.

Unit water consumption per capita in the future is proposed the following two alternatives, considering the living condition improvement such as for washing, bathing and so on.

(Unit : lpcd)

Class	Alternative 1	Alternative 2
High	250	250
Middle	200	220
Low	170	190

In consideration of willingness to pay, what almost residents are affordable to pay the present tariffs, and forecasted distribution of Income level, per capita consumption is recommended as follows;

(Unit : lpcd)

Class	1995	2000	2005	2010	2015
High	230	250	250	250	250
Middle	190	200	200	210	220
Low	160	170	170	180	190
Average	170	180	193	204	214

The proposed unit water consumption per capita are took into account of the potential water demand and A upper limit of unit domestic water consumption per capita is 250 lpcd. The domestic water consumption per capita increases according to the improvement of the standard of living. However, it has a tendency that a upper limit of a domestic water consumption per capita is generally less than 250 lpcd as compared with domestic water consumption in the other developed countries. Unit water consumption in the future is summarized in Table G-4.8.

4.2.2 Non-Domestic Use

Future water demand for non-domestic use will be projected based on the analytical results of records, questionnaire survey and information provided by DAWSSA and other relevant data collected, such as the Future Urban Development Plan (conceptual Plan), land

use plan and statistical data. The details of projection for non-domestic use are described in the following.

(1) Billing records

Table G-4.6 summarizes water consumption per connection per day of three categories, Commercial, Industrial and Governmental in 1995. Unite water consumption per connection is estimated 0.61 m^3/connection/day for Commercial Use, 1.29 m^3/connection/day for Industrial Use and 17.59 m^3/connection/day for Governmental Use, considering malfunction loss. It is remarkable that the estimated unit consumption at each category excludes potential water demand to be estimated from water suspension.

(2) Questionnaire survey

Questionnaire survey was conducted to the major water consumers, Hotels, Hospitals, Schools, Factories and Governmental Offices including Sports Facilities through DAWSSA, respectively as shown in Tables G-4.9, G-4.10, G-4.11, G-4.12 and G-4.13. The results of the questionnaire survey are summarized as average unit water consumption per connection below;

a) Governmental Offices & Facilities	:	51 m^3/d
b) Schools	:	14 m^3/d
c) University	:	254 m^3/d
d) Hospitals	:	370 m^3/d
e) Sports Facilities	:	176 m^3/d
f) Hotels	:	148 m^3/d
g) Large Commercial users	:	10 m^3/d
h) Others (commercial users)	:	1 m^3/d
i) Theaters	:	44 m^3/d
j) Factories	:	128 m^3/d
k) Manufacturing	:	0.60 m^3/d

(3) Religious & public facilities from meter reading and information

Meter reading survey was carried out to some of the Religious Facilities. The results of meter reading are 44 m^3/day for the Um-Ayad Mosque, 4 m^3/day for other mosques and churches. Based on the information from Damascus Municipality, water consumption per public tap is estimated about 40 m^3/day to 50 m^3/day and water of public fountains is supplied by the Municipality. Special uses, such as airport in the City, military division and others, are estimated about 3,000 m^3/day as bulk water supply.

(4) Future unit water consumption and number of facilities

Future unit water consumption are proposed as shown in Table G-4.8, considering the above results and information from DAWSSA. Basic factors for water demand projection are summarized as shown in Table G-4.14. The number of main users are estimated based on the area to be expanded according to the Urban Development Plan, since Damascus Municipality has no detail information about the main facilities. However, the conceptual plan for the City development and the land use plan indicates that the future land use pattern in the City and surrounding area of the City will not be changed from the existing land use pattern, excepting Residential and Commercial areas. It is acceptable that the non-domestic water demand projection is estimated based on the present water consumption and land use pattern.

4.2.3 Past Trend of Water Consumption

In this Study, water demand was forecasted by both methods of the past trend and the water use classification. The results of water demand forecast are summarized as shown in Table G-4.15 and Figure G-4.3 shows comparison of water demand forecast examined by the both methods. The following methods of the past trend were adopted for water demand forecast ;

1) Water consumption increase ratio :

y = 451*(1.045)^x where, x : year
Result of this method is shown in Figure G-4.4. DAWSSA adopted similar one of this method for water demand forecast.

2) Correlation between water consumption and number of subscribers :

y = 2.836x-258 where, x : Number of subscribers
Number of subscribers is estimated by the past trend. Correlation is shown in Figure G-4.5.

3) Correlation between water consumption and population served :

y = 0.355x-144.7 where, x : Population served
Population served is assumed from the billing data of DAWSSA. Correlation is shown in Figure G-4.5.

4) Correlation between water consumption and population :

y = 0.849x-833 where, x : Population
Population in the table is estimated based on the 1994 Cencus.

5) Logistic curve between population and per capita water consumption :

y = K/{1+e^(a-bx)} where, K : 450 lcd
a & b : Constants (a=1.70607, b=0.00094)
K, what is per capita water consumption, is detarmined from per capita water

consumption of developed countries, such as Japan and USA. Constants (a and b) is estimated from the logistic curve formula.

Water demand forecasted by the water use classified method is estimated approximately in the middle of values by the above-mentioned past trend methods as shown in Figure G-4.6. Future demand by the water use classified method is similar to the demand forecasted from correlation between water consumption and population served.

5. WATER DEMAND PROJECTION AND WATER REQUIREMENT

5.1 Prerequisite for Water Demand Projection

Water consumption forecast was examined by the water use classification method instead of the past trend method as described in the above mentioned Section 4. Based on the forecasted water consumption, proposed basic factors and analyzed information, water demand projection is proposed in the following.

(1) Classification of water use

Water use is classified as follows;

a) Accounted Water
  (i) Billed Water
    - Domestic
    - Governmental (office, school, University, Hospital and others)
    - Commercial (commercial users with large water consumption, hotels and Theaters)
    - Industrial (factory and manufacturing)
  (ii) Un-billed Water
    - Water right obligation
    - Religious & Public Use (mosques & churches and public taps & special area zone)

b) Un-accounted For Water (UFW)
  (i) Meter Malfunction (under estimation of meters)
  (ii) Informal use including Domestic and Non-domestic uses
  (iii) System Losses including leakage from the informal areas

(2) Prerequisite of analysis for water demand projection

Water demand projection is analyzed on the following assumption;

a) Population served is estimated based on the population from the census, the number of persons per family from the interview survey and the number of billed water connections in 1995.
b) Service area is proposed according the Urban Development Plan.
c) Water consumption estimated by the water use classification method is adopted.
d) Water consumption of the religious & public use is estimated by the result from the interview survey and the water meter reading survey, because it is supposed that past data of the water consumption for the religious & public use includes the UFW.
e) A upper limit of unit domestic water consumption per capita is 250 lpcd. A

domestic water consumption per capita increases according to the improvement of the standard of living. However, it has a tendency that a upper limit of a domestic water consumption per capita is less than 250 lpcd.

f) Unaccouted For Water (UFW) is estimated based on the data from the studies.

(3) Unaccounted For Water (UFW)

The overall unaccounted for water at present is estimated as 63 % or around consisting of 14.4 % for Meter Malfunction, 13.6 % for Informal Use and 34.7 % for System Losses. For the development of water production required, however, it is assumed that the following figures are, at present, most realistic, and are adopted in projection of water production.

a) Target unaccounted for water in the year 2015 is 25 %.

b) Target annual reduction rate of UFW at every five years are shown below;

Year	Annual Reduction Rate of UFW	Percentage of UFW
1995		63 %
2000	24 %	39 %
2005	8 %	31 %
2010	3 %	28 %
2015	3 %	25 %

c) Amount of UFW is estimated as follow;

(Unit : 1000 m³/day)

Type of UFW	1995	2000	2005	2010	2015
Meter Malfunction	88.6	22.5	0	0	0
Informal Use	81.4	30.0	8.1	0	0
System Losses	204.0	240.3	244.0	252.1	248.7
Total	374.0	292.8	252.1	252.1	248.7

(4) Seasonal load factor

Seasonal load factor is proposed as shown in Table G-5.1. Seasonal fluctuation of potential water consumption reflected by the climate according the information from DAWSSA. Table G-5.1 shows comparison of correlation between climate and fluctuations of billed consumption in 1995, average water production of the past 10 years and load factor adopted by DAWSSA. DAWSSA's load factor (1.12) has good correlation with climate, what correlation factor is 0.9. The correlation factor(0.9) is modified to 1.0 and 1.14 is estimated for recommendation. Seasonal load factor (1.14) is proposed and peak demand is on August as shown in Table G-5.1.

5.2 Water Demand Projection

5.2.1 Comparison between Alternatives of Water Demand Projection

As described in the Section 4.2.1, unit domestic water consumption has three alternatives depending on future economical conditions, Alternative 1 is in case of normal economic development from the recently past trend, Alternative 2 is the case of increasing water consumption according high economic development, and Alternative 3 is the case of increasing water consumption after 2005. These alternatives are detarmined on the following assumptions;

Water demand projection is prepared for the three alternatives, as shown in Table G-5.2 (for former economic developed case), Table G-5.3 (for high growth case), and Table G-5.4 (for realistic economic growth case).

Difference of domestic water demand between Alternative 1 and 2 in the year 2015 is some 600 l/sec or equivalent to 5 % of total water requirement. Difference of domestic water demand between Alternative 2 and 3 in the year 2005 is 368 l/sec or equivalent to 4 % of total water requirement, and one between Alternative 1 and 3 in the year 2005 is 8 % of total requirement. Fore planning the future water supply system, alternative 3 for realistic economic growth is recommended to be adopted, since such a small difference can be taken care of by flexible operation of water supply facilities and, more important, economy of construction, is of primary concern for the present projects, especially the improvement projects of informal areas. The improvement projects of informal areas are supposed to be completed until the year 2005 and then econimiy of construction will be developed with high level.

5.2.2 Classified Water Demand Projection

Table G-5.4 shows classified water demand projection. Classified water demand projection at each 5 years are summarized as follows;

(Unit : 100 m³/day)

Classification	1995	2000	2005	2010	2015
A. Domestic Use	126.1	272.1	376.9	449.4	535.2
B. Non-Domestic Use					
B.1 Governmental Use	37.3	99.7	102.4	109.2	119.6
B.2 Commercial Use	7.8	23.9	24.6	26.2	28.7
B.3 Industrial Use	1.5	6.2	6.3	6.7	7.4
B.4 Water Right Obligation	40.7	42.5	42.5	42.5	42.5
B.5 Religious & Public Use	10.5	10.6	10.9	11.6	12.7
Total	327.9	455.0	563.6	645.6	746.1
Effective Ratio of Total Water Requirement (%)	37	61	69	72	75

5.3 Water Requirement and Proposed Water Production

5.3.1 Water Requirement

(1) Annual water requirement

Based on the projected water demand so far made, annual water requirement is estimated as shown in Table G-5.5. Water requirement at each 5 years is estimated respectively as 274.0 MCM/year in 2000, 296.9 MCM/year in 2005, 328.6 MCM/year in 2010 and 363.1 MCM/year.

(2) Water supply for the new development areas

Schedule of water supply for the new development areas is shown in Table G-5.6. The schedule was formulated considering to the limitation of water resource capacity, the selection of priority schemes in DAWSSA and the conceptual plan of the Urban development in the City prepared by Damascus Municipality. Water requirement is estimated assuming the ratio of water losses is 25 % even in the new constructed area.

According the schedule, Dummar Extension Area (1st phase) and residential area in Special Area Zone (State Factory) is to be supplied water in 2000, in 2005 Kudsaya New Suburb is supplied water fully. After the year 2005, Deficit is supposed to arise from water supply of DAWSSA comparing water production and water demand. The proposed new areas by Damascus Municipality will be supplied water after developed new water resources. Assad Suburb (1st phase and 2nd phase), however, is to be supplied from 2010, because this area has its own water resource of wells located at the rural area. In 2010, DAWSSA, will not supply water to Dummar Extension Area (2nd phase), Assad Suburb Extension Area and Assad City, since the estimated water production can not afford to supply water to the such extension and new development areas.

(3) Water supply to proposed served areas

Water supply to proposed served areas is estimated as shown in Tables G-5.7 (1/5) to (5/5), from the year 1995 up to the year 2015. The estimation of water requirement is taken into consideration that the land use pattern in the existing served area is not changed so much.

Water requirement to proposed Served areas is summarized at each 5 years as follows;

(1000 m^3/day)

Year	2000	2005	2010	2015
Villages	53.7	56.9	60.5	65.3
New Development Areas	8.5	21.5	43.6	73.3
Existing City	688.6	737.9	796.3	856.2
Total	750.8	816.3	900.4	994.8

Water requirements to served areas in the years 1995, 2005 and 2015 are shown in Figures G-5.1, G-5.2 and G-5.3 respectively.

5.3.2 Proposed Water Production

Raw water production is proposed as shown in Figure G-5.4. Proposed water production is estimated with losses of 1 % at the production facilities site. The water losses at the production facilities is supposed to be limited less than 1 % of total raw water production, since the transmission of the Figeh spring as the main water resource is the tunnel and the other water resources are groundwater. The past average water requirement in 1986 and 1990 is assumed based on the average water requirement in 1995. Daily maximum water requirement is calculated by the load factor of 1.14.

It is supposed that water deficit will be occurred after the year 2005, since the capacity of water resource is limited with 296.9 MCM/year (9.4 m^3/sec) estimated by the existing water rights of DAWSSA. It, therefore, is necessary that DAWSSA will develop the new water resources for the year 2010 and 2015 in consideration of the harmony between the water demand augmentation and water saving need, and in cooperation with Damascus Municipality and the Ministry of Irrigation (MOI). The MOI would be expected for solving the water deficit in the City after the year 2005, because the MOI has the responsibility for formulation and arrangement of water resources development in the rural areas where have a potentiality of water resources, and is authorized for water rights in the rural areas.

TABLES

Table G-1.1 Water Consumption in Arabic Countries in 1992

	Syria	Bahrain	Iraq	Jordan	Kuwait	Lebanon	Oman	Qatar	Saudi Arabia	U.A.E.	Yemen	Turkey
Population (x1000)	13,000	500	19,200	3,900	2,100	3,800	1,600	510	16,800	1,700	13,000	58,500
Area (x1000 km2)	185	1	438	89	18	10	212	11	2,150	84	528	779
Population Density (per km2)	70	500	44	44	117	380	8	46	8	20	25	75
GDP (million $/year)	17,236			4,091			11,520		111,343	42,467		99,696
GDP Growth Rate 1980-1992 (%)				0.8			7.7		0.4	0.3		4.9
GNP per capita ($/year/cap.)	1,020	6,610	3,654	1,120	16,380	538	6,480	9,920	7,510	22,020	640	1,980
GNP Growth Rate 1980-1992 (%)				5.4			4.1		-3.3	-4.3		2.9
Water Consumption (million t/year)												
- Domestic	482	66	1,600	179	536	94	38	33	707	18	106	15,900
(lpcd)*	(102)	(362)	(228)	(126)	(699)	(68)	(65)	(177)	(115)	(29)	(22)	(745)
- Industrial	688	40	2,700	42	269	34	38	24	200	15	53	16,900
- Irrigation	5,710	4	20,400	613	34	730	1,184	35	8,693	130	2,495	58,600
- Total	6,880	110	24,700	834	839	858	1,260	92	9,600	163	2,654	91,400
Water Consumption per capita (lpcd)												
	1,450	603	3,525	586	1,095	619	2,158	494	1,566	263	559	4,281
Water Consumption per capita (lpcd) without Irrigation Use												
	247	581	614	155	1,050	92	130	306	148	53	34	1,536

(Source : JICA Study Team)

Remark * : Daily average Domestic water consumption per capita

Table G-2.1 - Demographic Indicators for Countries in the Middle East and North Africa Region

	Population 1992 (millions)	Population projection 2020 (millions)	Crude birth rate (per 1000)	Crude death rate (per 1000)	Rate of natural increase*	Population growth rate** (%)	urban population (%)	Life expectancy at birth male/female (years)
Oman	1.6	4.5	43	5	3.9	4.2	12	68/72
Kuwait	1.4	2.6	28	3	2.5	3.6	96	73/78
Libya	4.9	11.6	42	8	3.4	3.5	84	62/65
Jordan	3.9	8.1	38	5	3.3	3.3	69	68/72
Saudi Arabia	16.8	38.8	35	5	3.0	3.3	78	68/71
Syria	13.0	30.4	42	6	3.6	3.3	51	65/69
Yemen	13.0	31.9	50	15	3.6	3.3	31	52/53
Iraq	19.2	40.5	37	7	3.0	3.0	73	62/68
Bahrain	0.5	0.9	25	5	2.0	2.6	84	68/71
Iran	59.6	116.7	32	7	2.5	2.5	58	65/66
Algeria	26.3	44.3	30	6	2.4	2.4	54	67/68
United Arab Emirates	1.7	2.6	22	4	1.8	2.4	82	70/74
Qatar	0.5	0.8	22	4	1.9	2.3	91	68/73
Morocco	26.2	40.8	28	8	2.0	2.0	47	62/65
Egypt	54.7	81.7	28	9	2.0	1.9	44	60/63
Lebanon	3.8	5.5	28	8	1.9	1.9	86	64/68
Tunisia	8.4	13.4	25	6	1.9	1.9	57	67/69

*Rate of natural increase: birth rate minus death rate
**Population growth rate:natural increase plus net migration

Source: World Bank population data base, World Bank publication "A population perspective on development: The middle East and North Afri

Table G-2.2 - Demographic Indicators for Countries in the Middle East and North Africa Region

	Life expectancy at birth male/female (years)	Infant mortality rate (per 1000)	Average number of children (per woman)	Contaceptive prevalence c.1990 (%)	Girls' secondary school enrollment 1991 (%)
Bahrain	68/71	21	3.7	54	
Tunisia	67/69	32	3.8	50	42
Egypt	60/63	57	3.8	47	73
Morocco	62/65	57	3.8	42	29
Jordan	68/72	28	5.2	40	62
Syria	65/69	36	4.3	40	43
Iran	65/66	65	5	37	49
Algeria	67/68	55	4.3	35	53
Kuwait	73/78	14	3.7	35	
Qatar	68/73	26	4	32	
Yemen	52/53	106	7.6	10	
Oman	68/72	20	7.2	9	53
Iraq	62/68	58	5.7		
Lebanon	64/68	34	3.1		
Libya	62/65	68	6.4		
Saudi Arabia	68/71	28	6.4		41
United Arab Emirates	70/74	20	4.5		73

*Rate of natural increase: birth rate minus death rate
**Population growth rate:natural increase plus net migration

Source: World Bank population data base, World Bank publication "A population perspective on development: The middle East and North Afri

Table G-2.3 - Population by Age Group as % of Total

Age Groups	Census Year 1994	1981	1970
<1	2.9	3.9	3.7
1-4	11.9	15.4	15.2
5-9	15.3	15.6	17.1
10-14	14.5	13.5	13.3
15-19	11.5	11.3	9.6
20-24	9.1	8.4	7.3
25-29	7.6	6.2	5.6
30-34	6.2	5.0	5.1
35-39	4.7	3.8	5.0
40-44	3.9	3.6	4.2
45-49	2.9	3.1	3.2
50-54	2.4	3.2	2.4
55-59	2.0	2.0	1.9
60-64	2.0	1.7	2.1
65-69	3.0	1.0	1.4
70-74	*	1.0	1.4
75-79	*	0.4	1.7
>80	*	0.8	*

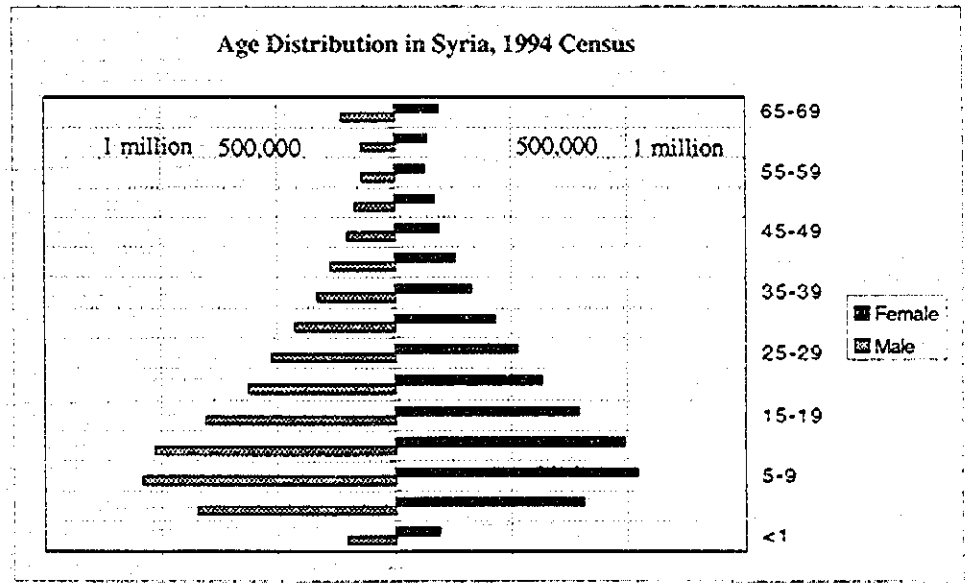

Table G-2.4 - Population of DAWSSA Service Areas by Census Year

	1960	1970		1981		1994	
	population (000's)	population (000's)	Average annual growth* (%)	population (000's)	Average annual growth* (%)	population (000's)	Average annual growth* (%)
1. Areas outside Damascus							
Ain El Figeh	1,456	2,244	4.4%	2,900	2.4%	3,822	2.1%
Ain El Khadra	-	2		-		2,145	
Bassimeh	1,004	1,724	5.6%	2,390	3.0%	450	-12.1%
Al Achrafei	608	882	3.8%	1,100	2.0%	3,184	8.5%
Al Jedaide	1,140	1,601	3.5%	1,960	1.9%	4,292	6.2%
Al Hameh & Jemrya	2,311	3,652	4.7%	4,810	2.5%	22,404	12.6%
Kudasaya	2,349	3,978	5.4%	5,450	2.9%	21,729	11.2%
Military area						13,500	n/a
Maaraba						4,500	n/a
Assad suburb						7,500	n/a
Takadom (1)						35,000	n/a
Kudasaya (1)						20,000	
Sub-total	8,868	14,083	4.7%	18,610	2.6%	138,526	n/a
2. Damascus City (includes informal areas)	551,754	836,668	4.25%	1,113,194	2.63%	1,394,322	1.75%
Total	560,622	850,751	4.3%	1,131,804	2.6%	1,532,848	2.4%

Source: Central Bureau of Statistics

*growth rate calculated by the formula $Pt=Po\ (1+r)^t$ where t=period in years, r=average growth rate per year, Po=population at beginning of period.
(1) informal area outside census district therefore not included in census, estimate provided by DAWSSA

Table G-2.5 - Population in Damascus City Governate by Census District 1994

Census District No.	Population (1)	Families	Occupied Dwellings	no. of persons per dwelling	no. of persons per family	Dwellings under construction
1	47,295	9,262	8,022	5.9	5.1	1,656
2	29,886	5,909	5,347	5.6	5.1	1,522
3	18,476	3,494	2,908	6.4	5.3	551
4	25,825	5,106	4,205	6.1	5.1	570
5	22,707	4,675	3,685	6.2	4.9	738
6	22,368	5,394	4,857	4.6	4.1	1,136
7	10,986	2,474	2,348	4.7	4.4	735
8	8,995	1,993	1,912	4.7	4.5	530
9	4,133	981	966	4.3	4.2	738
10	5,916	737	559	10.6	8.0	208
11	6,763	1,325	1,129	6.0	5.1	538
12	86,843	16,946	16,287	5.3	5.1	6,242
13	21,002	4,159	3,445	6.1	5.0	557
14	48,446	9,746	9,138	5.3	5.0	4,683
15	19,309	4,377	4,296	4.5	4.4	1,615
16	16,781	4,123	4,036	4.2	4.1	2,005
17	10,169	2,083	1,812	5.6	4.9	762
18	5,741	1,115	1,090	5.3	5.1	332
19	8,813	1,506	1,300	6.8	5.9	275
20	8,101	1,605	1,242	6.5	5.0	317
21	8,186	1,678	1,602	5.1	4.9	321
22	19,946	3,762	3,610	5.5	5.3	1,091
23	26,315	4,956	3,958	6.6	5.3	2,740
24	67,823	12,083	9,629	7.0	5.6	1,495
25	62,917	10,720	7,864	8.0	5.9	732
26	23,278	3,964	3,687	6.3	5.9	802
27	13,105	2,384	1,955	6.7	5.5	500
28	10,274	1,942	1,414	7.3	5.3	455
29	9,519	1,689	1,470	6.5	5.6	413
30	9,641	1,827	1,571	6.1	5.3	220
31	30,948	5,925	5,184	6.0	5.2	1,567
32	7,423	1,414	1,219	6.1	5.2	349
33	46,217	8,443	7,878	5.9	5.5	2,018
34	6,192	1,156	1,115	5.6	5.4	301
35	3,682	758	500	7.4	4.9	272
36	8,990	1,868	1,361	6.6	4.8	322
37	6,346	1,259	948	6.7	5.0	201
38	6,815	1,373	973	7.0	5.0	236
39	3,950	771	650	6.1	5.1	190
40	1,020	244	207	4.9	4.2	23
41	3,342	705	469	7.1	4.7	77
42	3,343	706	483	6.9	4.7	92
43	8,876	1,797	1,540	5.8	4.9	528
44	12,481	2,574	2,269	5.5	4.8	475
45	10,615	2,196	1,527	7.0	4.8	267
46	12,263	2,846	1,852	6.6	4.3	371
47	2,569	524	390	6.6	4.9	119
48	50,422	9,345	7,644	6.6	5.4	1,748
49	19,936	4,200	3,894	5.1	4.7	1,099
50	21,222	4,757	4,699	4.5	4.5	1,571
51	25,240	5,172	4,359	5.8	4.9	1,196
52	9,930	2,087	2,062	4.8	4.8	1,033
53	26,403	4,957	4,412	6.0	5.3	895
54	11,934	2,889	2,830	4.2	4.1	1,050
55	50,580	9,644	6,548	7.7	5.2	1,470
56	74,411	13,809	12,568	5.9	5.4	3,104
57	24,683	4,909	4,625	5.3	5.0	1,211
58	55,700	10,666	10,325	5.4	5.2	2,781
59	34,086	6,425	6,043	5.6	5.3	1,231
60	73,041	13,318	10,941	6.7	5.5	1,363
61	22,969	5,131	3,608	6.4	4.5	393
62	39,134	7,491	5,392	7.3	5.2	787
	1,394,322	271,377	233,859	6.0	5.1	62,852

(1) includes informal population

Table G-2.6 - Central Bureau of Statistics Population Forecasts for Damascus City

Year	Population* (millions)	Average Annual Growth Rate** (%)	Density per km²
1995	1.414	1.41	7,856
2000	1.539	1.71	8,550
2005	1.673	1.68	9,294
2010	1.802	1.50	10,013
2015	1.942	1.50	10,787
2020	2.092	1.50	11,620

Source: Central Bureau of Statistics

*Estimates for the years 2010, 2015, 2020 are based on discussions with CBS and not officialy published

Table G-2.7 - Master Plan Population Forecasts for Damascus City Governate

Year	Population (millions)	Average Growth Rate (%)	Density per km²
1995	1.468		8,156
2000	1.621	2.00	9,006
2005	1.772	1.80	9,844
2010	1.878	1.17	10,433
2015	1.934	0.59	10,744
2020	2.000	0.67	11,111

Source: Municipality of Damascus Master Plan

Table G-2.8 - Population Projections for Water Supply Master Plan (Damascus City Governate)

Year	Population (millions)	Average Growth Rate** (%)	Density per km²
1995	1.422	2.00	7,901
2000	1.570	2.00	8,724
2005	1.734	2.00	9,631
2010	1.914	2.00	10,634
2015	2.113	2.00	11,741
2020	2.333	2.00	12,963

**growth rate calculated by the formula $P_t=P_o(1+r)^t$ where t=period in years, r=average growth rate per year, P_o=population at beginning of period.

Table G-2.9 - Master Plan Population Forecasts for Suburbs and Rural Areas

Year	Population In Rural Governate*	Average annual growth rate**** (%)	DAWSSA Service Population**	Projected Population***
1960			8,868	
1970			14,083	
1981			18,610	
1994			-	
1995	375,000	4.50%		144,760
2000	468,000	4.53%		180,650
2005	600,000	5.09%		231,615
2010	770,000	5.12%		297,240
2015	1,020,000	5.78%		393,746
2020	1,260,000	4.32%		486,392

* population projections from municipal master plan
** population based on census data
*** population estimate based on growth rates established in municipal master plan

Table G-2.10 - Estimate of Informally Connected Population

Calculation Method 1 - Census population data .vs. DAWSSA metered connections	
1994 population (based on Census)	1,429,322
no. of households 1994 (based on census)	238,234
Less metered domestic subscribers (DAWSSA billing data)	(195,722)
Total estimated no. of unmetered households	**42,512**
Informally connected population (based on average of 8 persons per connection)	**340,096**
Informally connected population as a percent of total census population for Damascus	24%

Calculation Method 2 - By estimating population density and ratio of informal to formal by census district.

Informal area	Census district No.	Total district population(1)	Number of dwellings in district	Number of subscribers in district	Informally connected dwellings	Ratio of informal to formal population (2)	Estimated informal population based on ratio	Ratio of informal to formal population (3)	Area of informal settlement (ha)	Population density of informal settlement
Esh Al Warwa	56	74,411	15,672	12,242	3,430	0.22	14,882	0.20	31.9	467
Kassioun	1,2,3,4,5,6	166,557	29,024	23,192	5,832	0.20	33,311	0.20	30.9	1,078
Tichreen	55	60,580	6,548	4,949	1,599	0.24	15,145	0.25	36.2	418
Jobar	48	50,400	9,392	9,509	(117)	(0.01)	25,200	0.50	63.7	396
Tabbaleh	61,62	62,103	9,000	7,202	1,798	0.20	12,421	0.20	135.2	92
Yarmouk	57,58,59,60	187,510	31,934	17,815	14,119	0.44	84,380	0.45	118	715
Kadam	25,30	72,558	9,435	4,782	4,653	0.49	36,279	0.50	170.4	213
Carfasouse&M	23, 24	94,138	13,587	8,694	4,893	0.36	42,362	0.45	-	-
Shagour bassat	33,34	52,409	11,142	8,892	2,250	0.20	10,482	0.20	64.2	163
mezzeh 86	11, 12, 13	113,700	20,861	15,845	5,016	0.24	45,480	0.40	95.7	475
Somareya	n/a	5,000	7,337	n/a	n/a	n/a	4,500	0.90	37.6	120
Dummar	14	48,500	9,138	12,067	(2,929)	(0.32)	14,550	0.30	41.9	347
Kudsaya	n/a	20,000	n/a	n/a	n/a	n/a	20,000	1.00		
Takadom	n/a	40,000	n/a	n/a	n/a	n/a	40,000	1.00	54.5	734
Total		**1,047,866**					**398,992**	**0.38**	**880.2**	**453**
Informally connected population as a percent of total service population							26%			

(1) Population of the whole census district within which the smaller informal area is located.
(2) Ratio calculated from number of subscriber connections divided by no. of dwellings reported by census
a negative number indicates invalid data.
(3) Estimated ratio
(4) Census figure adjusted to include Takadom & Kudsaya informal areas. Other informal areas included in census figures

Table G-2.11 - Service Population Projection Scenarios

Year	Census	Scenario 3 Municipal Master Plan	Average Annual Growth Rate (%)	Scenario 2 Water Supply Master Plan	Average Annual Growth Rate (%)	Scenario 1 High Growth	Average Annual Growth Rate (%)
1960	582,413						
1970	980,629						
1981	1,320,870						
1994	1,512,619						
1995		1,612,760		1,566,968		1,585,094	
2000		1,801,660	2.24	1,750,893	2.24	1,874,861	3.41
2005		2,003,615	2.15	1,965,280	2.34	2,224,429	3.48
2010		2,175,240	1.66	2,211,345	2.39	2,641,297	3.50
2015		2,327,746	1.36	2,507,073	2.54	3,150,956	3.59
2020		2,486,392	1.33	2,819,676	2.38	3,729,575	3.43
Average annual growth rate (95-2015)			1.82%		2.33%		3.41%

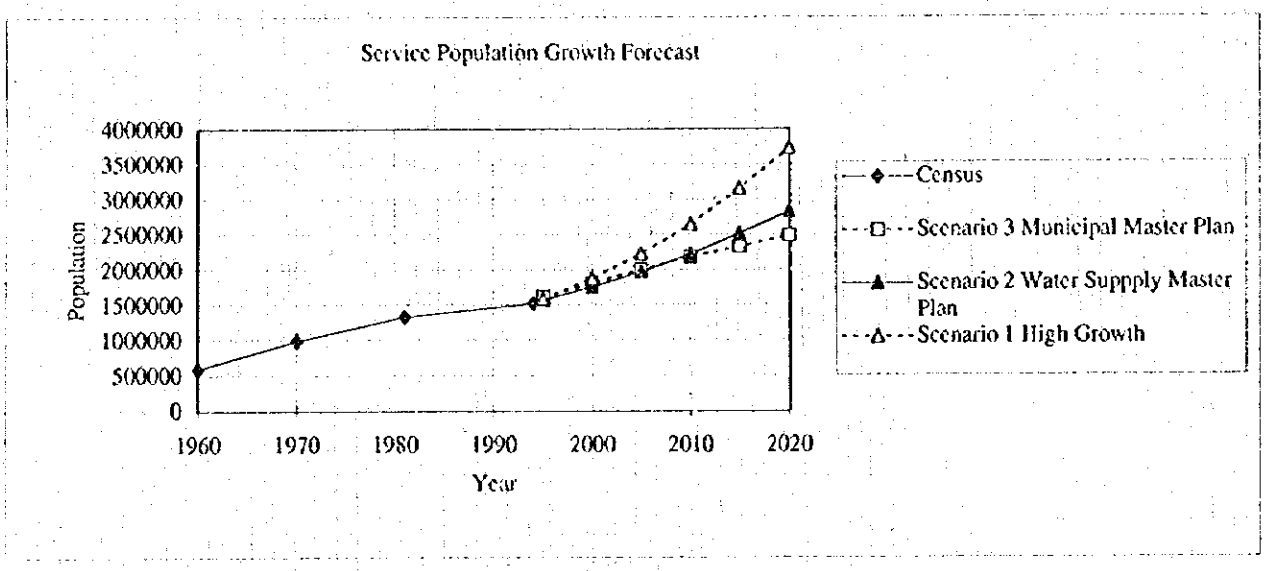

Table G-2.12 (1/2) - Population Projections by Service Area

Service area	Area (ha) in 1994	1995 Population	1995 Population Density (persons/ha)	1995 Average Growth Rate 94-95	2000 Population	2000 Population Density (persons/ha)	2000 Average Growth Rate 95-2000	2005 Population	2005 Population Density (persons/ha)	2005 Average Growth Rate 2000-2005
1. Existing Service Areas Outside Damascus		144,760			180,660		4.53%	231,615		5.09%
Ain El Figeh	44	3,975	89.7	4.00%	4,289	90.1	2.00%	4,845	109.4	2.00%
Ain El Khadra	12	2,231	230.7	4.00%	2,463	210.5	2.00%	2,719	232.4	2.00%
Bassimeh	18	468		4.00%	517	29.5	2.00%	570	32.6	2.00%
Al Aebnafeh	27	3,311	123.1	4.00%	3,656	135.9	2.00%	4,037	150.1	2.00%
Al Jedaide	53	4,464	83.9	4.00%	4,928	92.6	2.00%	5,441	102.3	2.00%
Al Hamch	56	21,570	383.8	4.00%	23,815	423.8	2.00%	26,294	467.9	2.00%
Jemrya	5	2,034	383.8	4.00%	2,246	423.7	2.00%	2,479	467.8	2.00%
Kudasaya suburb	108	22,598	209.8	4.00%	23,169	215.1	0.50%	23,754	220.6	0.50%
Military Area 4 (residential)	170	14,040	82.6	4.00%	14,040	82.6	0.00%	14,040	82.6	0.00%
Maarabu		4,680		4.00%	5,167		2.00%	5,431		1.00%
Assad suburb		7,800		4.00%	8,612		2.00%	10,732		4.50%
Takadom (informal)		36,750		5.00%	40,575		2.00%	44,798		2.00%
Kudsaya (informal)		20,800		4.00%	22,965		2.00%	25,355		2.00%
2. Proposed New Development Areas Outside Damascus										
Kudasaya suburb	300	-	-	-	-	-	-	30,000	100.0	-
Kudasaya proposed expansion	200	-	-	-	-	-	-	-	-	-
Dummar extension area (phase 1)	124	-	-	-	20,500	94.9	-	26,793	124.0	5.50%
Dummar extension area (phase 2)	216	-	-	-	-	-	-	-	-	-
Kassioun new town	340	-	-	-	-	-	-	-	-	-
Assad suburb (phase 2)	193	-	-	-	-	-	-	-	-	-
Assad suburb extension area	298	-	-	-	-	-	-	-	-	-
Assad city (Somaeya)	655	-	-	-	-	-	-	-	-	-
Assad city extension area 1	200	-	-	-	-	-	-	-	-	-
Assad city extension area 2	124	-	-	-	-	-	-	-	-	-
Assad city extension area 3	575	-	-	-	-	-	-	-	-	-
Special Area (static factory)	25	-	-	-	3,500	140.0	-	4,000	160.0	2.71%
Sub-total	1,673	144,721	86.5		180,541	107.9		231,288	138.3	
3. Damascus City Governate		1,422,208		2.00%	1,570,233		2.00%	1,733,664		2.00%
Dummar existing	473	49,415	104.5	2.00%	54,558	115.3	2.00%	60,237	127.3	2.00%
Mouhajreen	363	77,461	213.4	2.00%	85,523	235.6	2.00%	94,424	260.1	2.00%
Ruku Aldyn	437	166,768	381.6	2.00%	184,125	421.3	2.00%	203,289	465.2	2.00%
Berze	673	75,899	112.8	2.00%	83,799	124.5	2.00%	92,521	137.5	2.00%
Jobar	642	104,106	162.2	2.00%	114,942	179.0	2.00%	126,905	197.7	2.00%
Saroujа	349	117,617	337.0	2.00%	129,859	372.1	2.00%	143,375	410.8	2.00%
Old City	145	18,493	127.5	2.00%	20,417	140.8	2.00%	22,542	155.5	2.00%
Kanawat	269	66,761	248.2	2.00%	73,710	274.0	2.00%	81,381	302.5	2.00%
Kadam	300	64,175	213.9	2.00%	70,855	236.2	2.00%	78,229	260.8	2.00%
Shaghour	470	65,631	139.6	2.00%	72,462	154.2	2.00%	80,004	170.2	2.00%
Midan	296	143,579	485.1	2.00%	158,523	535.6	2.00%	175,022	591.3	2.00%
Mezze	1,328	110,002	82.8	2.00%	121,451	91.5	2.00%	134,092	101.0	2.00%
Kaboon	497	51,592	103.8	2.00%	56,961	114.6	2.00%	62,890	126.5	2.00%
Cafarsouse	1,200	96,021	80.0	2.00%	106,015	88.3	2.00%	117,049	97.5	2.00%
Yarmouk	227	214,689	945.8	2.00%	237,034	1,044.2	2.00%	261,704	1,152.9	2.00%
Sub-total	7,669	1,422,208	185.4		1,570,233	204.8		1,733,664	226.1	
Total	9,342	1,566,929	167.7	2.22%	1,750,774	187.4	2.24%	1,964,952	210.3	2.34%

Table G-2.12 (2/2) - Population Projections by Service Area

Service area		2010 Population	2010 Population Density (persons/ha)	2010 Average Growth Rate 2005-2010	2015 Population	2015 Population Density (persons/ha)	2015 Average Growth Rate 2010-2015	2020 Population	2020 Population Density (persons/ha)	2020 Average Growth Rate 2015-2020
1. Existing Service Areas Outside Damascus		297,240		5.12%	393,746		5.78%	486,392		4.32%
Ain El Figeh	44	4,968	112.1	0.50%	5,093	115.0	0.50%	5,222	117.9	0.50%
Ain El Khadra	12	2,788	238.3	0.50%	2,858	244.3	0.50%	2,931	250.5	0.50%
Bassimeh	18	585	33.4	0.50%	600	34.3	0.50%	615	35.1	0.50%
Al Achrafei	27	4,138	153.8	0.50%	4,243	157.7	0.50%	4,350	161.7	0.50%
Al Jedaide	53	5,579	104.9	0.50%	5,719	107.5	0.50%	5,864	110.2	0.50%
Al Hameh	56	26,958	479.7	0.50%	27,628	491.8	0.50%	28,336	504.2	0.50%
Jemrya	5	2,542	479.6	0.50%	2,606	491.7	0.50%	2,672	504.2	0.50%
Kudasaya suburb (existing)	108	24,354	226.1	0.50%	24,969	231.8	0.50%	25,599	237.7	0.50%
Military Area 4 (residential)	170	14,040	82.6	0.00%	14,040	82.6	0.00%	14,040	82.6	0.00%
Maaraba	75	5,568	74.2	0.50%	5,708	76.1	0.50%	5,853	78.0	0.50%
Assad suburb	40	11,949	296.2	2.00%	13,082	327.1	2.00%	13,749	343.7	1.00%
Takadom (informal)		49,461		2.00%	54,609		2.00%	60,292		2.00%
Kudsaya (informal)		31,597		4.50%	38,443		4.00%	45,658		3.50%
2. Proposed New Development Areas Outside Damascus										
Kudasaya Suburb new development	300	48,315	161.1	10.00%	53,344	177.8	2.00%	58,896	196.3	2.00%
Kudasaya proposed new development	200	-	-	-	-	-	-	25,000	125.0	-
Dummar extension area (phase 1)	124	35,017	282.4	5.50%	38,662	311.8	2.00%	42,685	344.2	2.00%
Dummar extension area (phase 2)	216	-	-	-	25,000	115.7	-	29,692	137.5	3.50%
Kassioun new town	340	-	-	-	-	-	-	12,000	35.3	-
Assad suburb (phase 2)	193	25,000	129.5	-	33,456	173.3	6.00%	39,735	205.9	3.50%
Assad suburb extension area	298	-	-	-	14,000	47.0	-	16,628	55.8	3.50%
Assad city (Somaniya)	655	-	-	-	25,000	38.2	-	29,692	45.3	3.50%
Assad city extension area 1	200	-	-	-	-	-	-	12,500	62.5	-
Assad city extension area 2	124	-	-	-	-	-	-	-	-	-
Assad city extension area 3	575	-	-	-	-	-	-	-	-	-
Special Area (state factory)	25	4,204	168.2	1.00%	4,418	176.7	1.00%	4,644	185.8	1.00%
Sub-total	2,279	296,962			393,488	235.2		486,653	290.9	
3. Damascus City Governate		1,914,105		2.00%	2,113,327		2.00%	2,333,284		2.00%
Dummar existing	473	66,506	140.6	2.00%	73,428	155.2	2.00%	81,070	171.4	2.00%
Mouhajreen	363	104,252	287.2	2.00%	115,103	317.1	2.00%	127,083	350.1	2.00%
Ruku Aldyn	437	224,448	513.6	2.00%	247,808	567.1	2.00%	273,601	626.1	2.00%
Berze	673	102,150	151.8	2.00%	112,782	167.6	2.00%	124,521	185.0	2.00%
Jobar	642	140,313	218.2	2.00%	154,896	241.0	2.00%	170,797	266.0	2.00%
Sarouja	349	158,297	453.6	2.00%	174,773	500.8	2.00%	192,964	552.9	2.00%
Old City	145	24,889	171.6	2.00%	27,479	189.5	2.00%	30,339	209.2	2.00%
Kanawat	269	89,852	334.0	2.00%	99,203	368.8	2.00%	109,529	407.2	2.00%
Kadam	300	86,372	287.9	2.00%	95,361	317.9	2.00%	105,286	351.0	2.00%
Shaghour	470	88,331	187.9	2.00%	97,524	207.5	2.00%	107,674	229.1	2.00%
Midan	296	193,229	652.8	2.00%	213,351	720.8	2.00%	235,557	795.8	2.00%
Mezze	1,328	148,048	111.5	2.00%	163,457	123.1	2.00%	180,470	135.9	2.00%
Kaboon	497	69,436	139.7	2.00%	76,662	154.3	2.00%	84,641	170.3	2.00%
Cafarsouse	1,200	129,231	107.7	2.00%	142,682	118.9	2.00%	157,532	131.3	2.00%
Yarmouk	227	288,943	1,272.9	2.00%	319,016	1,405.4	2.00%	352,219	1,551.6	2.00%
Sub-total	7,669	1,914,105	249.6		2,113,327	275.6		2,333,284	304.2	
Total	9,948	2,211,067	236.7	2.39%	2,506,815	268.3	2.54%	2,819,936	301.9	2.38%

Table G-3.1 Average Number of Family Members

Designation			Average		
				Adults	Children
Damascus			6.01	3.87	2.15
District	1	Dummar	6.12	4.00	2.12
	2	Mouhajreen	5.98	4.07	1.91
	3	Rukn Aldyn	5.32	3.21	2.11
	4	Berze	6.04	3.10	2.94
	5	Jobar	6.45	4.00	2.45
	6	Sarouja	5.24	3.76	1.49
	7	Old City	6.27	4.20	2.07
	8	Kanawat	5.72	4.00	1.72
	9	Kadam	7.26	4.11	3.14
	10	Shaghour	6.35	4.97	1.38
	11	Midan	6.33	4.04	2.29
	12	Mezze	4.86	3.52	1.34
	13	Kabon	4.83	2.97	1.87
	14	Cafarsouse	7.25	4.25	3.00
	15	Yarmouk	6.43	4.29	2.14
Class	HC	High	5.50	3.91	1.59
	MC	Middle	6.33	4.19	2.14
	LC	Low	5.79	3.85	1.94
	IR	Informal	6.33	3.70	2.63

(Source : Interview Survey)

Table G-3.2 Average Monthly Income per Family

Syrian Lira (S.L.)

1 US$ = 50 S.L

Designation			1000-3000		3000-5000		5000-10000		10000-25000		25000-50000		50000 +	
			No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Damascus			25	4.2	153	25.5	187	31.2	119	19.8	16	2.7	100	16.7
District	1	Dummar	0	0	9	36.0	5	20.0	2	8.0	3	12.0	6	24.0
	2	Mouhajreen	1	2.2	7	15.6	5	11.1	11	24.4	0	0	21	46.7
	3	Rukn Aldyn	0	0	7	12.5	29	51.8	11	19.6	2	3.6	7	12.5
	4	Berze	0	0	6	12.5	31	64.6	8	16.7	0	0	3	6.3
	5	Jobar	3	6.8	14	31.8	18	40.9	8	18.2	0	0	1	2.3
	6	Sarouja	3	7.3	6	14.6	7	17.1	5	12.2	7	17.1	13	31.7
	7	Old City	0	0	3	20.0	3	20.0	6	40.0	1	6.7	2	13.3
	8	Kanawat	1	3.4	12	41.4	4	13.8	6	20.7	0	0	6	20.7
	9	Kadam	0	0	8	22.9	10	28.6	15	42.9	1	2.9	1	2.9
	10	Shaghour	2	5.9	7	20.6	13	38.2	8	23.5	0	0	4	11.8
	11	Midan	6	11.5	15	28.8	10	19.2	9	17.3	2	3.8	10	19.2
	12	Mezze	3	6.0	13	26.0	11	22.0	10	20.0	0	0	13	26.0
	13	Kabon	3	10.0	14	46.7	6	20.0	6	20.0	0	0	1	3.3
	14	Cafarsouse	0	0	13	32.5	12	30.0	5	12.5	0	0	10	25.0
	15	Yarmouk	3	5.4	19	33.9	23	41.1	9	16.1	0	0	2	3.6
Class	HC	High	0	0	0	0	0	0	0	0	0	0	100	100.0
	MC	Middle	0	0	0	0	0	0	85	85.0	15	15.0	0	0
	LC	Low	12	6.0	86	43.0	102	51.0	0	0	0	0	0	0
	IR	Informal	13	6.5	67	33.5	85	42.5	34	17.0	1	.5	0	0

(Source : Interview Survey)

Table G-3.3 Classification of Used Water Resource

(Unit : %)

Water Use Classsification	DAWSSA Water Supply		Private Tank Lorry	Bottled Water	Private Spring/wells	Communal Spring/wells	Others	Total
	Individual	Shared						
Drinking & Cooking	71.8	18	0.2	4.7	0.3	0.5	4.5	100
Laundering	71.5	17.5	0.0	0.0	6.0	4.7	0.3	100
Bathing	71.8	17.5	0.0	0.0	5.8	4.5	0.3	100
Toilet	71.2	17.3	0.0	0.0	5.8	5.3	0.3	100
Gardening	34	11.3	0.0	0.0	5.5	5.0	0.3	56
In Dry Season	23.2	9.7	0.0	0.0	4.3	4.2	0.3	42

(Source : Interview Survey)

Table G-3.4 Percentage of Major Water Resource

For Drinking And cooking

Designation		DAWASSA pipe Individual connection		DAWASSA pipe, Shared connection		Private Tank Lorry		Bottled Water		Private Spring or Wells		Communal Spring or Wells		Others		Residences
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
Damascus		431	71.8	108	18.0	1	.2	28	4.7	2	.3	3	.5	27	4.5	600
District	1 Dummar	15	60.0	7	28.0	0	0	2	8.0	1	4.0	0	0	0	0	25
	2 Mouhajreen	42	93.3	3	6.7	0	0	0	0	0	0	0	0	0	0	45
	3 Rukn Aldyn	54	96.4	2	3.6	0	0	0	0	0	0	0	0	0	0	56
	4 Berze	36	75.0	12	25.0	0	0	0	0	0	0	0	0	0	0	48
	5 Jobar	25	56.8	17	38.6	1	2.3	0	0	0	0	1	2.3	0	0	44
	6 Sarouja	32	78.0	9	22.0	0	0	0	0	0	0	0	0	0	0	41
	7 Old City	15	100.0	0	0	0	0	0	0	0	0	0	0	0	0	15
	8 Kanawat	27	93.1	1	3.4	0	0	0	0	1	3.4	0	0	0	0	29
	9 Kadam	20	57.1	3	8.6	0	0	12	34.3	0	0	0	0	0	0	35
	10 Shaghour	18	52.9	16	47.1	0	0	0	0	0	0	0	0	0	0	34
	11 Midan	40	76.9	11	21.2	0	0	1	1.9	0	0	0	0	0	0	52
	12 Mezze	48	96.0	0	0	0	0	2	4.0	0	0	0	0	0	0	50
	13 Kabon	12	40.0	11	36.7	0	0	6	20.0	0	0	1	3.3	0	0	30
	14 Cafarsouse	32	80.0	8	20.0	0	0	0	0	0	0	0	0	0	0	40
	15 Yarmouk	15	26.8	8	14.3	0	0	5	8.9	0	0	1	1.8	27	48.2	56
Class	HC High	96	96.0	2	2.0	0	0	2	2.0	0	0	0	0	0	0	100
	MC Middle	88	88.0	8	8.0	0	0	4	4.0	0	0	0	0	0	0	100
	LC Low	156	78.0	32	16.0	0	0	12	6.0	0	0	0	0	0	0	200
	IR Informal	91	45.5	66	33.0	1	.5	10	5.0	2	1.0	3	1.5	27	13.5	200

(Source : Interview Survey)

Table G-3.5 Present Status of Dawssa Water

Designation			Satisfactory		Unsatisfactory												Storage device			
					Total		Due to reasons													
							Poor quality		Low pressur		Unstable		Insufficient		Expensive		Yes		No	
			No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Damascus			284	71.0	116	29.0	54	13.5	37	9.3	4	1.0	10	2.5	11	2.8	339	84.8	61	15.3
District	1	Dummar	15	88.2	2	11.8	0	0	2	11.8	0	0	0	0	0	0	17	100.0	0	0
	2	Mouhajreen	33	80.5	8	19.5	0	0	7	17.1	0	0	1	2.4	0	0	41	100.0	0	0
	3	Rukn Aldyn	31	83.8	6	16.2	4	10.8	1	2.7	0	0	0	0	1	2.7	35	94.6	2	5.4
	4	Berze	28	93.3	2	6.7	0	0	0	0	0	0	2	6.7	0	0	30	100.0	0	0
	5	Jobar	7	26.9	19	73.1	19	73.1	0	0	0	0	0	0	0	0	19	73.1	7	26.9
	6	Sarouja	38	92.7	3	7.3	2	4.9	1	2.4	0	0	0	0	0	0	29	70.7	12	29.3
	7	Old City	11	73.3	4	26.7	0	0	4	26.7	0	0	0	0	0	0	12	80.0	3	20.0
	8	Kanawat	25	92.6	2	7.4	0	0	1	3.7	0	0	1	3.7	0	0	20	74.1	7	25.9
	9	Kadam	4	23.5	13	76.5	13	76.5	0	0	0	0	0	0	0	0	11	64.7	6	35.3
	10	Shaghour	16	80.0	4	20.0	0	0	4	20.0	0	0	0	0	0	0	8	40.0	12	60.0
	11	Midan	14	41.2	20	58.8	7	20.6	0	0	3	8.8	2	5.9	8	23.5	26	76.5	8	23.5
	12	Mezze	21	65.6	11	34.4	2	6.3	7	21.9	0	0	1	3.1	1	3.1	31	96.9	1	3.1
	13	Kabon	15	93.8	1	6.3	0	0	1	6.3	0	0	0	0	0	0	16	100.0	0	0
	14	Cafarsouse	17	60.7	11	39.3	4	14.3	6	21.4	1	3.6	0	0	0	0	27	96.4	1	3.6
	15	Yarmouk	9	47.4	10	52.6	3	15.8	3	15.8	0	0	3	15.8	1	5.3	17	89.5	2	10.5
Class	HC	High	72	72.0	28	28.0	8	8.0	17	17.0	1	1.0	2	2.0	0	0	94	94.0	6	6.0
	MC	Middle	74	74.0	26	26.0	14	14.0	9	9.0	0	0	3	3.0	0	0	86	86.0	14	14.0
	LC	Low	138	69.0	62	31.0	32	16.0	11	5.5	3	1.5	5	2.5	11	5.5	159	79.5	41	20.5

(Source : Interview Survey)

Table G-3.6 Availability of Water Supply

Dawssa Water

Designation			Dawssa Water Availability (Day/week)										Daily Water Availability in Dry Season (Hours/day)							
			One day		Two days		Three days		Four days +		All week		< 4 hrs		4 to 8 hrs		8 to 12 hrs		Over 12 hrs	
			No.	Ratio	No.	Ratio	No.	Ratio	No.	Ratio	No.	Ratio	No.	Ratio	No.	Ratio	No.	Ratio	No.	Ratio
Damascus			4	.010	1	.003	5	.013	58	.145	332	.830	20	.050	19	.048	140	.350	221	.553
District	1	Dummar	0	0	0	0	0	0	0	0	17	1.000	0	0	0	0	0	0	17	1.000
	2	Mouhajreen	0	0	0	0	0	0	1	.024	40	.976	0	0	2	.049	7	.171	32	.780
	3	Rukn Aldyn	0	0	0	0	0	0	20	.541	17	.459	0	0	0	0	29	.784	8	.216
	4	Berze	0	0	0	0	1	.033	24	.800	5	.167	1	.033	1	.033	25	.833	3	.100
	5	Jobar	0	0	0	0	0	0	2	.077	24	.923	0	0	0	0	7	.269	19	.731
	6	Sarouja	2	.049	0	0	0	0	0	0	39	.951	0	0	2	.049	14	.341	25	.610
	7	Old City	0	0	0	0	0	0	0	0	15	1.000	2	.133	0	0	1	.067	12	.800
	8	Kanawat	0	0	0	0	0	0	2	.074	25	.926	3	.111	2	.074	4	.148	18	.667
	9	Kadam	1	.059	1	.059	1	.059	0	0	14	.824	2	.118	0	0	2	.118	13	.765
	10	Shaghour	0	0	0	0	0	0	1	.050	19	.950	0	0	0	0	5	.250	15	.750
	11	Midan	1	.029	0	0	0	0	0	0	33	.971	2	.059	1	.029	19	.559	12	.353
	12	Mezze	0	0	0	0	1	.031	1	.031	30	.938	6	.188	1	.031	3	.094	22	.688
	13	Kabon	0	0	0	0	1	.063	0	0	15	.938	1	.063	3	.188	1	.063	11	.688
	14	Cafarsouse	0	0	0	0	1	.036	4	.143	23	.821	3	.107	6	.214	13	.464	6	.214
	15	Yarmouk	0	0	0	0	0	0	3	.158	16	.842	0	0	1	.053	10	.526	8	.421
Class	HC	High	2	.020	0	0	1	.010	9	.090	88	.880	4	.040	8	.080	36	.360	52	.520
	MC	Middle	2	.020	1	.010	1	.010	18	.180	78	.780	5	.050	4	.040	37	.370	54	.540
	LC	Low	0	0	0	0	3	.015	31	.155	166	.830	11	.055	7	.035	67	.335	115	.575

(Source : Interview Survey)

Table G-3.7 Percentage of Major Water Resource

For Other Uses If Any In Dry Season

Designation		DAWASSA pipe Individual connection		DAWASSA pipe, Shared connection		Private Tank Lorry		Bottled Water		Private Spring or Wells		Communal Spring or Wells		Others		Residences		
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
Damascus		139	23.2	58	9.7	0	0	0	0	26	4.3	25	4.2	2	.3	524	87.3	600
District	1 Dummar	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	100.0	25
	2 Mouhajreen	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	11.1	45
	3 Rukn Aldyn	0	0	0	0	0	0	0	0	0	0	0	0	0	0	46	82.1	56
	4 Berze	0	0	0	0	0	0	0	0	0	0	0	0	0	0	48	100.0	48
	5 Jobar	25	56.8	17	38.6	0	0	0	0	1	2.3	1	2.3	0	0	44	100.0	44
	6 Sarouja	32	78.0	9	22.0	0	0	0	0	0	0	0	0	0	0	41	100.0	41
	7 Old City	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	100.0	15
	8 Kanawat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	29	100.0	29
	9 Kadam	15	42.9	0	0	0	0	0	0	1	2.9	1	2.9	0	0	35	100.0	35
	10 Shaghour	18	52.9	16	47.1	0	0	0	0	0	0	0	0	0	0	34	100.0	34
	11 Midan	9	17.3	2	3.8	0	0	0	0	0	0	2	3.8	0	0	52	100.0	52
	12 Mezze	1	2.0	0	0	0	0	0	0	0	0	0	0	0	0	24	48.0	50
	13 Kabon	6	20.0	1	3.3	0	0	0	0	0	0	0	0	0	0	30	100.0	30
	14 Cafarsouse	20	50.0	6	15.0	0	0	0	0	9	22.5	4	10.0	0	0	40	100.0	40
	15 Yarmouk	13	23.2	7	12.5	0	0	0	0	15	26.8	17	30.4	2	3.6	56	100.0	56
Class	HC High	27	27.0	1	1.0	0	0	0	0	0	0	3	3.0	0	0	69	69.0	100
	MC Middle	30	30.0	4	4.0	0	0	0	0	4	4.0	1	1.0	0	0	80	80.0	100
	LC Low	72	36.0	16	8.0	0	0	0	0	1	.5	3	1.5	0	0	184	92.0	200
	IR Informal	10	5.0	37	18.5	0	0	0	0	21	10.5	18	9.0	2	1.0	191	95.5	200

(Source : Interview Survey)

Table G-3.8 Waterborne Diseases

Designation			Dysentery		Typhoid / Typhos / Paratyphoid		Cholera		Malaria		Others	
			No.	%	No.	%	No.	%	No.	%	No.	%
Damascus			0	0	15	2.5	1	.2	0	0	93	15.5
District	1	Dummar	0	0	0	0	0	0	0	0	0	0
	2	Mouhajreen	0	0	0	0	0	0	0	0	5	11.1
	3	Rukn Aldyn	0	0	4	7.1	0	0	0	0	5	8.9
	4	Berze	0	0	0	0	0	0	0	0	2	4.2
	5	Jobar	0	0	0	0	0	0	0	0	13	29.5
	6	Sarouja	0	0	0	0	0	0	0	0	5	12.2
	7	Old City	0	0	0	0	0	0	0	0	0	0
	8	Kanawat	0	0	0	0	0	0	0	0	1	3.4
	9	Kadam	0	0	7	20.0	0	0	0	0	14	40.0
	10	Shaghour	0	0	0	0	0	0	0	0	10	29.4
	11	Midan	0	0	3	5.8	0	0	0	0	6	11.5
	12	Mezze	0	0	0	0	1	2.0	0	0	10	20.0
	13	Kabon	0	0	0	0	0	0	0	0	3	10.0
	14	Cafarsouse	0	0	1	2.5	0	0	0	0	8	20.0
	15	Yarmouk	0	0	0	0	0	0	0	0	11	19.6
Class	HC	High	0	0	0	0	1	1.0	0	0	14	14.0
	MC	Middle	0	0	4	4.0	0	0	0	0	14	14.0
	LC	Low	0	0	2	1.0	0	0	0	0	38	19.0
	IR	Informal	0	0	9	4.5	0	0	0	0	27	13.5

(Source : Interview Survey)

Table G-3.9 Summary of Interview Survey (Average)

Designation			Number Of Family Members	Montly Income	Monthly Water Consumption	Percentage*1 Of Using Dewssa water	Percentage*2 Of Using Major Water Except DAWSSA in Dry Season	Percentage*3 Of Informal Connections	Number Of Waterborne Diseases	Ratio Of Water Availability		Present Payment Of Water	Feeling Of Satisfaction For Water Supply	Reasonability Of Present Payment	Affordable Tariff for Water
										Every Day	Over 12 hrs				
				s.l./m	m3/m	%	%	%		%	%	s.l./m	%	%	s.l./m
Damascus			6.01	16423	32	91	9	33	109	85	59	147	70	71	148
District	1	Dummar	6.12	20840	29	94	6	32	0	100	100	118	88	88	116
	2	Mouhajreen	5.98	29111	28	100	0	9	5	98	78	155	80	93	166
	3	Rukn Aldyn	5.32	15411	50	100	0	34	9	46	22	162	84	70	160
	4	Berze	6.04	11385	39	100	0	38	2	17	10	165	93	73	177
	5	Jobar	6.45	8795	31	96	4	41	13	92	73	123	27	54	124
	6	Sarouja	5.24	26402	33	100	0	0	5	95	61	166	93	80	173
	7	Old City	6.27	18467	33	100	0	0	0	100	80	147	73	73	160
	8	Kanawat	5.72	16724	31	98	2	7	1	93	67	133	93	89	133
	9	Kadam	7.26	13057	46	89	11	51	21	82	76	171	24	41	166
	10	Shaghour	6.35	13809	27	100	0	41	10	95	75	130	80	60	128
	11	Midan	6.33	16913	22	86	14	35	9	97	35	140	41	62	131
	12	Mezze	4.86	19310	28	98	2	36	11	94	69	161	66	72	168
	13	Kabon	4.83	8733	34	84	16	47	3	94	69	134	94	88	133
	14	Cafarsouse	7.25	18238	27	75	25	30	9	82	21	143	61	50	148
	15	Yarmouk	6.43	9143	26	40	60	66	11	84	42	161	47	68	143
Class	HC	High	5.50	50000	35	98	2	0	15	88	52	162	72	84	171
	MC	Middle	6.33	20500	33	94	6	0	18	78	54	152	74	73	156
	LC	Low	5.79	5665	32	97	3	0	40	83	58	142	69	65	141
	IR	Informal	6.33	7820	31	71	29	100	36	0	0	0	0	0	146

(Source : Interview Survey)

Table G-3.10 Monthly Payments for Water, Sewerage and Electricity

S . L/month

Designation			Water						Sewerge						Electricity					
			< 100		100-200		200 +		< 50		50-100		100 +		< 300		300-600		600 +	
			No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Damascus			123	30.8	160	40.0	117	29.3	147	36.8	131	32.8	122	30.5	133	33.3	134	33.5	133	33.3
District	1	Dummar	12	70.6	4	23.5	1	5.9	13	76.5	3	17.6	1	5.9	7	41.2	7	41.2	3	17.6
	2	Mouhajreen	8	19.5	21	51.2	12	29.3	18	43.9	14	34.1	9	22.0	17	41.5	12	29.3	12	29.3
	3	Rukn Aldyn	4	10.8	20	54.1	13	35.1	2	5.4	1	2.7	34	91.9	5	13.5	16	43.2	16	43.2
	4	Berze	3	10.0	15	50.0	12	40.0	1	3.3	3	10.0	26	86.7	6	20.0	15	50.0	9	30.0
	5	Jobar	17	65.4	6	23.1	3	11.5	14	53.8	10	38.5	2	7.7	19	73.1	6	23.1	1	3.8
	6	Sarouja	6	14.6	16	39.0	19	46.3	19	46.3	8	19.5	14	34.1	8	19.5	15	36.6	18	43.9
	7	Old City	4	26.7	8	53.3	3	20.0	1	6.7	7	46.7	7	46.7	3	20.0	5	33.3	7	46.7
	8	Kanawat	11	40.7	14	51.9	2	7.4	14	51.9	11	40.7	2	7.4	13	48.1	8	29.6	6	22.2
	9	Kadam	3	17.6	4	23.5	10	58.8	7	41.2	4	23.5	6	35.3	10	58.8	5	29.4	2	11.8
	10	Shaghour	12	60.0	4	20.0	4	20.0	12	60.0	7	35.0	1	5.0	7	35.0	9	45.0	4	20.0
	11	Midan	19	55.9	3	8.8	12	35.3	7	20.6	24	70.6	3	8.8	11	32.4	8	23.5	15	44.1
	12	Mezze	2	6.3	21	65.6	9	28.1	17	53.1	9	28.1	6	18.8	3	9.4	11	34.4	18	56.3
	13	Kabon	7	43.8	7	43.8	2	12.5	2	12.5	10	62.5	4	25.0	3	18.8	6	37.5	7	43.8
	14	Cafarsouse	10	35.7	12	42.9	6	21.4	6	21.4	19	67.9	3	10.7	12	42.9	9	32.1	7	25.0
	15	Yarmouk	5	26.3	5	26.3	9	47.4	14	73.7	1	5.3	4	21.1	9	47.4	2	10.5	8	42.1
Class	HC	High	17	17.0	42	42.0	41	41.0	38	38.0	30	30.0	32	32.0	16	16.0	24	24.0	60	60.0
	MC	Middle	27	27.0	43	43.0	30	30.0	28	28.0	37	37.0	35	35.0	28	28.0	37	37.0	35	35.0
	LC	Low	79	39.5	75	37.5	46	23.0	81	40.5	64	32.0	55	27.5	89	44.5	73	36.5	38	19.0

(Source : Interview Survey)

Table G-3.11 Official Consumers Assessment of Monthly Payments

Designation			Reasonable				Unreasonable Due To :					
			Yes		No		Poor quality		Less quantity and pressure		Expensive comp. to incom	
			No.	%	No.	%	No.	%	No.	%	No.	%
Damascus			287	71.8	113	28.3	25	6.3	3	.8	85	21.3
District	1	Dummar	15	88.2	2	11.8	0	0	0	0	2	11.8
	2	Mouhajreen	38	92.7	3	7.3	1	2.4	0	0	2	4.9
	3	Rukn Aldyn	26	70.3	11	29.7	2	5.4	0	0	9	24.3
	4	Berze	22	73.3	8	26.7	0	0	0	0	8	26.7
	5	Jobar	14	53.8	12	46.2	8	30.8	0	0	4	15.4
	6	Sarouja	33	80.5	8	19.5	2	4.9	0	0	6	14.6
	7	Old City	11	73.3	4	26.7	2	13.3	0	0	2	13.3
	8	Kanawat	24	88.9	3	11.1	0	0	0	0	3	11.1
	9	Kadam	7	41.2	10	58.8	0	0	0	0	10	58.8
	10	Shaghour	12	60.0	8	40.0	3	15.0	0	0	5	25.0
	11	Midan	21	61.8	13	38.2	1	2.9	0	0	12	35.3
	12	Mezze	23	71.9	9	28.1	4	12.5	0	0	5	15.6
	13	Kabon	14	87.5	2	12.5	0	0	0	0	2	12.5
	14	Cafarsouse	14	50.0	14	50.0	1	3.6	0	0	13	46.4
	15	Yarmouk	13	68.4	6	31.6	1	5.3	3	15.8	2	10.5
Class	HC	High	84	84.0	16	16.0	4	4.0	0	0	12	12.0
	MC	Middle	73	73.0	27	27.0	4	4.0	2	2.0	21	21.0
	LC	Low	130	65.0	70	35.0	17	8.5	1	.5	52	26.0

(Source : Interview Survey)

Table G-4.1 Land Use Classification

Name of Area	Area (ha)	EXISTING LAND USE IN 1995							
		Agricultural	Agriculture & Residential	Green & Park	Special Area & Airport	Industrial Zone	Residential & Commercial	Reserved / Others	Kassioun Mountain
Villages*									
Figeh	44						44		
Al Khadra	12						12		
Bassime	18						18		
Ashrafye Wadi	27						27		
Judayde	53						53		
Hame	56					2	54		
Jemarya	5						5		
Kudsaya	158					2	156		
Takadom	55						55		
Military Area 4 (Residential)	85						85		
Sub-total	512	0	0	0	0	4	355	0	0
Existing Damascus City									
Ruku Aldyn	437			27			410		
Mouhajreen	363			53			310		
Mezze & Kafar Souse	2,428	605	256	47	355	12	1,037	117	
Kanawat	269						269		
Kadam & Midan	596	95				11	490		
Old City & Shaghour	716	89		21		28	577		
Sarouja	349			8			341		
Yarmouk	227						227		
Jobar	642	107	124	25		50	335		
Berze & Kaboon	1,170	110	33	229		121	677		
Dummar	473			93			380		
Kassioun Mountain	2,956								2,956
Sub-total	10,625	1,006	414	503	355	222	5,053	117	2,956
Total	11,137	1,006	414	503	355	226	5,408	117	2,956

(Source : Damascus Governate, DAWSSA and the Study Team)

(Remarks) * : Service Area for DAWSSA

Table G-4.2 Service Area and Population (1995 to 2015)

Name of Area	1995			2000			2005			2010			2015		
	Population (***)	Area (ha)	Density	Population (***)	Area (ha)	Density	Served Population	Area (ha)	Density	Served Population	Area (ha)	Density	Served Population	Area (ha)	Density
Villages*															
Ilgeh	3,975	41	99	4,389	44	99	4,845	44	109	4,968	44	112	5,093	44	115
Al Khadra	2,231	12	191	2,463	12	211	2,719	12	232	2,788	12	238	2,858	12	244
Bassime	468	18	27	517	18	30	570	18	33	585	18	33	600	18	34
Ashrafye Wadi	3,311	27	123	3,656	27	136	4,037	27	150	4,138	27	154	4,243	27	158
Judayde	4,464	53	84	4,928	53	93	5,441	53	102	5,579	53	105	5,719	53	108
Hame	21,570	56	381	23,815	56	424	26,294	56	468	26,958	56	480	27,638	56	492
Jemarya	2,031	5	381	2,246	5	424	2,479	5	468	2,542	5	480	2,606	5	492
Kudsaya	43,398	158	275	46,134	158	293	49,109	158	311	55,951	158	355	63,412	158	402
Takadom	36,750	55	671	40,575	55	744	44,798	55	822	49,461	55	908	54,609	55	1,002
Military Area 4 (Residential)	14,040	85	165	14,040	85	165	14,040	85	165	14,040	85	165	14,040	85	165
Maaraba															
Sub-total	132,241	512	258	142,763	512	279	154,332	512	301	167,010	512	326	180,818	512	353
Proposed New Development Area															
Kudsaya New Suburb							30,000	300	100	48,315	300	161	53,344	300	178
Proposed Kudsaya New Suburb															
Dummar Extension Area (1st phase)				20,500	124	165	26,793	124	216	35,017	124	282	38,662	124	312
Dummar Extension Area (2nd phase)													25,000	216	116
Kassioun New Town (650 ha)															
Assad Suburb (1st phase)										11,849	40	296	13,082	40	327
Assad Suburb (2nd phase)										25,990	193	130	33,455	193	174
Assad Suburb Extension Area													14,000	298	47
Kaboon Green Area											530	0		530	0
Assad City													25,000	655	38
Proposed Assad City Extension Area (1)															
Proposed Assad City Extension Area (2)															
Proposed Assad City Extension Area (3)															
Special Area Zone (State Factory) **	3,500	25	140	3,500	25	140	4,000	25	160	4,204	25	168	4,418	25	177
Others (not classified)															
Sub-total	3,500	25	140	24,000	149	161	60,793	449	135	124,385	1,212	103	206,962	2,380	87
Existing Damascus City															
Rukn Aldyn	166,768	437	382	184,125	437	421	203,289	437	465	224,418	437	513	247,808	437	567
Mouhajreen	77,451	363	213	85,523	363	235	94,424	363	260	104,252	363	287	115,103	363	317
Mezze	110,002	1,328	83	121,451	1,328	91	134,092	1,328	101	148,048	1,328	111	163,457	1,328	123
Kafar Sousch	96,021	1,200	80	106,015	1,200	88	117,049	1,200	98	129,231	1,200	108	142,682	1,200	119
Kanawat	66,761	269	248	73,710	269	274	81,381	269	302	89,852	269	335	99,203	269	368
Kadam	64,175	300	214	70,855	300	236	78,229	300	261	86,372	300	288	95,361	300	318
Midan	143,579	296	485	158,523	296	536	175,022	296	591	193,239	296	653	213,351	296	721
Old City	18,493	145	128	20,417	145	141	22,542	145	155	24,889	145	172	27,479	145	190
Shaghour	65,631	470	140	72,462	470	154	80,004	470	170	88,331	470	188	97,524	470	207
Saroujа	117,617	349	337	129,859	349	373	143,375	349	411	158,297	349	454	174,773	349	502
Yarmouk	214,689	227	945	237,034	227	1,047	261,704	227	1,155	288,933	227	1,276	319,016	227	1,408
Jobar	104,106	642	162	114,942	642	179	126,905	642	198	140,113	642	218	154,696	642	241
Berze	75,899	673	113	83,799	673	125	92,521	673	137	102,150	673	152	112,782	673	168
Kaboon	51,592	497	104	56,961	497	115	62,890	497	127	69,456	497	140	76,662	497	154
Dummar	49,415	473	104	54,558	473	115	60,237	473	127	66,506	473	141	73,428	473	155
Kassioun Mountain		2,956			2,956			2,956			2,956			2,956	
Sub-total	1,422,209	10,624	134	1,570,231	10,624	148	1,733,664	10,624	163	1,914,107	10,624	180	2,133,325	10,624	199
Total	1,557,950	11,161	140	1,736,997	11,286	154	1,948,789	11,586	168	2,205,502	12,349	179	2,501,105	13,517	185

(Source : Damascus Governate, DAWSSA and the Study Team)

(Remarks) * : Area of Villages is water served area.
** : It is a bulk water system to supply water from DAWSSA.
*** : Service level to the total population is estimated 74 % in 1995 and 90 % in 2000.

Table G-4.3 List of Informal Connection Areas

No.	Name of Area	Population 1995	Area (ha)	Existing Conditions	
				Distribution Main & Water Meter	Remarks
1	Esh - Al Warwar	15,180	31.9	under construction (Kaboon Wells) used Booster Pump	1845 Connections, 1 Reservoir 7300 m (D80-150) pipe length
2	Kassioon Mountains Foot (Akrad) (Mouhajreen)	33,977	10.8 20.1	partially installed, no meter (K1 & K2)	
3	Tichreen	15,448	36.2	partially installed No meter	(planning)
4	Jobar Surrounding - Al Aksab Mosque	25,704	63.7	partially installed	(planning)
5	East - West Tabbaleh (map)	12,669	135.2	partially installed	
6	Mokhayam Al Yarmouk (Tadamon & Zahera)	86,068	118.0	partially used Private Wells	(planning) project is on starting by the end of 1996
7	Naher Eshah - Dahhadil & Asalie Kadam Al Kadam A Al Kadam B Al Kadam C	37,005	 60.5 31.5 78.4	partially installed	(planning) project is on starting by the end of 1996
8	Kafar Souseh Organisation	Non	Non	Re-developping Area under construction by Damascus Municipality (not informal area)	
9	Al Qazzaz & Shagour Bassateen	10,692	24.9 39.3	partially installed Partially used Private Wells	
10	Mezze - Razy Kafar Souseh - Lawan	32,786 14,000	110.5 59.8	partially installed	
11	Mezze # 86 (map)	46,390	95.7	under construction (M1 & M2) used Booster Pump	constructed Elevated Tank:500 m3
12	Somareya (map)	4,590	37.6	partially installed used Booster Pump at each bilding	(Military Housing Area)
13	Dumnar - Wadi Al Mashare (map)	14,841	41.9	Non	(planning) caonstructed 5 wells & installed 3 pumps
14	Takadom	36,750	54.5	partially installed (Takadom Well Field)	(planning)
15	Kudsaya	20,800	50.0	Non	
	Total	407,000	1,050.5		

Table G-4.4 List of Informal Connection Areas (1995)

No.	Name of Area	Population	Area (ha)	Daily Water Consumption (m3/d) (Estimated)
1	Esh - Al Warwar	15,180	31.9	3,036
2	Kassioun Mountains Foot (Akrad)	33,977	10.8	6,795
	(Mouhajreen)		20.1	
3	Tichreen	15,448	36.2	3,090
4	Jobar Surounding - Al Aksab Mosque	25,704	63.7	5,141
5	East - West Tabbaleh	12,669	135.2	2,534
	(map)			
6	Mokhayam Al Yarmouk	86,068	118.0	17,214
	(Tadamon & Zahera)			
7	Naher Eshah - Dahhadil & Asalie Kadam	37,005		7,401
	Al Kadam A		60.5	
	Al Kadam B		31.5	
	Al Kadam C		78.4	
8	Kafar Souseh Organisation	Non	Non	
9	Al Qazzaz &	10,692	24.9	2,138
	Shagour Bassateen		39.3	
10	Mezze - Razy	32,786	110.5	6,557
	Kafar Souseh - Lawan	14,000	59.8	2,800
11	Mezze # 86	46,390	95.7	9,278
	(map)			
12	Somareya	4,590	37.6	918
	(map)			
13	Dummar - Wadi Al Mashare	14,841	41.9	2,968
	(map)			
14	Takadom	36,750	54.5	7,350
15	Kudsaya	20,800	50.0	4,160
	Total	406,900	1,050.5	81,380
	per capita (lpcd)			200

Table G-4.5 Annual Water Consumption of Past 5 Years and The 8th 5 Years Plans for Water Supply by DAWSSA

Item	Unit	1990	The 7th 5 Years					The 8th 5 Years Plan				
			1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1 Un-billed (Free)	MCM/year	62.520	65.165	84.792	89.000	87.168	102.965	102.785	106.752	110.720	114.687	118.655
(Percentage)		54%	50%	56%	56%	56%	62%	62%	62%	62%	61%	61%
1.1 Water Right Obligations		14.020	15.750	15.154	15.750	15.028	14.859	15.500	15.500	15.500	15.500	15.500
(Percentage)	%	12%	12%	10%	10%	10%	9%	9%	9%	9%	8%	8%
1.2 Public & Religious Use		48.500	49.415	69.638	73.250	72.140	88.106	87.285	91.252	95.220	99.187	103.155
(Percentage)	%	42%	38%	46%	46%	46%	53%	53%	53%	53%	53%	53%
a) Mosque & Church*												
b) Public fountains & Tap*												
2 Billed	MCM/year	53.280	64.515	66.328	70.000	69.582	62.218	62.215	65.748	69.280	72.813	76.345
(Percentage)		46%	50%	44%	44%	44%	38%	38%	38%	38%	39%	39%
2.1 Domestic Use		36.524	44.225	45.468	47.985	47.698	45.454	44.708	47.247	49.785	52.323	54.862
(Percentage)	%	32%	34%	30%	30%	30%	28%	27%	27%	28%	28%	28%
2.2 Governmental Use (Public Use)		12.025	14.561	14.970	15.799	15.705	13.418	13.096	13.846	14.590	15.335	16.078
(Percentage)	%	10%	11%	10%	10%	10%	8%	8%	8%	8%	8%	8%
a) Office & Public Facilities*												
b) Schools*												
c) Hospitals*												
d) Special & Airport Use*												
2.4 Commercial, Tourism & Industrial Use (Percenatge)	%	4.731 4%	5.729 4%	5.890 4%	6.216 4%	6.179 4%	3.346 2%	4.411 3%	4.655 3%	4.905 3%	5.155 3%	5.405 3%
a) Commercial*												
b) Hotels*												
c) Industrial*												
3. Counted Water Consumption without Leakage	MCM/year	115.800	129.680	151.120	159.000	156.750	165.183	165.000	172.500	180.000	187.500	195.000

(Source: DAWSSA)

Remark * : Data is not available

Table G-4.6 (1/2) Summary of Seasonal Water Consumption from Bill in 1995

	Unit	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Average	Total	Percentage
		1st Quarter			2nd Quarter			3rd Quarter			4th Quarter				MCM/y	(%)
1 Billed Consumption	MCM/m															
Domestic		4.127	4.127	4.127	4.127	4.127	4.127	3.542	3.542	3.542	3.356	3.356	3.356	3.788	45.454	73
without Water Rights		1.976	1.976	1.976	1.976	1.976	1.976	1.582	1.582	1.582	1.681	1.681	1.681	1.804	21.642	35
with Water Rights		2.151	2.151	2.151	2.151	2.151	2.151	1.960	1.960	1.960	1.675	1.675	1.675	1.984	23.812	38
Commercial		0.251	0.251	0.251	0.251	0.251	0.251	0.225	0.225	0.225	0.203	0.203	0.203	0.233	2.792	4
Industrial		0.051	0.051	0.051	0.051	0.051	0.051	0.042	0.042	0.042	0.041	0.041	0.041	0.046	0.554	1
Government		1.093	1.093	1.093	1.093	1.093	1.093	1.109	1.109	1.109	1.178	1.178	1.178	1.118	13.418	22
Sub-total		5.521	5.521	5.521	5.521	5.521	5.521	4.917	4.917	4.917	4.779	4.779	4.779	5.185	62.218	100
2 Number of Connections	x 1000															
Domestic		180.158	180.158	180.158	180.158	180.158	180.158	194.842	194.842	194.842	198.912	198.912	198.912	188.518		84
without Water Rights		101.893	101.893	101.893	101.893	101.893	101.893	102.575	102.575	102.575	103.940	103.940	103.940	102.575		46
with Water Rights		78.265	78.265	78.265	78.265	78.265	78.265	92.267	92.267	92.267	94.972	94.972	94.972	85.942		38
Commercial		29.046	29.046	29.046	29.046	29.046	29.046	30.539	30.539	30.539	33.525	33.525	33.525	30.539		14
Industrial		2.310	2.310	2.310	2.310	2.310	2.310	2.310	2.310	2.310	2.306	2.306	2.306	2.309		1
Government		3.019	3.019	3.019	3.019	3.019	3.019	3.065	3.065	3.065	3.065	3.065	3.065	3.042		1
Sub-total		214.533	214.533	214.533	214.533	214.533	214.533	230.756	230.756	230.756	237.808	237.808	237.808	224.408		100
3 Unit Consumption per Connection	m3/d															
Domestic		0.764	0.764	0.764	0.764	0.764	0.764	0.606	0.606	0.606	0.562	0.562	0.562	0.674		
without Water Rights		0.646	0.646	0.646	0.646	0.646	0.646	0.514	0.514	0.514	0.539	0.539	0.539	0.586		
with Water Rights		0.916	0.916	0.916	0.916	0.916	0.916	0.708	0.708	0.708	0.588	0.588	0.588	0.782		
Commercial		0.288	0.288	0.288	0.288	0.288	0.288	0.245	0.245	0.245	0.202	0.202	0.202	0.256		
Industrial		0.730	0.730	0.730	0.730	0.730	0.730	0.605	0.605	0.605	0.598	0.598	0.598	0.666		
Government		12.064	12.064	12.064	12.064	12.064	12.064	12.059	12.059	12.059	12.816	12.816	12.816	12.251		
4 Population Served (6 persons per Domestic Connection)	x 1000	1.081	1.081	1.081	1.081	1.081	1.081	1.169	1.169	1.169	1.193	1.193	1.193	1.131		
5 Population in Damascus City (from Census)	x 1000													1.422		
6 Percentage of Population Sreved (without Informal residents)	%	76	76	76	76	76	76	82	82	82	84	84	84	80		
7 Water Consumption per capita (1/5)	lcd	129	129	129	129	129	129	115	115	115	112	112	112	122		

Table G-4.6 (2/2) Summary of Seasonal Water Consumption from Bill in 1995

	Unit	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Average	Total MCM/y	Percentage (%)
		1st Quarter			2nd Quarter			3rd Quarter			4th Quarter					
8 Percentage of Meter Malfunction*	%															
Domestic		35	35	35	35	35	35	38	38	38	34	34	34	35.597		
without Water Rights		36	36	36	36	36	36	45	45	45	38	38	38	38.683		
with Water Rights		34	34	34	34	34	34	30	30	30	30	30	30	32.118		
Commercial		57	57	57	57	57	57	63	63	63	54	54	54	57.645		
Industrial		47	47	47	47	47	47	48	48	48	50	50	50	48.171		
Government		26	26	26	26	26	26	40	40	40	28	28	28	29.859		
Average		38	38	38	38	38	38	42	42	42	37	37	37	38.641		
9 Unit Consumption per Connection (without Inefficient WAter Meter)	m3/d															
Domestic		1.175	1.175	1.175	1.175	1.175	1.175	0.979	0.979	0.979	0.855	0.855	0.855	1.046		
without Water Rights		1.005	1.005	1.005	1.005	1.005	1.005	0.938	0.938	0.938	0.871	0.871	0.871	0.955		
with Water Rights		1.391	1.391	1.391	1.391	1.391	1.391	1.015	1.015	1.015	0.840	0.840	0.840	1.159		
Commercial		0.666	0.666	0.666	0.666	0.666	0.666	0.663	0.663	0.663	0.440	0.440	0.440	0.609		
Industrial		1.386	1.386	1.386	1.386	1.386	1.386	1.166	1.166	1.166	1.195	1.195	1.195	1.284		
Government		16.245	16.245	16.245	16.245	16.245	16.245	20.012	20.012	20.012	17.855	17.855	17.855	17.589		
10 Domestic per Served Population (without Inefficient WAter Meter)																
Domestic Consumption	lcd	191	191	191	191	191	191	159	159	159	140	140	140	170		
without Water Rights	lcd	164	164	164	164	164	164	153	153	153	142	142	142	156		
with Water Rights	lcd	227	227	227	227	227	227	166	166	166	137	137	137	189		
11 Sesonal Load Factor	%															
Domestic		109	109	109	109	109	109	94	94	94	89	89	89	100.000		
without Water Rights		110	110	110	110	110	110	88	88	88	93	93	93	100.000		
with Water Rights		108	108	108	108	108	108	99	99	99	84	84	84	100.000		
Commercial		108	108	108	108	108	108	97	97	97	87	87	87	100.000		
Industrial		110	110	110	110	110	110	91	91	91	90	90	90	100.000		
Government		98	98	98	98	98	98	99	99	99	105	105	105	100.000		
Average		106	106	106	106	106	106	95	95	95	92	92	92	100.000		

(Source : DAWSSA)

Remark * : Meter Malfunction includs number of meter under estimation and no meter reading.

Table G-4.7 Suspension of the Water Supply (1991 - 1995)

(Unit : hours / month)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Average
1991	0	0	0	0	0	0	240	240	240	240	240	240	120
1992	240	200	0	0	0	0	0	0	80	180	210	240	96
1993	0	0	0	0	0	0	0	70	150	180	180	210	66
1994	60	0	0	0	0	0	0	0	80	200	200	210	63
1995	100	60	0	0	0	0	150	150	150	180	225	250	105
Average	80	52	0	0	0	0	78	92	140	196	211	230	90
Day	3.33	2.17	0.00	0.00	0.00	0.00	3.25	3.83	5.83	8.17	8.79	9.58	3.75

(Source : DAWSSA)

Table G-4.8 Unit Water Consumption by DAWSSA's Classification

Classification	Unit	Unit Water Consumption (Damascus)*	(Japan)	(Recommendation)
1 Domestic Use	lpcd	(170)**		
High Income		212 -236	160 - 250	250
Middle Income		163 - 191		200 / 210 / 220
Low Income		120 - 184		170 / 180 / 190
2 Governmental Use		(18)**		
Government Offices & Facilities	m3/d/connection	51		51
	l/d/worker	266	100 - 200	
School	m3/d/connection	14		24
	l/d/student	26	40 - 50	
University	m3/d/connection	254		500
	l/d/student	53	100 - 200	
Hospital	m3/d/connection	370		800
	l/d/bed	340	1,000	
Sport Facilities	m3/d/connection	176	Required	176
	l/d/worker	486	survey	
3 Commercial Use	m3/d/connection	(0.609)**		
Hotel		148		148
	l/d/bed	371	250 - 300	
General Commercial User	m3/d/connection		Required	15
- Large Commercial User		10	survey	14
- Others		1		1
Theater	m3/d/connection	44	Required survey	44
3 Industrial Use	m3/d/connection	(1.3)**		
Factories	m3/d/connection		Required	128
- Large		287.5	survey	
- Medium		84.4		
- Small		12.6		
Manufacturing	m3/d/connection	0.603		0.600
11 Religious & Public Facilities				
Um-Ayad Mosque	m3/d/connection	44		44
Other Mosques & Church	m3/d/connection	4		4
Public Tap/Fountain	m3/d/connection	72		72

(Remark)

* Unit water consumption in Damascus are data from the results of the Interview survey and the water meter reading survey.

** Average unit water consumption based on the billed consumption in 1995.

Table G-4.9 Summary of Water Use for Hotel

	Class	Number of Staff Members	Number of Beds	Average Water Consumption (m3/month) in 1995					Unit Water Consumption per Bed(l/B/day)				
				Jan.-Mar.	Apr.-June	July-Sep.	Oct.-Dec.	Average	Jan.-Mar.	Apr.-June	July-Sep.	Oct.-Dec.	Average
1	International (3)												
	1 Sheraton Damascus Hotel	450	500	10,710	13,440	9,510	17,430	12,773	714	896	634	1,162	852
	2 Meridien Hotel	400	764	17,310	22,200	28,500	27,660	23,918	755	969	1,243	1,207	1,044
	3 Cham Palace Damascus*1	135	944	240	630	1,650	480	750	8	22	58	17	26
	Average	328	736	14,010	17,820	19,005	22,545	18,345	735	932	939	1,184	948
2	Deluxe (12)												
	1 Semiramis Hotel	80	200	1,830	1,800	2,700	1,500	1,958	305	300	450	250	326
	2 Fardoss Towers	175	143	2,850	2,940	3,690	3,720	3,300	664	685	860	867	769
	3 Ommayade Hotel	172	75	1,830	2,220	1,380	750	1,545	813	987	613	333	687
	4 Plaza	140	287	5,850	6,390	6,510	6,330	6,270	679	742	756	735	728
	5 Al Bustan*2	35	212	420	660	360	240	420	66	104	57	38	66
	Average	120	183	2,556	2,802	2,928	2,508	2,699	506	564	547	445	515
3	First (15)												
	1 Asia	30	175	300	360	360	210	308	57	69	69	40	59
	2 Samar Kand	25	110	180	450	270	150	263	55	136	82	45	80
	3 Imad	6	70	150	480	780	360	443	71	229	371	171	211
	4 Al Tad	15	132	570	750	810	690	705	144	189	205	174	178
	5 Al Shark	60	160	810	1,200	1,950	1,410	1,343	169	250	406	294	280
	Average	27	129	402	648	834	564	612	104	167	215	145	158
4	Second (30)												
	1 Vinesia	45	200	480	540	330	60	353	80	90	55	10	59
	2 Al Saodi	6	74	270	330	420	300	330	122	149	189	135	149
	3 Al Dara	25	44	360	480	600	540	495	273	364	455	409	375
	4 Samir	45	120	180	240	270	150	210	50	67	75	42	58
	5 Al Snabed*3	12	66	300	300	300	300	300	152	152	152	152	152
	Average	27	101	318	378	384	270	338	105	125	127	89	112
5	Third (87)												
	1 Ramses First	11	37	30	90	60	30	53	27	81	54	27	47
	2 Al Bahren	5	39	60	60	150	90	90	51	51	128	77	77
	3 Al Akdar	7	47	270	330	420	270	323	191	234	298	191	229
	4 Al Amaal	10	67	210	300	360	210	270	104	149	179	104	134
	5 Al A Ahad Aljadid	2	29	30	60	120	60	68	34	69	138	69	78
	Average	7	44	120	168	222	132	161	91	128	169	100	122
	AVERAGE	102	239	3,481	4,363	4,675	5,204	4,431	308	383	399	393	371

(Source : DAWSSA & Ministry of Tourism)

(Remarks)

*1 Supplied only drinking water from DAWSSA

*2 Used private well

*3 Assumed 300 m3/m due to no records during the third quarter

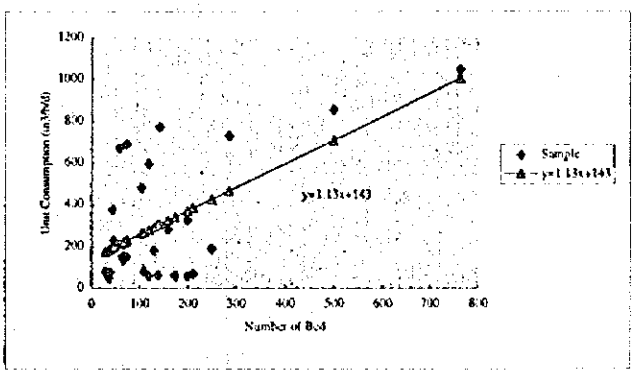

Table G-4.10 Summary of Water Use for Hospitals

	Type of Health Facilities	Number of Staff Members	Number of Beds	Average Water Consumption (m3/month) in 1995					Unit Water Consumption per Bed(l/b/d)				
				Jan.-Mar.	Apr.-June	July-Sep.	Oct.-Dec.	Annual	Jan.-Mar.	Apr.-June	July-Sep.	Oct.-Dec.	Annual
1	**Public Hospital (18)**												
1	Moassat	3,060	8,600	36,300	35,250	49,350	39,210	40,028	141	137	191	152	155
2	Damascus	600	700	21,990	18,930	14,970	13,500	17,348	1,047	901	713	643	826
3	Children	665	300	6,600	7,650	8,550	7,920	7,680	733	850	950	880	853
4	Mezze 601	1,000	200	8,070	6,870	11,760	11,190	9,473	1,345	1,145	1,960	1,865	1,579
5	Tchren	2,500	1,306	27,780	29,970	30,690	29,400	29,460	709	765	783	750	752
	Average	1,565	2,221	20,148	19,734	23,064	20,244	20,798	302	296	346	304	312
2	**Private Hospital (31)**												
1	French	250	200	1,140	1,830	2,400	1,740	1,778	190	305	400	290	296
2	Italian	150	100	720	870	840	720	788	240	290	280	240	263
3	Al Shami	394	75	1,200	1,200	1,260	1,050	1,178	533	533	560	467	523
4	Hesham Sinan	150	130	1,380	1,530	1,740	1,350	1,500	354	392	446	346	385
5	Al Asdi	150	120	1,830	1,980	1,380	1,350	1,635	508	550	383	375	454
	Average	219	125	1,254	1,482	1,524	1,242	1,376	334	395	406	331	367
3	**Sanatorium (1)**												
1	Aben Al Nafes	950	650	15,420	14,010	15,510	17,370	15,578	791	718	795	891	799
	Sub-total	950	650	15,420	14,010	15,510	17,370	15,578	791	718	795	891	799
4	**First Health Care Center (109)**												
1	Berze Municipality Dispensary	40	0	270	150	60	30	128					
2	Cafersousse Dispensary	40	0	120	210	240	180	188					
3	Hygiene Center Pre-Fabricated	13	0	30	30	60	60	45					
4	Dentistry Training Center	35	0	90	90	90	120	98					
5	Scholastic Health Dispensary*1			30	30	60	60	45					
	Average	32		108	102	102	90	101					
5	**Special Health Care Centor (4)**												
1	Al Saada House for the aged	10	23	1,410	1,590	2,130	1,890	1,755	2,043	2,304	3,087	2,739	2,543
2	Kuraish Assembly for Orphans	45	250	1,080	1,200	660	780	930	144	160	88	104	124
3	Al Akram Dispensary	60	0	120	180	300	210	203					0
4	n.a.							0					0
	Average	38	91	870	990	1,030	960	722	1,094	1,232	1,587	1,422	667

Remarks *1: closed now

(Source : DAWSSA & Ministry of Health)

Table G-4.11 Summary of Water Use for School

	Type of School	Number of School	Number of Stuff Members	Number of Students	Average Water Consumption (m3/month) in 1995					Unit Water Consumption per Student(l/Student/d)				
					Jan.-Mar.	Apr.-June	July-Sep.	Oct.-Dec.	Annual	Jan.-Mar.	Apr.-June	July-Sep.	Oct.-Dec.	Annual
1	**Kindergarten (148)**	148		24,373										
1	Dummar Kindergarten		10	85	60	60	90	60	68	24	24	35	24	26
2	Al Yarmauk Kindergarten		7	85	180	180	150	60	143	71	71	59	24	56
3	Women Union Berze Kinder.		15	110	240	150	120	120	158	73	45	36	36	48
	Average		11	93	160	130	120	80	123	56	47	43	28	43
2	**Primary (397)**	397		222,515										
1	Mezze Al Sharif Radi School		40	1,400	510	450	600	660	555	12	11	14	16	13
2	Baramke Talaie School		12	400	270	240	210	90	203	23	20	18	8	17
3	Iba Araker Ahmed Shawki Sc.		28	800	360	330	90	120	225	15	14	4	5	9
	Average		27	867	380	340	300	290	328	17	15	12	9	13
3	**Preparatory & Secondary**	209		117,637										
3-1	**Prparatory (79)**	79												
1	Mezze Sawargalari		50	110	60	150	120	90	105	18	45	36	27	32
2	Berze N. Al Wafieh		20	700	510	240	180	180	278	24	11	9	9	13
3	Kaboon Anwar Al Attor		25	800	210	240	150	150	188	9	10	6	6	8
	Average		32	537	260	210	150	140	190	17	22	17	14	18
3-2	**Secondary (91)**	91												
1	Mezze A.I.A.		56	890	270	300	270	360	300	10	11	10	13	11
2	Hallouni A.Abdella		42	750	180	330	300	420	308	8	15	13	19	14
3	Baramkeh F.Marsour		20	650	630	660	600	270	540	32	34	31	14	28
	Average		39	763	360	430	390	350	383	17	20	18	15	18
3-3	**Technical (21)**	21												
1	Kanawat Industry School		30	850	90	150	180	270	173	4	6	7	11	7
2	Kaboon Chemical Industry Ins.		140	310	210	270	210	210	225	23	29	23	23	24
3	Berze Electronic Industry Ins.		500	2,000	690	720	780	1,140	833	12	12	13	19	14
	Average		223	1,053	330	380	390	540	410	13	16	14	17	15
3-4	**Private (18)**	18												
1	Kemariel Private Al Maona Sc.		90	1,340	720	600	450	660	608	18	15	11	16	15
2	Bagdad Al Harich Institution		350	3,000	780	900	690	870	810	9	10	8	10	9
3	n.a.													
	Average		220	2,170	750	750	570	765	709	13	12	9	13	12
4	**University (15)**	15		83,087										
1	Literature Faculty		250	11,500	14,310	15,030	13,920	11,490	13,688	41	44	40	33	40
2	Civil Engeniring Faculty		305	2,500	5,100	5,910	4,950	3,390	4,838	68	79	66	45	65
3	Agriculture Faculty		300	2,700	4,560	4,350	3,690	4,830	4,358	56	54	46	60	54
	Average		285	5,567	7,990	8,430	7,520	6,570	7,628	55	59	51	46	53
5	**Training Institute (124)**	124		44,205										
1	Kudasaya Al Gazali Juvenile		47	400	1,620	1,200	930	1,140	1,223	135	100	78	95	102
2	Dummar Tourist Hotel		35	400	720	870	1,230	780	900	60	73	103	65	75
3	Tigara Sport		50	300	270	90	60	90	128	30	10	7	10	14
	Average		44	367	870	720	740	670	750	75	61	62	57	64

(Source : DAWSSA & Ministry of Education)

Table G-4.12 Summary of Water Use for Factories

	Type/Name of Factories	Area (m2)	Main Production (ton or SL/year)	Number of Workers	Average Water Consumption (m3/month) in 1995					Unit Water Consumption per Worker (l/worker/d)				
					Jan.-Mar.	Apr.-June	July-Sep.	Oct.-Dec.	Average	Jan.-Mar.	Apr.-June	July-Sep.	Oct.-Dec.	Average
1	Light Industries													
1	Wearing & Spinning Co.	n.a.	n.a.	1,440	3,660	2,430	2,790	2,310	2,798	85	56	65	53	65
2	Glass Factory			1,500	2,250	2,100	2,160	2,190	2,175	50	47	48	49	48
3	Dar Al Baath Printing Est.			550	2,610	2,370	3,990	3,720	3,173	158	144	242	225	192
4	Al Wehda Printing Est.			900	2,880	2,550	2,390	2,010	2,458	107	94	89	74	91
5	Techrine Printing Est.			200	480	600	570	660	578	80	100	95	110	96
	Average			918	2,376	2,010	2,380	2,178	2,236	86	73	86	79	99
2	Chemical Industries													
1	Al Aahlia Co.(Rubber Products)				60	30	30	270	98	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
2	Tanning Factory			105	60	210	300	570	285	19	67	95	181	90
3	Painting Factory				90	90	60	30	68	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	Average			105	70	110	130	290	150	22	35	41	92	90
3	Medical Industries													
1	Serum Factory			200	4,110	3,900	4,260	4,080	4,088	685	650	710	680	681
2	Medicine Factory			200	2,010	1,890	2,070	2,100	2,018	335	315	345	350	336
3									0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	Average			200	3,060	2,895	3,165	3,090	2,035	510	483	528	515	509
4	Electric Industries													
1	Battery Factory			470	840	210	450	600	525	60	15	32	43	37
2	Syrian Electronic Co.			916	4,620	2,550	1,920	2,220	2,828	168	93	70	81	103
3									0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	Average			693	2,730	1,380	1,185	1,410	1,118	131	66	57	68	70
5	Food Industries													
1	Food Processing Factory			50	150	120	210	150	158	100	80	140	100	105
2	Milk & Yogurt Factory			220	15,240	17,940	20,070	16,800	17,513	2,309	2,718	3,041	2,545	2,653
3	New Food Processing			50	480	2,010	1,860	525	1,219	320	1,340	1,240	350	813
4	Beer Factory			140	6,420	6,990	8,790	7,470	7,418	1,529	1,664	2,093	1,779	1,766
	Average			115	5,523	6,765	7,733	6,236	6,577	1,615	1,961	2,241	1,808	1,334
6	Heavy Industries													
1	Mechanical Structures			1,800	6,180	6,750	4,650	4,350	5,483	114	125	86	81	102
2	Amianthus Cement Factory			500	3,510	2,970	3,810	4,080	3,593	234	198	254	272	240
3										#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
	Average			1,150	4,845	4,860	4,230	4,215	4,538	140	141	123	122	171
7	Others													
1	Canada Dry Cola Factory			30	180	360	630	390	390	200	400	700	433	433
2	Ice Factory				210	240	180	120	188	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
3	RC Cola Factory			35	120	330	630	270	338	114	314	600	257	321
	Average			33	170	310	480	260	305	174	318	492	267	377

(Source : Ministry of Industry & DAWSSA)

	Unit	Large Consumption more than 5000 m3/m	Midiam Consumption 1000 m3/m to 5000 m3/m	Small Consumption less than 1000 m3/m	Average
Number of Factories	No.	4	8	6	
Number of Workers	persons	2,360	6,056	890	
Average number of Workers per Factory	persons	590	757	148	498
Average Water Consumption per Factory	m3/m	8,625	2,532	379	3,845
Unit Water Consumption per Worker	l/d	487	112	85	228

Table G-4.13 Summary of Water Use for Governmental & Municipal Offices

	Type/Name of Factories	Area (m2)	Floor Area (m2)	Number of Workers	Average Water Consumption (m3/month) in 1995					Unit Water Consumption per Worker (l/worker/d))				
					Jan.-Mar.	Apr.-June	July-Sep.	Oct.-Dec.	Average	Jan.-Mar.	Apr.-June	July-Sep.	Oct.-Dec.	Average
1	**Ministries (26)**													
	1 Finannce			1,480	2,730	2,610	2,910	3,150	2,850	61	59	66	71	64
	2 Foreign Affairs			300	360	420	510	420	428	40	47	57	47	48
	3 Health			500	2,760	3,450	3,000	1,410	2,655	184	230	200	94	177
	Average			760	1,950	2,160	2,140	1,660	1,978	86	95	94	73	96
2	**Damascus Municipality**													
	1 City Governorate			2,000	3,120	3,300	3,000	1,980	2,850	52	55	50	33	48
	2 Mezze Municipality			120	870	1,110	1,140	1,080	1,050	242	308	317	300	292
	3 Berze Kaboon Municipality			100	60	90	210	60	105	20	30	70	20	35
	Average			740	1,350	1,500	1,450	1,040	1,335	61	68	65	47	125
3	**Public Office**													
	1 DAWSSA			950	870	870	1,260	540	885	31	31	44	19	31
	2 Railway General Directorate			28	1,380	1,800	1,230	990	1,350	1,643	2,143	1,464	1,179	1,607
	3 Mechanical Telephone			600	690	1,830	1,860	2,190	1,643	38	102	103	122	91
	Average			526	980	1,500	1,450	1,240	1,293	62	95	92	79	576
4	**Others**													
	1 Military Sport Club			400	780	1,080	870	600	833	65	90	73	50	69
	2 National(Al Asad) Liblary			200	750	1,770	1,470	1,110	1,275	125	295	245	185	213
	3 National Theatre			790	1,410	1,410	1,320	1,140	1,320	59	59	56	48	56
	4 Damascus Internatinal Fair			60	19,650	23,070	19,560	8,490	17,693	10,917	12,817	10,867	4,717	9,829
	Average			363	5,648	6,833	5,805	2,835	5,280	519	628	534	261	486

(Source : DAWSSA)

Table G-4.14 Basic Factor of Water Use Classification

Year / Factor for Basic Frame	Unit	1995 0	2000 5	2005 10	2010 15	2015 20
1 Income Classification (Domestic)						
1) High	%	16.7	17.5	18.4	19.2	20.0
Medium	%	18.0	23.5	29.0	34.5	40.0
Low	%	39.5	49.0	52.7	46.3	40.0
Informal	%	26.0	10.0	0.0		
2) Average Domestic Demand per capita (3)	lpcd	170.0	180.0	193.0	204.0	214.0
2 Connection of Main Water Users	Number	37,475	37,895	38,912	41,494	45,453
1) Governmental Users	Number	991	1,002	1,029	1,097	1,202
Government Offices & Facilities		650	657	675	720	788
Schools		235	238	244	260	285
Universities		42	42	44	47	51
Hospitals		46	47	48	51	56
Sport Facilities		18	18	19	20	22
2) Industrial Users	Number	2,310	2,336	2,399	2,558	2,802
Factories		38	38	39	42	46
Manufacturing		2,272	2,297	2,359	2,516	2,756
3) Commercial Users	Number	33,525	33,901	34,810	37,121	40,662
Hotels		89	90	92	99	108
Large Commercial Users		659	666	684	730	799
Other Commercial Users		32,722	33,089	33,977	36,232	39,688
Restraints		41	41	43	45	50
Theaters		14	14	15	16	17
4) Public Use (Un-billed)	Number	649	656	674	719	787
Mosques & Church		534	540	554	591	648
Public Taps/Fountains		115	116	119	127	139

Table G-4.15 Summary of Water Demand Forecast

Year / Factor for Basic Frame	Unit	1986 -9	1987 -8	1988 -7	1989 -6	1990 -5	1991 -4	1992 -3	1993 -2	1994 -1	1995 0	2000 5	2005 10	2010 15	2015 20
1 **Area**	km2										111	112	115	122	134
1.1 Existing City											106	106	106	106	106
1.2 Villages & New Developed Area											4	6	9	16	28
2 **Population**	1000 persons	1,309	1,333	1,358	1,383	1,409	1,436	1,463	1,491	1,520	1,554	1,737	1,949	2,205	2,501
2.1 City		1,225	1,245	1,265	1,286	1,307	1,328	1,350	1,372	1,394	1,422	1,570	1,734	1,914	2,113
2.2 Villages		83	88	92	97	102	108	114	120	126	132	167	215	291	388
4 **Billed Population Served**	1000 persons	727	765	806	848	893	940	989	1,041	1,096	1,150	1,564	1,949	2,205	2,501
5 **Percentage of Population Served (4/2)**	%	56	57	59	61	63	65	68	70	72	74	90	100	100	100
6 **Number of Subscribers**	connections	201,698	205,406	205,828	206,188	221,236	226,099	232,530	237,941	243,468	237,808	275,101	308,484	345,918	387,895
7 **Daily Average Water Consumption**	m3/d	281,753	356,658	374,384	318,630	317,836	355,288	414,027	435,616	429,452	456,332				
7.1 Analysis of Past Trend															
1) Water Consumption Increase Ratio	(Past Trend)											562,830	702,059	875,730	1,092,362
y=451*(1.045)^x	m3/d	303,500	317,100	331,400	346,300	361,900	378,200	395,200	413,000	431,600	451,000	562,000	700,400	872,800	1,087,700
2) Correlation between Water Consumption	(Past Trend)											546,838	650,278	766,348	896,851
and Number of Subscribers	m3/d	314,100	327,500	341,400	355,300	369,700	384,500	399,500	415,100	431,000	447,200	533,900	631,500	741,000	864,000
y=2.836x-258.159															
3) Correlation between Water Consumption	(Past Trend)											459,519	531,676	621,573	721,304
and Population Served	m3/d	113,400	127,000	141,300	156,300	172,200	188,800	206,400	224,900	244,300	263,500	410,300	547,000	638,100	743,200
y=0.355x-144.729															
4) Correlation between Water Consumption	(Past Trend)											574,076	721,432	905,016	1,108,682
and Population	m3/d	277,500	298,200	319,400	341,000	363,200	385,800	409,000	432,800	457,100	486,100	641,400	821,000	1,038,700	1,290,200
y=0.849x-833.463															
7.2 Logistic curve between Population and	(Past Trend)					154,397	185,271	193,245	201,958	200,516	224,100	346,057	467,600	588,150	740,741
Unit Water Consumption per capita	(Past Trend)					173	197	195	194	183	195	199	240	267	296
K:450 lcd y=K/(1+e^(a-bx))	(lcd)	119	122	126	130	133	138	142	147	152	157				
	m3/d	156,100	163,300	170,900	179,200	188,100	197,700	208,100	219,200	231,300	244,500	346,100	467,600	588,100	740,700
7.3 Water Use Classified Analysis	m3/d	198,061	209,535	221,673	234,515	248,100	262,473	277,678	293,764	310,781	327,900	455,000	563,600	645,600	746,100
	(lcpd)	272	274	275	277	278	279	281	282	284	285	291	289	293	298

(Source : DAWSSA & JICA)

Table G-5.1 Comparison of Seasonal Load Factor and Climate

Factor	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1 Billed Consumption in 1995	106	106	106	106	106	106	95	95	95	92	92	92	12
Past 10 years Water Production	92	96	104	107	110	107	107	104	99	95	90	90	12
DAWSSA's Load Factor	90	90	91	95	98	101	108	112	103	99	97	95	12
2 Relative Humidity (Average)	72	66	57	48	40	35	38	40	42	46	58	72	
Relative Dehydration (Average)	28	34	43	52	60	65	62	60	58	54	42	28	
Air Temperature (Mean Monthly)	7.0	8.7	11.7	16.1	21.0	25.1	26.9	26.6	24.1	20.0	13.7	8.6	
3 **Correlation between 1and 2**													
Billed Consumption in 1995	-0.27 to Air Temperature (Mean Monthly)						-0.07 to Relative Dehydration (Average)						
Past 10 years Water Production	0.661 to Air Temperature (Mean Monthly)						0.781 to Relative Dehydration (Average)						
DAWSSA's Load Factor	0.901 to Air Temperature (Mean Monthly)						0.759 to Relative Dehydration (Average)						
4 **Load Factor (Recommendation)**	92	92	93	97	100	103	110	114	105	101	99	97	12

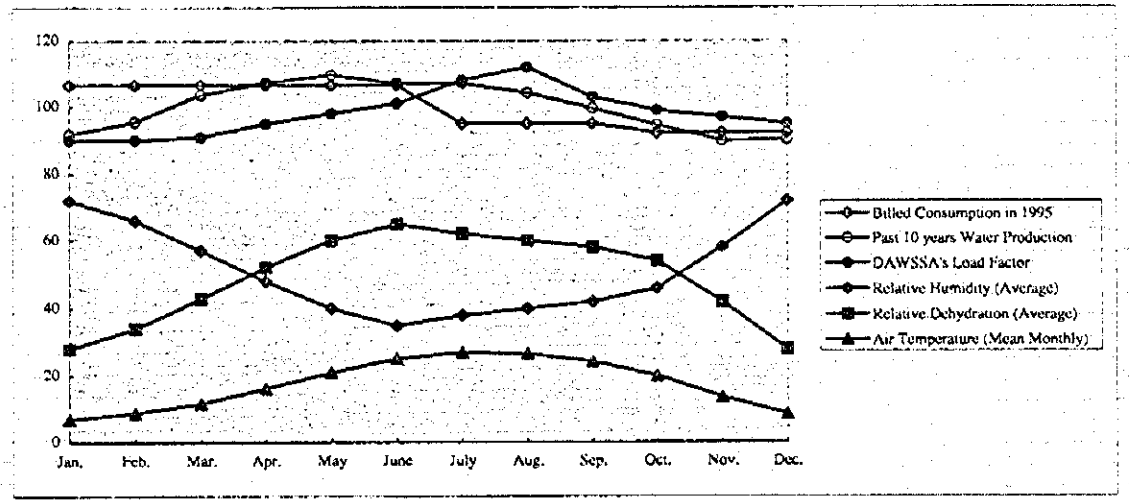

Table G-5.2 Water Demand Forecast by Water Use Classified Analysis (Alternative 1)

Year / Factor for Basic Frame	Unit	1995 0	2000 5	2005 10	2010 15	2015 20
1 Area (km2)	km2	111.62	112.86	115.86	123.49	135.17
1.1 Existing City		106.25	106.25	106.25	106.25	106.25
1.2 Villages & New Developed Area		5.37	6.61	9.61	17.24	28.92
2 Population	1000 persons	1,554	1,737	1,949	2,205	2,501
2.1 City		1,422	1,570	1,734	1,914	2,113
2.2 Villages & New Development Area		132	167	215	291	388
3 (Billed) Population Served	1000 persons	1,150	1,563	1,949	2,205	2,501
4 Percentage of Population Served (3/2)	%	74	90	100	100	100
5 Daily Average Water Demand	m3/d	**310,600**	**448,200**	**555,100**	**618,000**	**694,500**
5.1 Water Deficits*	m3/d	86,500				
5.2 (Billed Consumption)	m3/d	224,100				
1) Domestic	m3/d	126,300	266,600	369,700	423,100	485,200
2) Governmental Use	m3/d	37,300	98,800	101,400	108,200	118,500
Government Offices & Facilities	m3/d		33,209	34,100	36,363	39,832
Schools	m3/d		1,010	1,037	1,106	1,211
Universities	m3/d		21,038	21,602	23,036	25,233
Hospitals	m3/d		36,866	37,855	40,367	44,218
Sport Facilities	m3/d		6,672	6,851	7,306	8,003
3) Commercial Use	m3/d	7,800	23,700	24,400	26,000	28,400
Hotels	m3/d		13,196	13,550	14,449	15,827
Commercial Users	m3/d		9,903	10,168	10,843	11,878
Theaters	m3/d		617	634	676	740
4) Industrial Use	m3/d	1,500	6,100	6,300	6,700	7,300
Factories	m3/d		4,720	4,847	5,169	5,662
Manufacturing	m3/d		1,372	1,409	1,503	1,646
5) Water Right Obligations	m3/d	40,700	42,500	42,500	42,500	42,500
(Un-billed Consumption)						
6) Religious & Public Use	m3/d	10,500	10,500	10,800	11,500	12,600
Mosques & Churches (500 m2)	m3/d	2,176	2,180	2,237	2,383	2,607
Public Taps/Special Area	m3/d	8,280	8,295	8,517	9,083	9,949
6 Uncounted for Water						
6.1 (% of Production Water Required)	%	**37**	**61**	**69**	**72**	**75**
6.2 % of UFW	%	62.7	39	31	28	25
1) Meter Malfunction	%	14.4	3	0	0	0
2) Informal Use	%	13.6	4	1	0	0
3) System Losses	%	34.7	32	30	28	25
7 Daily Average Water Requirement**	m3/d	**678,000**	**739,600**	**801,000**	**861,900**	**926,000**
7.1 Average Flow	(l/s)	7,800	8,600	9,300	10,000	10,700
7.2 Yearly Water Requirement	MCM/y	247.5	270.0	292.4	314.6	338.0
7.3 Yearly Water Production Amount	MCM/y	218.3				
8 Saving Water	m3/d		**462,000**	**115,000**	**29,900**	**42,600**
Losses in case of the former % of UFW	m3/d		1,201,699	916,007	891,775	968,619
9 Daily Maximum Water Requirement (Load Factor : 1.14)	m3/d	**668,800**	**843,100**	**913,100**	**982,600**	**1,055,600**
10 Unit Domestic Demand per capita	lpcd	110	171	190	192	191
11 Unit Water Demand per capita	lpcd	270	287	285	280	278

(Remark) * : Estimated on the assumption of the water consumption per capita with 185 lpcd.

** : Effective water Requirement based on data of production on April.

: UFW in 1995 is estimated from water production amount (598,100 m3/d)

Table G-5.3 Water Demand Forecast by Water Use Classified Analysis (Alternative 2)

Year / Factor for Basic Frame	Unit	1995 0	2000 5	2005 10	2010 15	2015 20
1 Area (km2)	km2	111.62	112.86	115.86	123.49	135.17
1.1 Existing City		106.25	106.25	106.25	106.25	106.25
1.2 Villages & New Developed Area		5.37	6.61	9.61	17.24	28.92
2 Population	1000 persons	1,554	1,737	1,949	2,205	2,501
2.1 City		1,422	1,570	1,734	1,914	2,113
2.2 Villages		132	167	215	291	388
3 (Billed) Population Served	1000 persons	1,150	1,563	1,949	2,205	2,501
4 Percentage of Population Served (3/2)	%	74	90	100	100	100
5 Daily Average Water Demand	m3/d	**322,100**	**476,400**	**594,100**	**662,100**	**744,500**
5.1 **Water Deficits***	m3/d	98,000				
5.2 **(Billed Consumption)**	m3/d	224,100				
1) Domestic	m3/d	126,300	294,800	408,700	467,200	535,200
2) Governmental Use	m3/d	37,300	98,800	101,400	108,200	118,500
Government Offices & Facilities	m3/d		33,209	34,100	36,363	39,832
Schools	m3/d		1,010	1,037	1,106	1,211
Universities	m3/d		21,038	21,602	23,036	25,233
Hospitals	m3/d		36,866	37,855	40,367	44,218
Sport Facilities	m3/d		6,672	6,851	7,306	8,003
3) Commercial Use	m3/d	7,800	23,700	24,400	26,000	28,400
Hotels	m3/d		13,196	13,550	14,449	15,827
Commercial Users	m3/d		9,903	10,168	10,843	11,878
Theaters	m3/d		617	634	676	740
4) Industrial Use	m3/d	1,500	6,100	6,300	6,700	7,300
Factories	m3/d		4,720	4,847	5,169	5,662
Manufacturing	m3/d		1,372	1,409	1,503	1,646
5) Water Right Obligations	m3/d	40,700	42,500	42,500	42,500	42,500
(Un-billed Consumption)						
6) Religious & Public Use	m3/d	10,500	10,500	10,800	11,500	12,600
Mosques & Churches (500 m2)	m3/d	2,176	2,180	2,237	2,383	2,607
Public Taps/Special Area	m3/d	8,280	8,295	8,517	9,083	9,949
6 Uncounted for Water						
6.1 (% of Production Water Required)	%	37	61	69	72	75
6.2 % of UFW	%	62.7	39	31	28	25
1) Meter Malfunction	%	14.4	3	0	0	0
2) Informal Use	%	13.6	4	1	0	0
3) System Losses	%	34.7	32	30	28	25
7 Daily Average Water Requirement**	m3/d	**678,000**	**786,100**	**857,300**	**923,400**	**992,700**
7.1 Average Flow	(l/s)	7,800	9,100	9,900	10,700	11,500
7.2 Yearly Water Requirement	MCM/y	247.5	286.9	312.9	337.0	362.3
7.3 **Yearly Production Amount**	MCM/y	218.3				
8 Saving Water	m3/d		**491,100**	**123,100**	**32,000**	**45,700**
Losses in case of the former % of UFW	m3/d		1,277,212	980,363	955,411	1,038,354
9 Daily Maximum Water Requirement (Load Factor : 1.14)	m3/d	668,800	896,200	977,300	1,052,700	1,131,700
10 Unit Domestic Demand per capita	lpcd	110	190	210	212	214
11 Unit Water Demand per capita	lpcd	280	305	305	300	298

(Remark) * : Estimated on the assumption of the water consumption per capita with 195 lpcd.

** : Effective water Requirement based on data of production on April

: UFW in 1995 is estimated from water production amount (598,100 m3/d)

Table G-5.4 Water Demand Forecast by Water Use Classified Analysis (Alternative 3)

Year		1995	2000	2005	2010	2015
Factor for Basic Frame	Unit	0	5	10	15	20
1 Area (km2)	km2	111.62	112.86	115.86	123.49	135.17
1.1 Existing City		106.25	106.25	106.25	106.25	106.25
1.2 Villages & New Developed Area		5.37	6.61	9.61	17.24	28.92
2 Population	1000 persons	1,554	1,737	1,949	2,205	2,501
2.1 City		1,422	1,570	1,734	1,914	2,113
2.2 Villages		132	167	215	291	388
3 (Billed) Population Served	1000 persons	1,150	1,563	1,949	2,205	2,501
4 Percentage of Population Served (3/2)	%	74	90	100	100	100
5 Daily Average Water Demand	m3/d	**327,900**	**453,700**	**562,300**	**644,300**	**744,500**
5.1 Water Deficits*	m3/d	103,800				
5.2 (Billed Consumption)	m3/d	224,100				
1) Domestic	m3/d	126,300	272,100	376,900	449,400	535,200
2) Governmental Use	m3/d	37,300	98,800	101,400	108,200	118,500
Government Offices & Facilities	m3/d		33,209	34,100	36,363	39,832
Schools	m3/d		1,010	1,037	1,106	1,211
Universities	m3/d		21,038	21,602	23,036	25,233
Hospitals	m3/d		36,866	37,855	40,367	44,218
Sport Facilities	m3/d		6,672	6,851	7,306	8,003
3) Commercial Use	m3/d	7,800	23,700	24,400	26,000	28,400
Hotels	m3/d		13,196	13,550	14,449	15,827
Commercial Users	m3/d		9,903	10,168	10,843	11,878
Theaters	m3/d		617	634	676	740
4) Industrial Use	m3/d	1,500	6,100	6,300	6,700	7,300
Factories	m3/d		4,720	4,847	5,169	5,662
Manufacturing	m3/d		1,372	1,409	1,503	1,646
5) Water Right Obligations	m3/d	40,700	42,500	42,500	42,500	42,500
(Un-billed Consumption)						
6) Religious & Public Use	m3/d	10,500	10,500	10,800	11,500	12,600
Mosques & Churches (500 m2)	m3/d	2,176	2,180	2,237	2,383	2,607
Public Taps/Special Area	m3/d	8,280	8,295	8,517	9,083	9,949
6 Uncounted for Water						
6.1 (% of Production Water Required)	%	**37**	**61**	**69**	**72**	**75**
6.2 % of UFW	%	62.7	39	31	28	25
1) Meter Malfunction	%	14.4	3	0	0	0
2) Informal Use	%	13.6	4	1	0	0
3) System Losses	%	34.7	32	30	28	25
7 Daily Average Water Requirement**	m3/d	**678,000**	**748,700**	**811,400**	**898,600**	**992,700**
7.1 Average Flow	(l/s)	7,800	8,700	9,400	10,400	11,500
7.2 Yearly Water Requirement	MCM/y	247.5	273.3	296.2	328.0	362.3
7.3 Yearly WAter Production Amount	MCM/y	218.3				
8 Saving Water	m3/d		**467,700**	**116,500**	**31,100**	**45,700**
Losses in case of the former % of UFW	m3/d		1,216,354	927,888	929,726	1,038,354
9 Daily Maxionum Water Requirement (Load Factor : 1.14)	m3/d	**759,400**	**853,500**	**925,000**	**1,024,400**	**1,131,700**
10 Unit Domestic Demand per capita	lpcd	110	180	193	204	214
11 Unit Water Demand per capita	lpcd	285	290	289	292	298

(Remark) * : Estimated on the assumption of the potential water consumption per capita with 200 lpcd.

** : Effective water Requirement based on data of production on April

: UFW in 1995 is estimated from water production amount (598,100 m3/d)

Table G-5.5 Monthly Water Requirement (Alternative 3)

(Unit : MCM)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Total
2000	21	21	21	22	23	23	25	26	24	23	23	22	274.0
2005	23	23	23	24	25	25	27	28	26	25	24	24	296.9
2010	25	25	25	26	27	28	30	31	29	28	27	26	328.6
2015	28	28	28	29	30	31	33	34	32	30	30	29	363.1
Factor	0.92	0.92	0.93	0.97	1.00	1.03	1.10	1.14	1.05	1.01	0.99	0.97	12.00

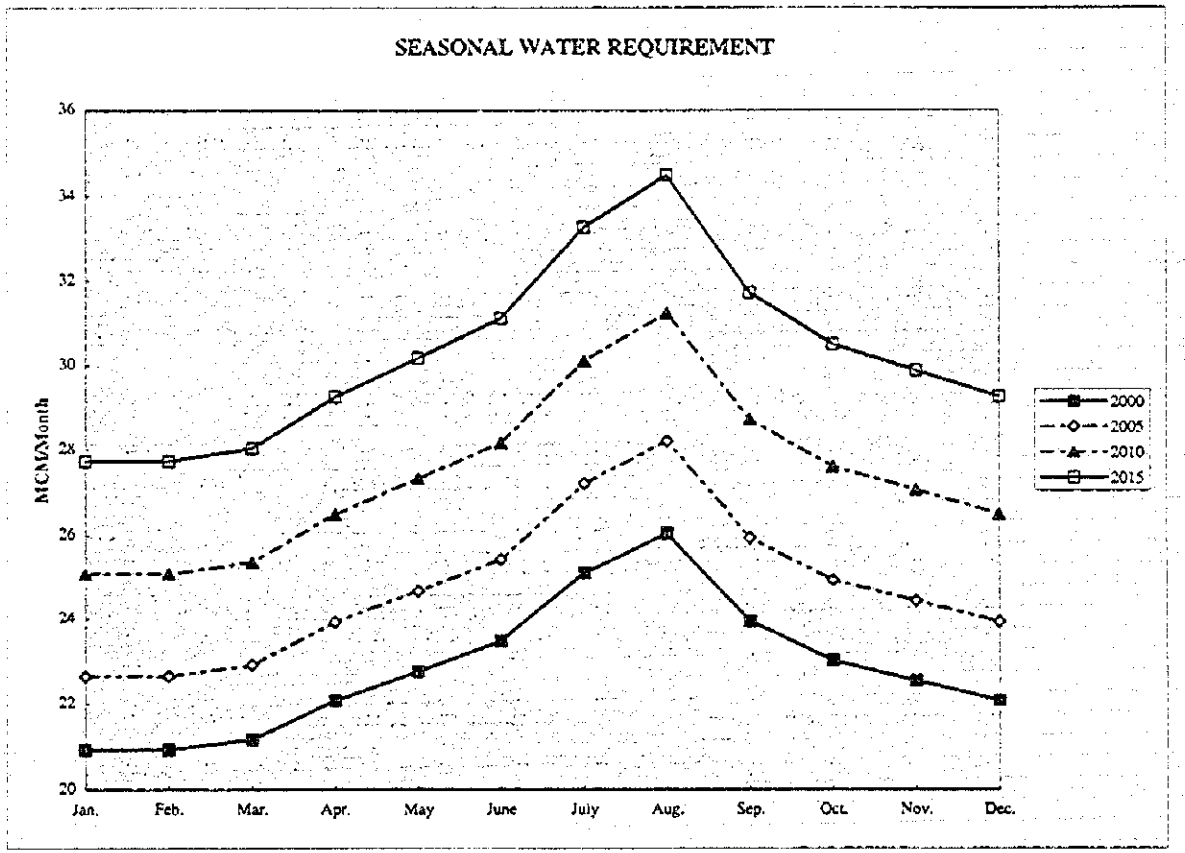

Table G-6.6 Recomended Projection of Proposed New Area in The City

Name of Area	Area (ha)	Water Source	Houses	1995 Population	1995 Dencity	1995 Consumption (m3/d)	2000 Population	2000 Dencity	2000 Consumption (m3/d)	2005 Population	2005 Dencity	2005 Consumption (m3/d)	2010 Population	2010 Dencity	2010 Consumption (m3/d)	2015 Population	2015 Dencity	2015 Consumption (m3/d)	2020 Population	2020 Dencity	2020 Consumption (m3/d)
1. Proposed Villages																					
1.1 Hame*1	56	DAWSSA		21,570	384	6,665	23,815	424	8,073	25,030	445	9,511	25,662	457	10,085	26,310	468	10,471	26,974	480	10,790
1.2 Jemarya*1	5	DAWSSA		2,034	384	629	2,246	424	761	2,360	445	897	2,420	457	951	2,481	468	987	2,544	480	1,018
1.3 Kudsaya*1	158	DAWSSA		52,000	329	16,068	53,313	337	18,073	54,659	346	20,770	56,040	355	22,024	57,445	364	22,863	58,905	373	23,562
1.4 Special Area Zone (Military)*2	n.a	DAWSSA				1,300			1,300			1,300			1,300			1,300			1,300
Special Area No.4 (Residential)	85	DAWSSA	3,000	14,560	171	4,499	14,560	171	4,936	14,560	171	5,533	14,560	171	5,722	14,560	171	5,795	14,560	171	5,824
1.5 Maaraba	75	35 m3/hr (CDII)	1,000	6,240	83	1,928	6,889	92	2,335	7,241	97	2,752	7,424	99	2,918	7,611	101	3,029	7,803	104	3,121
Sub-total	380			96,404		32,105	100,823		36,495	103,850		41,779	106,106		44,016	108,407		45,462	110,786		46,630
2. Proposed New Development Area																					
2.1 Kudsaya New Suburb	300	Wadi Marwam	10,000		0	0		0	0	35,000	117	13,300	56,368	188	22,153	62,235	207	24,770	65,409	218	26,164
2.2 Proposed Kudsaya New Suburb	200				0	0		0	0		0	0		0	0		0	0	25,000	125	10,000
2.3 Dummar Extension Area (1st phase)	124				0	0	20,000	161	6,780	21,020	170	7,988	22,092	178	8,692	23,219	187	9,241	23,806	192	9,522
2.4 Dummar Extension Area (2nd phase)	216				0	0		0	0		0	0		0	0	20,000	93	7,960	24,924	116	9,970
2.5 Kassioun New Town (650 ha)	340				0	0		0	0		0	0		0	0		0	0	12,000	35	4,800
2.6 Assad Suburb (1st phase)	40	5 wells (60 m3/hr)	10,000	12,480	312	3,856	13,779	344	4,671	17,171	429	6,525	22,979	574	9,031	23,559	589	9,376	24,154	604	9,662
2.7 Assad Suburb (2nd phase)	193				0	0		0	0		0	0	25,000	130	9,825	36,733	191	14,620	45,776	238	18,310
2.8 Assad Suburb Extension Area	298				0	0		0	0		0	0		0	0	15,000	50	5,970	18,693	63	7,477
2.9 Kaboon Green Area	530					0			0			0			0			0			0
2.10 Assad City	655				0	0		0	0		0	0		0	0	25,000	38	9,950	31,155	48	12,462
2.1 Proposed Assad City Extension Area (1)	200				0	0		0	0		0	0		0	0		0	0	12,000	60	4,800
2.1 Proposed Assad City Extension Area (2)	124				0	0		0	0		0	0		0	0		0	0		0	0
2.1 Proposed Assad City Extension Area (3)	575				0	0		0	0		0	0		0	0		0	0		0	0
2.1 Special Area Zone (State Factory) *2	25	DAWSSA(100 m3/d)	4,000	3,500	140	100	3,500	140	500	4,000	160	500	4,101	164	500	4,205	168	500	4,311	172	500
2.2 Others (Unclassified Area)	5,227																				
Sub-total	7,046			15,980		3,956	37,279		11,951	77,191		28,313	130,540		50,191	209,951		82,387	287,228		113,667
Total (ha)	7,425			112,384		36,061	138,102		48,446	181,041		70,092	236,646		94,206	318,358		127,849	398,014		160,297

(Source : Damascus Municipality & DAWSSA)

(Remarks)

*1 : Area of Villages is water served area.

*2 : Its a bulk water system to supply water from DAWSSA.