ESTABLISHMENT OF DRINKING WATER AND
SEWERAGE IN THE RURAL PROVINCE OF DAMASCUS

BASIC DESIGN STUDY REPORT
ON
THE PROJECT FOR WATER SUPPLY DEVELOPMENT
IN THE RURAL PROVINCE OF DAMASCUS
IN
THE SYRIAN ARAB REPUBLIC

MARCH 1996

JAPAN INTERNATIONAL COOPERATION AGENCY
SANYU CONSULTANTS INC.

ESTABLISHMENT OF DRINKING WATER AND

SEWERAGE IN THE RURAL PROVINCE OF DAMASCUS

BASIC DESIGN STUDY REPORT
ON
THE PROJECT FOR WATER SUPPLY DEVELOPMENT
IN THE RURAL PROVINCE OF DAMASCUS
IN
THE SYRIAN ARAB REPUBLIC

MARCH, 1996

JAPAN INTERNATIONAL COOPERATION AGENCY

SANYU CONSULTANTS INC.

PREFACE

In response to a request from the Government of the Syrian Arab Republic, the Government of Japan decided to conduct a basic design study on the Project for Water Supply Development in the Rural Province of Damascus and entrusted the study to the Japan International Cooperation Agency (JICA).

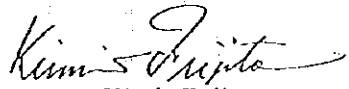
JICA sent to Syria a study team from November 10 to December 9, 1995.

The team held discussions with the officials concerned of the Government of Syria, and conducted a field study at the study area. After the team returned to Japan, further studies were made. Then, a mission was sent to Syria in order to discuss a draft basic design, and as this result, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Syrian Arab Republic for their close cooperation extended to the Team.

March, 1996



Kimio Fujita
President
Japan International Cooperation Agency

Letter of Transmittal

Mr. Kimio Fujita
President
Japan International Cooperation Agency

Dear Sir,

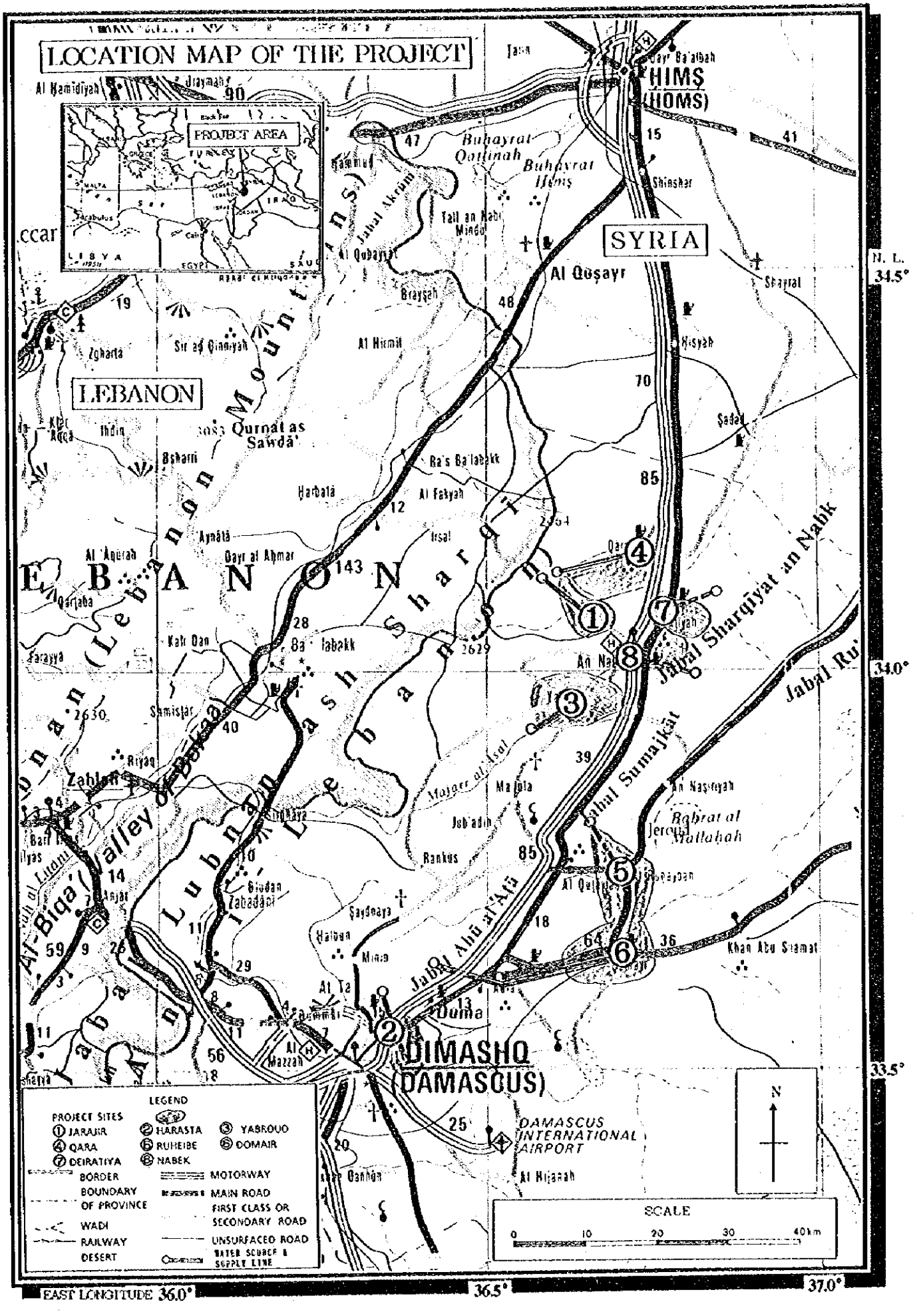
We are pleased to submit to you the Basic Design Study Report on the Project for Water Supply Development in the Rural Province of Damascus in the Syrian Arab Republic.

This study was conducted by Sanyu Consultants Inc., under a contract with JICA, during the period from November 2, 1995 to March 29, 1996. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Syria and formulated the most appropriate basic design for the project under Japan's grant aid scheme.

Finally, we hope that this report will contribute to further promotion of the project.

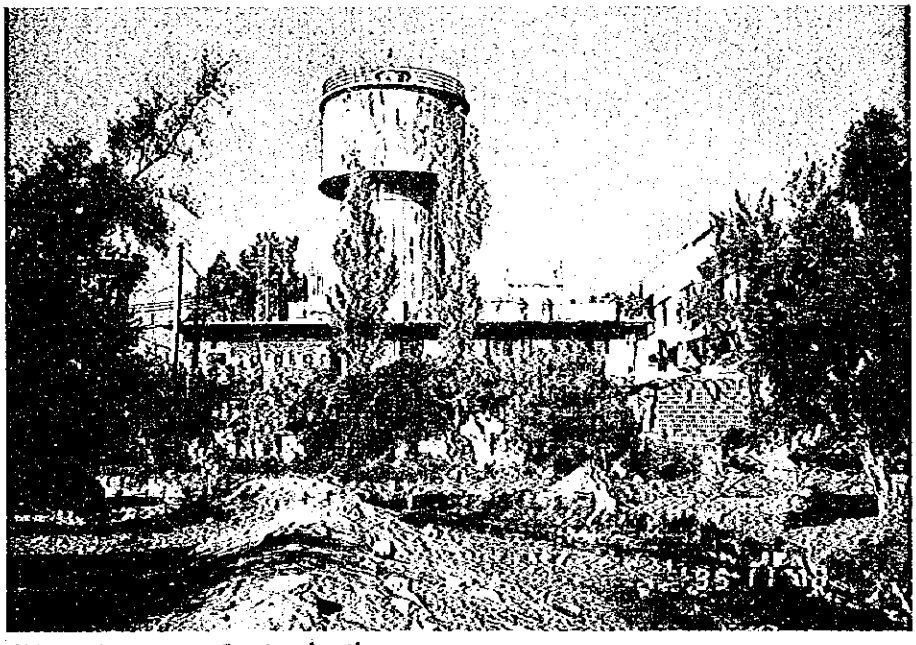
Very truly yours,

Eng. Yasuo Teramura
Project manager,
Basic design study team on
The Project for Water Supply Development
in the Rural Province of Damascus
Sanyu Consultants Inc.


LOCATION MAP OF THE PROJECT
PROJECT AREA
LEBANON
SYRIA
HIMS (HOMS)
DIMASHQ (DAMASCUS)
Al Qoşayr
Jabal Sharqiyat an Nabk
Jabal Sumaykat
Al-Biqa' (Valley of Bekaa)
Jabal Lubnan Ash Sharqi
Jabal Abū al'Aṭā
DAMASCUS INTERNATIONAL AIRPORT
Buhayrat Qaṭṭinah
Buhayrat Ḥimṣ
Khan Abu Shamat
LEGEND
PROJECT SITES
① JARAJIR ② HARASTA ③ YABROUD
④ QARA ⑤ RUHEIBE ⑥ DOMAIR
⑦ DEIRATIYA ⑧ NABEK
BORDER
BOUNDARY OF PROVINCE
WADI
RAILWAY
DESERT
MOTORWAY
MAIN ROAD
FIRST CLASS OR SECONDARY ROAD
UNSURFACED ROAD
WATER SOURCE & SUPPLY LINE
SCALE
0 10 20 30 40km
N
N. L.
34.5°
34.0°
33.5°
EAST LONGITUDE 36.0°
36.5°
37.0°

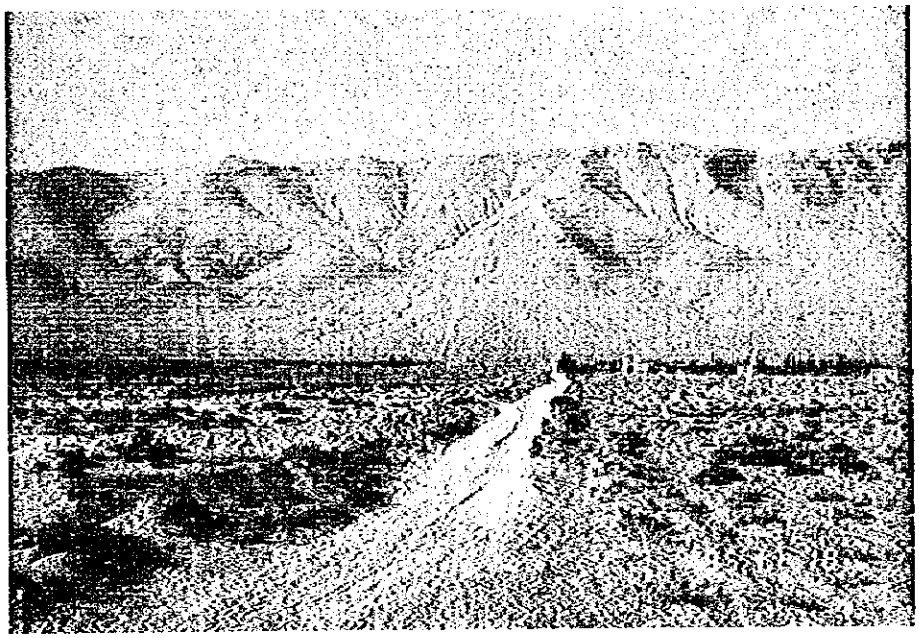
Water Distribution by Water Tank

Drinking water is supplied by a tankroly when no water distributed through networks due to insufficient resources. (Ruheib District)



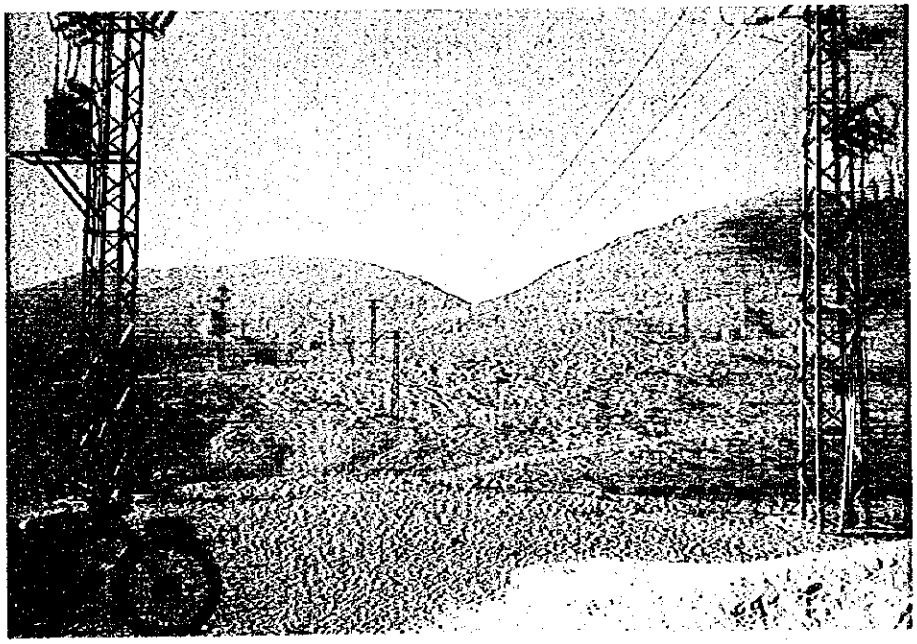
Water Resources Contamination

Water resources contamination is accelerated due to released untreated drainage water. (Harasta District)



Well Water Resources Located on a Hillside

Water resources are found at a fan of hillsides on east side of the Anti Lebanon Mountain range. (Ruheib District)

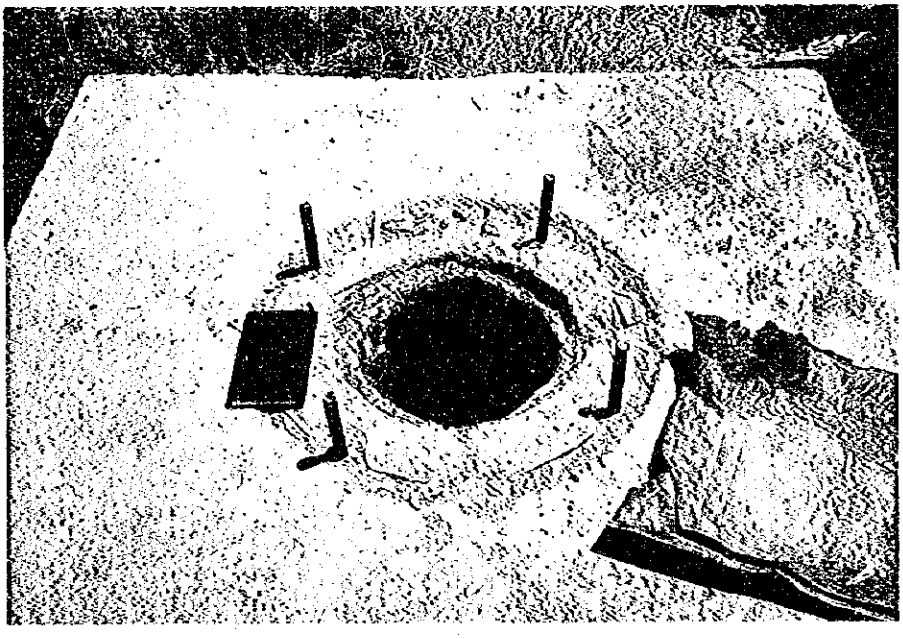


Scattered Wells on Hillsides

Scattered pump houses and transmission line of public supply electricity. (Domail District)

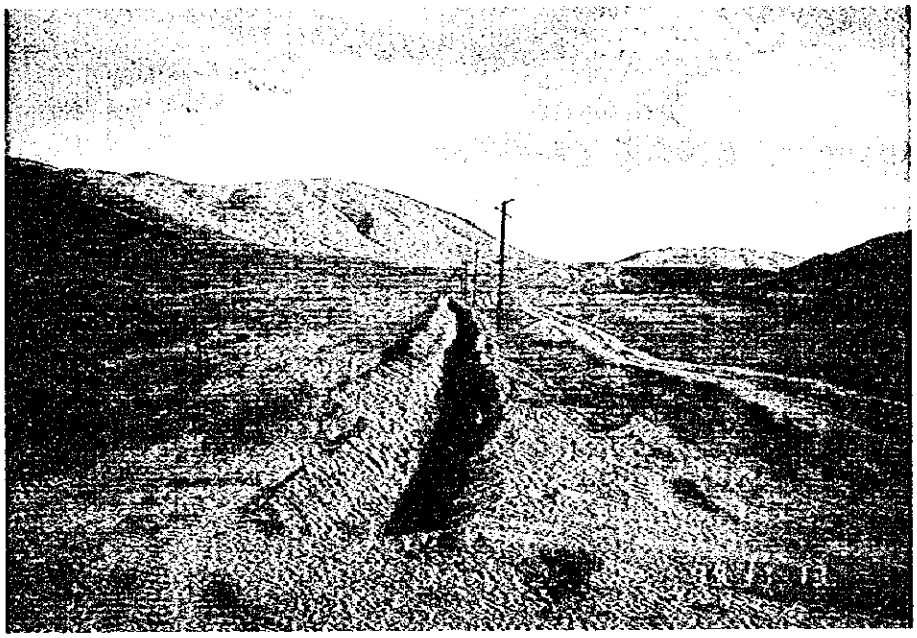
Well bored near a Generator House

Water supply development project is suspended due to no equipment and materials can be procured. (Yabroud District)



Bored Well

Bored wells are waiting pumps. (Yabroud District)

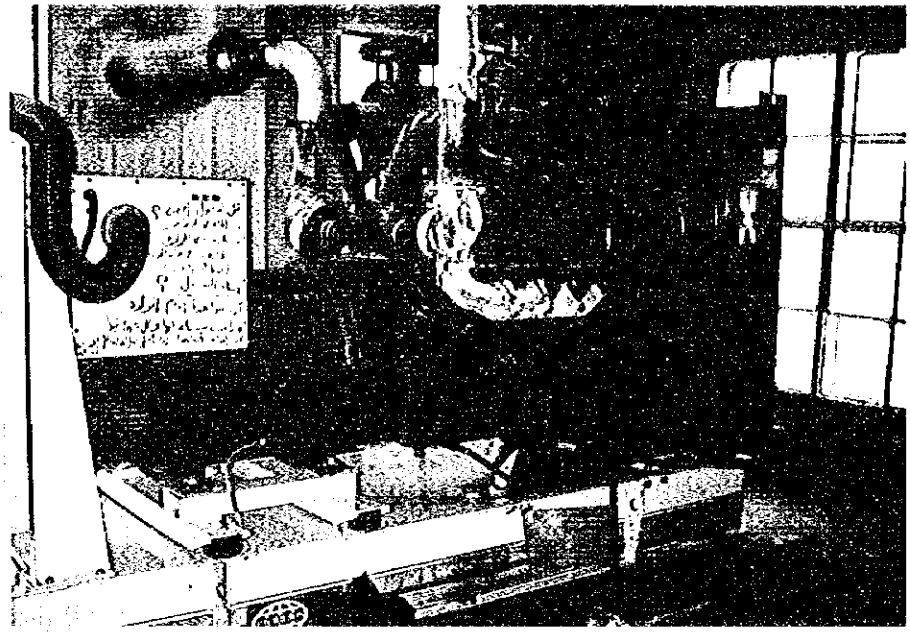


Pipeline Installation

Pipe installation work for a gathering pipeline. Electric poles are newly constructed along the pipeline for pump energy. (Deir-Atiya District)

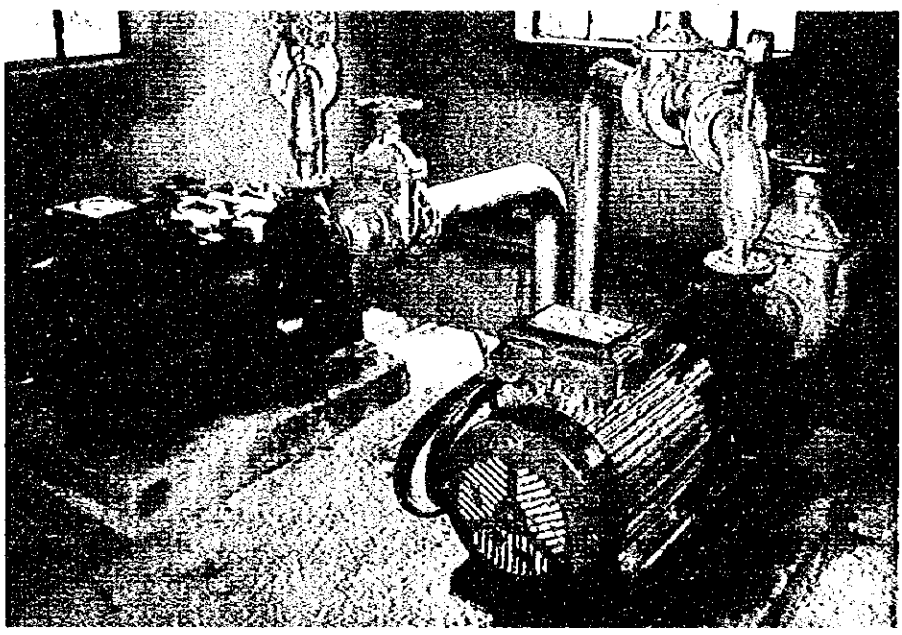
Proposed Pipeline Route

Pipeline is installed through agricultural road and fruit plantation. (Qara District)



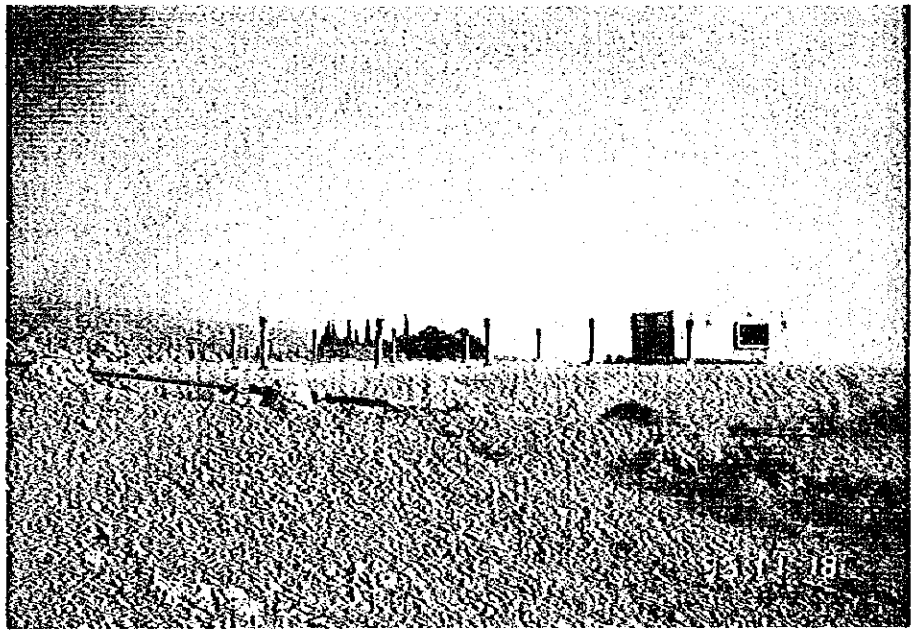
Diesel Generator

Diesel generator is installed in a generator house. (Nabek District)



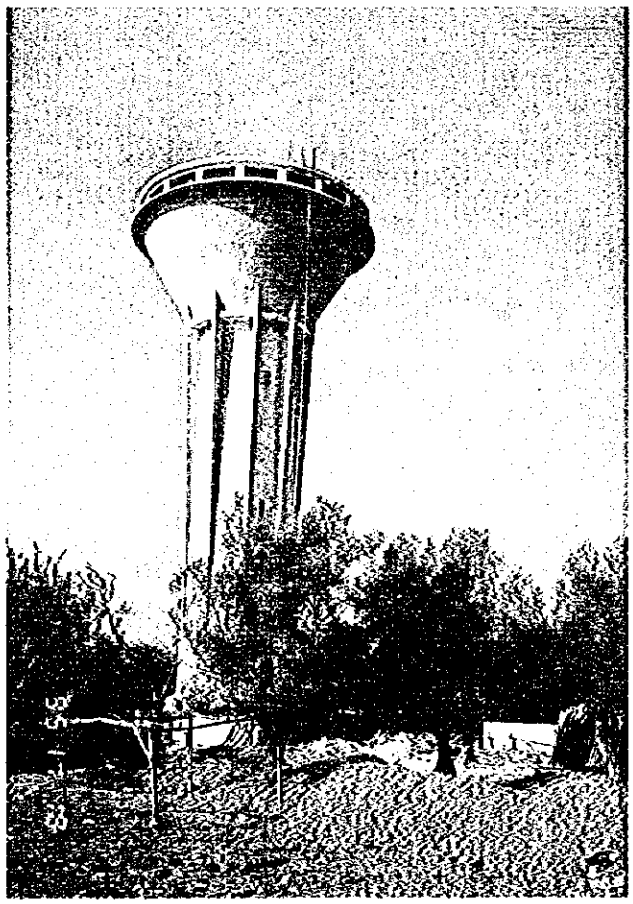
Booster Pump

Booster pumps are used where no enough head loss is available. (Nabek District)



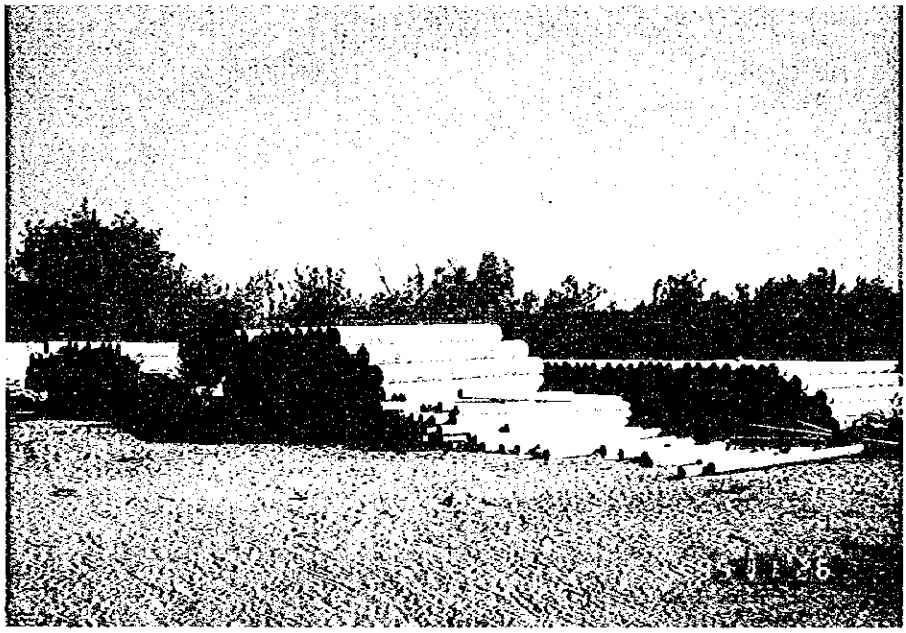
Ground Reservoir

Pumped water is reserved in a reservoir constructed at hillside. (Domail District)



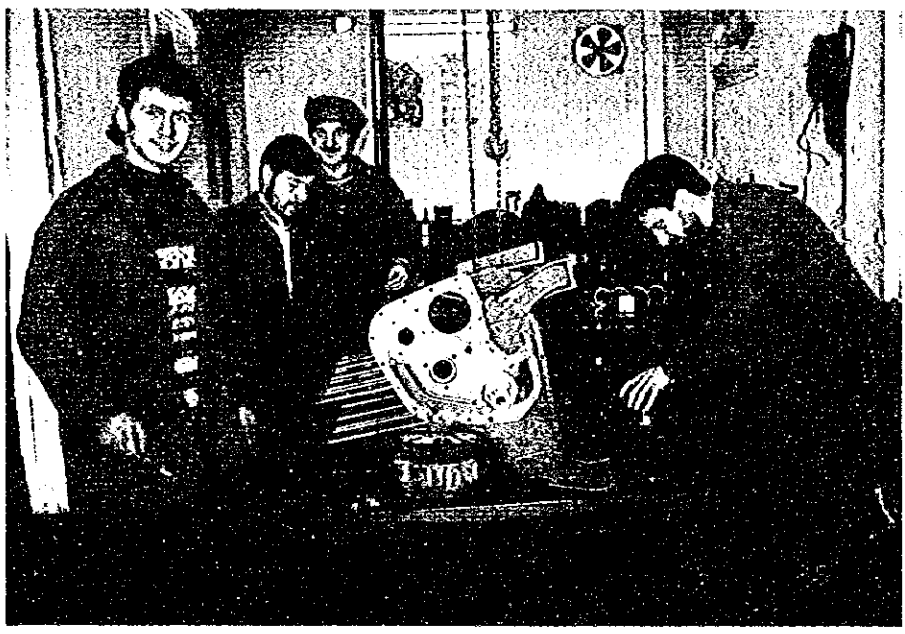
Elevated Tank

Water is conveyed from a reservoir to a elevated tank. (Harasta District)



Stocked Pipes

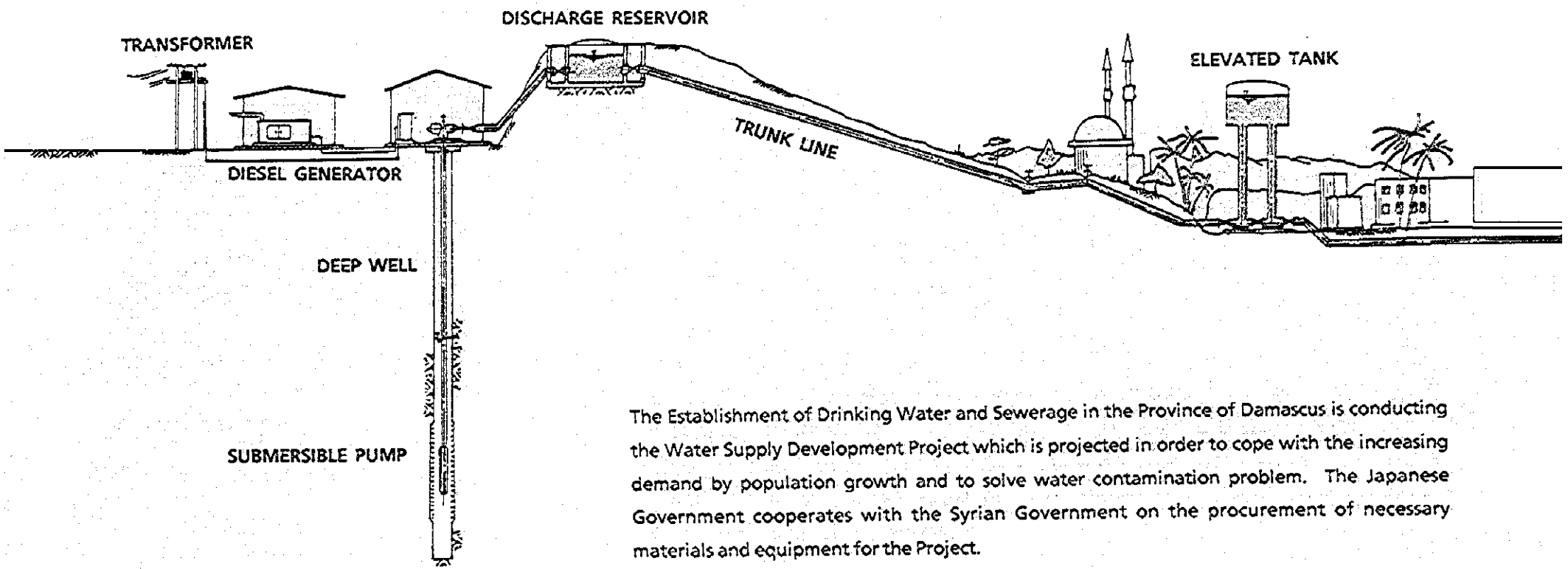
Pipes are stocked at the stock pile in the Work Shop. (Work Shop)



Overhaul

A generator is overhauled by engineers assigned at the Work Shop. (Work Shop)

IDEAL FIGURE OF WATER SUPPLY PROJECT



The Establishment of Drinking Water and Sewerage in the Province of Damascus is conducting the Water Supply Development Project which is projected in order to cope with the increasing demand by population growth and to solve water contamination problem. The Japanese Government cooperates with the Syrian Government on the procurement of necessary materials and equipment for the Project.

TABLE OF CONTENTS

Appendices

Table

Figure

Drawings

Abbreviation

ACP	Asbestos Cement Pipe
DAC	Development Assistance Committee
GCC	Gulf Cooperation Council
GDP	Gross Domestic Product
ISO	International Organization for Standardization
ITU	International Telecomunication Union
JICA	Japan International Cooperation Agency
MHU	Ministry of Housing and Utility
EDWSRPD	Establishment of Drinking Water and Sewerage in Rural Province of Damascus
Syria	Syrian Arab Republic
WHO	World Helth Organization

Units of Measurement

ha	hectare
km^2	square kilometer
m^3	cubic meter
m/s	meter per second
l/s	litter per second
m^3/s	cubic meter per second
m^3/min	cubic meter per minute
m^3/hr	cubic meter per hour
W	watt
KW	kilo watt
MW	mega watt
V	volt
KV	kilo volt
KVA	kilo volt ampere
Hz	cycle
Hp	horse power

Currency

S.P	Syrian Pound
US$	US dollar
¥	Japanese Yen

Exchange Rate

US$	= 42 S.P
	= 97 ¥
S.P	= 0.0238 US$
	= 2.31 ¥

CHAPTER 1 BACKGROUND OF THE PROJECT

CHAPTER 1 Background of the Project

The Syrian Arab Republic is located at the east coast of the Mediterranean sea and bounded by Turkey, Iraq, Jordan, Israel and Lebanon. The national area is around 185 thousand square kilometers and the population is 13.39 million in 1993. Climate is varied according to its location. It has comparatively abundant rainfall at the coastal area along the Mediterranean sea, however it has very few rainfall in the midland of the country. From the economic view point, each of the industrial sector are well balanced with the others having agriculture, mining and manufacturing, and service sectors with the structural ratio of GDP at 30 %, 23 % and 47 % respectively. GDP per capita in Syria is around 1,170 US dollar in 1991. The education ratio is quite high level as compared with the other arabic countries. The population in Damascus, capital of Syria, is 2.5 million accounting to around 18 % of the total population in Syria.

Damascus city, capital of Syria and surrounding cities of Damascus are supplied drinking water through long distribution networks from the sources of springs and groundwater. However, due to the rapid population growth, the inhabitants are faced to serious drinking water shortage. Especially, Damascus city has coped with the serious drinking water shortage condition by controlling the supply system in recent year from 1991 to 1992. Therefore, the improvement for water distribution system in the city and its suburban area is the urgent need due to increasing demand of drinking water including water for industrial use.

As a result, the Syrian government are taking indirect measure to restrain migration from rural area to urban area, on the other hand, the government has promote the Water Supply Development Project in the Rural Province of Damascus as direct measure.

The expected population growth rate in Syria is very high at 3.3 to 4.0 % and the demand for drinking water has been drastically increasing, and presently many people are facing lack of safe water. Especially, the southern part of Syria is far from surface water resources such as rivers or lakes, and groundwater can be observed only at quite limited points. As a result, the drinking water in Damascus city and its surrounded area is supplied through long distribution pipeline from such limited springs or groundwater. However,

rapid urbanization and population growth is further causing the water shortage.

Due to the serious lack of drinking water, the inhabitants in towns and villages of rural province of Damascus are forced to drink and use the contaminated water from the local and individual wells. The contamination resulted from the primitive sewerage which penetrates into shallow local wells. Consequently, the inhabitants, especially the children, are suffering from various diseases.

The unused sanitary conditions in those villages and towns forced many people to leave their homes and migrate to the nearest cities seeking for a clean drinking water for their families. Such migration brought about two negative results;

- Loss in productivity, mainly in agriculture, in Rural Province of Damascus.
- Further congestion and resultant accommodation problems in Damascus city.

Under these conditions, the Syrian Government decided to undertake the water supply development project for 9 districts in the Rural Province of Damascus in 1993. The purpose of the Project is to supply sanitary water and to ensure good health to inhabitants, to promote agriculture as the main industry and to control the migration to Damascus City. The Establishment of Water Supply and Sewerage in the Rural Province of Damascus (herinafter refer to as the Establishment) is implementing the Project under their original plan and design.

As the result, the drilling of the wells for water resources and some other facilities were completed. However, due to the lack of foreign exchange, necessary equipment and materials for the Project such as pipes, submersible pumps, diesel generators and transformers could not be purchased. Hence, the construction of those facilities have been suspended.

In view of the above circumstances, the Syrian Government made a request for Japan's Grant-Aid assistance to procure the equipment and materials such as ductile iron pipes, submersible pumps, diesel generators and

transformers, etc. in order to complete the construction of water supply facilities and to supply safe water steadily as soon as possible.

CHAPTER 2 CONTENTS OF THE PROJECT

CHAPTER 2 Contents of the Project

2 - 1 Objective of the Project

The Establishment has been carrying out water works development projects to improve water supply for the local communities. However, due to the shortage of budget, improvement works were suspended at such incomplete stage where the water pumps or pipelines are not provided, though the drilling of deep wells have been completed. The objectives of this project are to procure equipment and materials such as submersible pumps and pipes that are in shortage for the construction, and to complete the construction of water supply facilities so as to enable the supply of safe drinking water.

2 - 2 Basic Concept of the Project

In recent years, the shortage of water supply and the contamination of water resources have become more serious in the suburbs of Damascus due mainly to the population increase in the urban cities and villages in the rural province of Damascus. To cope with this problem, the Establishment has drilled deep-wells to secure new sources of groundwater, and construct pipelines in nine districts.

The overall plan adopted by the Establishment included exploitation of water resources, drilling of deep-wells, installation of submersible pumps, construction of reservoirs, installation of pipelines connecting the reservoir tank to the delivery tank, which is designed to improve the facilities for water supply and distribution. However, the works of installation of pumps, construction of reservoirs or relating facilities have been suspended due to non-availability of required equipment and materials such as water pumps, ductile cast iron pipes and the like because of financial problem. In the present project, the general construction plan shall be formulated, and then, necessary equipment and materials shall be procured in order to complete the construction of the water supply facilities.

Among the nine districts, the Qodosaya district (nearby Damascus city) is excluded from the project plan, despite the urgent need for improvement of

water supply condition in the district, because the project preparation has not been completed and judged not ready for implementation.

The present project plan was formulated in order to improve the water supply facilities, setting the year 2000 as target year under this studies. In formulating the project plan, the study has focused on the long-term national construction plan as well as based on the available statistic references. Considerations are given to the need for the facility improvement in the districts concerned, while carrying out comprehensive survey of water resources. The project plan should be conceived, with the specifications of pumps or the number of necessary pumps which shall be determined by the examination of the current pumping facilities, and the estimated volume of the water demand and water supply condition. The total pipeline length, pipe diameter and its kinds are determined based on the route survey and the water supply scale. The electric power generator and transformer are selected with the specifications that can meet the purpose. The vehicles which will be used for the project shall be chosen from among the models adequate for the maintenance and operation of the facilities to be constructed.

2 - 3 Basic Design

2 - 3 - 1 Basic Concept

1) Demand Projection

The Establishment set the year of 2015 as the target year for water supply and made the demand estimation from the population of 1990 and expected natural growth rate in between 3.3 and 4.0% during the period. However, the formulated plan of the present project sets the year 2000 as the minimum project range, considering the emergency level of facility requirement and current capacity of the water supply, so that the project shall meet the demand expected in 2000 at the earliest, and with several years of succeeding allowance.

2) Conveyance Pipeline

The Establishment has not applied any criteria or standard for water pipeline, thus, the pipelines are to be designed based on the Japanese standard. However, the basic design may follow the regulations or standard to be adopted by the Establishment.

a. Route Selection

The distribution reservoir is located far from the water source wells as shown in the General Map (refer to Drawing No 1. at the end of this Volume). The existing wells used for water source in Deir Atiya and Nabek are located at the foot of mountains situated in east of Towns.

New water source wells in Qara, Jarajir, Yabroud, Ruheibe, Domair and Harasta are located at east of Anti Lebanon Mountains range. The length of those pipelines are 2 kilometers for new line of Yabroud, from 7 or 8 kilometers to over 20 kilometers in other districts. In Ruheibe, a proposed length of new line is 2 kilometers out of total length of 9 kilometers.

Proposed routes of 6 lines are as follows except Deir Atiya and Nabek where no new lines proposed;

① Jaragir

The proposed line extends toward west-north-west direction along the orchard from source well to the center of Jarajir town. The proposed length is 7,000 meters and the difference of ground elevation between the reservoir site and the distribution tank site is around 190 meters. The longitudinal slope is estimated at 1 over 35 (1/35). (refer to Drawings No. 2 to No. 4)

② Harasta

The source wells are located on the foothill at 8 kilometers north of Harasta city. The water produced from the four source wells is collected into the reservoir tank through collecting pipelines. The proposed pipeline is extended from the reservoir to the distribution tanks located at the centers of Harasta city and Urbin city. The length of proposed line is estimated at 9,930 meters. There

is a diversion for the proposed Urbin branch at around 5.5 kilometer from the reservoir. The difference of ground elevation between the reservoir site and the distribution tank sites is around 80 meters. The pipelines are installed under roads for easier installation and maintenance. (refer to Drawings No. 5 to No. 8)

③ Yabroud

The source well site is located at 2 kilometers east of the existing well site. The pipelines of a trunk line from the new well to the existing pipe line and collecting lines of 0.7 kilometers in the existing wells site are planned.

The length of the proposed pipeline is around 2,000 meters along the road. It is connected with the existing line and extends to the new distribution reservoir. The difference of ground elevation of the proposed line is 10 meters and is fluctuating. (refer to Drawing No. 9)

④ Qara

The source well site is located at the foothill with ground elevation of 1,700 meters at east-south-east of the town. The proposed pipeline extends straight from the well site to the distribution tank located at the center of the town. The length of the pipeline is 11,500 meters and the difference of ground elevation between reservoir site and the distribution tank site is around 490 meters. The average longitudinal slope is 1 over 25 (1/25). (refer to Drawings No. 10 to No. 13)

⑤ Ruheibe

The source well site is located at the foothill on an alluvial fan, 10 kilometers east of the town. The proposed line starts from the source site and connects with the existing pipeline. The length of the line is 2,300 meters and the difference of ground elevation between the beginning point to the end point is more or less 100 meters. (refer to Drawing No. 4)

⑥ Domair

The proposed pipeline extends from the existing reservoir constructed at the source well site to the elevated distribution tank located at the center of

the town. Thepipe line is the longest among the 6 lines under the present project with a length of 23,254 meters long.

The proposed line starts from the reservoir located at the foothill, crosses a highway and runs along the road extending straight from the highway to the center of the city. There are few obstructs with no residence observed between the reservoir and the distribution tank. (refer to Drawings No. 15 to No. 22)

b. Selection of pipe

In Syria, manufacturing of asbestos pipes began in 1970's, and they have been used widely for water distribution pipelines. Although the small diameter pipes have not caused any serious problems for low pressured pipeline, the pipes installed in the high pressured pipeline have often inflicted damages at their joints or the pipes themselves.

While, the ductile cast iron pipelines which were constructed in the beginning of 1980s have not been reported of any accidents. For the construction of steel or FRP pipes, welding must be done at the joints, but welding cannot be applied, because welding technology is not popular in Syria. When the ductile iron pipes are used, the joints are worked by the push-fit method, which has been well experienced by Syrians, and therefore, higher construction standard could be secured. In addition, this method is economical and easy, not only in installation but also in repair jobs. For these reasons, the ductile iron pipes are selected for the high pressured sections of pipelines.

c. Determination of Pipe Diameter

The diameter of the pipe is determined based on discharge capacity and its velocity. The water flow velocity must be restricted regarding the secureness of the facility and pipe itself. The pipe diameter should be decided while taking all these into considerations. In this project plan, flow velocity is adopted within the range from 0.7 to 1.8 m/s, which is allowable velocity range for pipelines and pressure pipes using pump, adopted as the standard by the Ministry of Agriculture, Forestry and Fisheries of Japan (hereinafter refer to as MAFF).

d. Extension Rate for Pipeline Materials

The actual length of the pipeline materials is not identical with the layout length on the Plan. It is determined according to bending, longitudinal slope, joint loss requirements or possible damages that might be occurred during their transportation or storage. The landscape of the pipeline routes in the Project area are mostly on the plain surfaces except some mountainous sections. The proposed pipelines are installed mostly in the suburbs of the towns, hence the route laying in town is short. Taking all these into considerations, an incremental rate of 7 percent must be adopted to the Project, consisting of 3 percent for longitudinal slopes and 4 percent for other possible losses, such as joint loss for adjustment, damages during transportation or storage.

e. Attachments and Parts

Blow-offs shall be installed at the lower sections for the periodical maintenance such as cleaning of pipelines. Air valves as safety facilities are usually installed at the higher section of longitudinal lay-out. However the proposed lines are of fairly gentle slope, so that the valves are to be installed at least one in 500 meters. Bend pipes will be used at the points of plane bends and sharp angles of longitudinal bend. Joint rings are used in both sides of bend pipes, valves or structures for adequate operation and maintenance of the pipelines. Branch pipes are distributed at the points of branches and air valves, and blow-offs and short pipes with flange are necessary to connect pipelines with branch pipes. Check valves at the inlets and the same at the outlet are installed for the reservoirs and distribution tanks. However, those valves are to be included in the structures which will be installed by the Syrian side. Valves for blow-offs and air valves are standard type applied by the Establishment, and therefore not included in the procurement items to be covered by Japan's Grant Aid assistance.

3) Pump

a. Discharge and Pump Capacity

Distribution water fluctuates seasonally, but as the regulating reservoir is installed at the beginning point of the supply pipeline,it is possible to take water constantly from source wells in spite of fluctuation of distribution

water. Therefore, 24 hours' average discharge of daily maximum discharge for the plan is adopted as pump capacity.

b. Selection of Pump Model

A borehole-type pump may be used for the shallow well. This type of pump has a merit that a motor is installed outside the well. But failures of pump, such as fault of impeller or shaft, are observed when wells become deeper, and that maintenance cost becomes expensive. Therefore, a submersible pump is usually used for deeper wells with the depth more than 50 meters. By the Establishment's standard, it is regulated that a submersible pump must be used for a deep well with the depth more than 50 meters. In fact, submersible pumps are used for the existing wells exceeding 50 meters deep. The workshop of the Establishment is well furnished with service facilities and parts for the maintenance of pumps. Also, it is staffed with mechanical and electrical engineers, skilled mechanics and electrician. These engineers have sufficient experience in installation and maintenance for this type of pump, so the selection of submersible pump is considered appropriate.

c. Determination of Pump Specifications

The specifications of a submersible pump will be determined according to engineering calculation such as static groundwater level, lowest dynamic water level, operating water level in the discharge tank and required water head in relation to pipe diameter and pipeline length.

4) Selection of Diesel Generator and Transformer

According to the field survey conducted in the Project area, the proposed diesel generators will be used as standby generators in most parts of the Project districts. However, the diesel generators are planned to be used as main power supply in the districts of Qara and Jarajir, since there is no public power supply line. Public power supply condition in Damascus city has been remarkably improved recently, but in rural area, public power supply condition is not good and power failures occur frequently. Particularly, a standby generator is indispensable in the district where rotational water supply is needed due to seasonal water shortage.

Transformers are required in order to match the voltage to the specifications of the pump motor. Capacity of the generator will be determined based on the requirement of the motor.

2 - 3 - 2 Basic Design

1) Benefited Population

a. Current Situation of Population

The following table is the beneficiary population in recent years.

Comparison of Existing Population

DISTRICT	(1) CENSUS (1993)	(2) INQUIRY (1995)	(3) PROJECTED (1994)	(4) PROJECT (1994)
Jarajir	4,015	7,000	3,928	3,928
Harasta				
Harasta	27,462	100,000	70,192	70,192
Urbin	32,416	34,000	40,945	40,945
Yabroud	34,033	30,000	51,241	51,241
Qara	16,918	17,500	11,486	17,500
Ruheibe	21,149	30,000	25,099	25,099
Deir Atiya	18,853	25,000	24,201	24,201
Nabek	37,006	40,000	43,562	43,562
Domair	23,926	25,000	27,598	27,598
Qodsaya			(159,000)	(159,000)
Daraya	51,436	N.A	90,000	90,000
Maadamiya	17,190	N.A	50,000	50,000
Senaya	6,300	N.A	10,000	10,000
Ashrafia	N.A	N.A	9,000	9,000

Note: (1) Population registered in Towns or Village by census in 1993.
(2) Population by oral inquiry survey.
(3) Design population by EDWSRPD depending on the basic population in 1990.
(4) Applied design beneficiary population.

The above table shows fairly large difference between the population figures based on a census and the other figures derived from the inquiry. The discrepancy is due to the difference between the administrative district and the water supply districts; the city administrative population may not coincide with the benefited population necessarily. In such case, it is considered to be appropriate to adopt the figures of the proposed benefited population prepared by the Establishment. However, in Qara, the figure estimated in 1990 by the Establishment does not coincide with the actual figure, therefore, it is determined to adopt the benefited population obtained by the oral inquiry.

b. Population Growth Rate

In the Syrian Arab Republic, the national average of annual population growth rate from 1965 to 1994 is estimated at 3.35%, which is quite stable. The latest estimated population growth rate in the Rural Province of Damascus is 3.6 %, which is almost the same with that of the national average. In the Rural Province of Damascus, the vicinities of Damascus City, however, there is rapidly increasing population with a rate of 4.65 %, in contrast with the provincial average of only 2.84 %.

The population growth rates in local area of the Rural Province of Damascus are distributed wide range. The Project areas are located nearby Damascus city and along the high way to Homs. Accordingly, their population growth rate is considered an average of urban and local area. Furthermore, after the completion of the Water Supply Development Project, migration will be accelerated. Accordingly, it is considered that the population growth in Syria will still continue same tendency for ten years or more judging from a Logistic curve of the population growth in Syria.

The population growth rate stated in the request document is summarized as follows.

Projected Growth Rate (%)

District	Requested	Projected
City Area (Harasta. Urbin)	4.00	4.00
Rural Area (Other areas)	3.30 - 3.35	3.35

c. Estimation of Benefited Population

Annual population growth rate seems changing steadily at a certain pace in recent year in Syria, therefore, it is appropriate to estimate the benefited population by the following formula:

$$P = Po(1 + r)^n$$

where, P : Benefited population in the estimated year
Po : Benefited population in the projected basic year

n : Number of year from the projected basic year to the estimated year

r : Annual average population growth rate

The projected basic year is set in 1994 as separately discussed, and Po is the current benefited population (1994). The results of the calculation are shown in Table-4.

2) Water Supply Projection

a. Target Year for Water Supply

As mentioned in the foregoing, the target year for water supply plan in this study is year of 2000. Although the target year set by the Establishment is 2015, judging from the water supply capacity (refer to Table-6 - Table-13) by the proposed wells which are explored and drilled by the Establishment, the year 2000 is appropriate to adopt the minimum range for supply projection under the Japan's Grant Aid assistance. However, the water supply pipeline may cope with the demand for several years even after the target year, depending on the limit of allowable velocity.

b. Projected Unit Water Consumption per capita per day

The average unit water consumption in the Project area is 100 ℓ/capita per day. But, the unit water consumption in the suburbs of Damascus city is estimated at 173 ℓ/capita/day. On the contrary, unit water consumption is 58 ℓ/capita/day in the rural area and it varies according to the supply method and its locality.

The projected unit water consumption shall be determined according to the city planning, industrial development programs, etc. of the districts concerned. Further, the dissolution of the rotational water supply shall be taken into account for the determination of the projected unit water consumption. Based on these situations, the projected unit water consumption has been determined as follows:

- Suburban area of the Capital

The unit water consumption of 200 ℓ/capita/day shall be applied for the project in suburban districts. The figure seems relatively low in reference to the data of the similar countries (the table below refers). While the current unit water consumption in Urbin is 197 ℓ/capita/day, even this figure water shortage was frequently recorded, therefore the projected unit water consumption of 200 ℓ/capita/day is considered quite reasonable.

- Rural area

Water shortage is observed frequently at rural district in the Project area. In these districts, a rotational water supply method is practiced with intervals from 3 days to 15 days. Among these districts, Deir Atiya consumes the largest unit water consumption of 97 ℓ/capita/day, where water is supplied for 24 hours continuously in winter, but for 24 hours every there other days in summer. The unit water consumption in summer at rural district is estimated at about 1.5 times of that in winter, therefore, the projected unit water consumption in rural districts will be 110 ℓ/capita/day according to the following calculation:

97 (ℓ/capita/day)×0.76 (actual load in winter)×1.5=110 ℓ/capita/day

From the above review, the projected water consumption is set at 200 ℓ/capita/day in the suburban districts of Harasta and Urbin, and at 110 ℓ/capita/day in other rural districts.

Water Consumption (1985)

Name	Designed (ℓ/capita/day)		Performance (ℓ/capita/day)	
	City Area	Rural Area	City Area	Rural Area
Morocco	-	-	117	50
Iraqu	370	225	315	210
Yemen	60	40	60	40
Sauji Arabia	350	250	250	110
Tunisia	-	20	73	23
Somalia	30-130	25	25	15
Oman	250	45	220	35
Cyprus	250	150	220	130
Bahrain	320	270	502	1

Source : WHO "International Drinking Water Supply and Sanitation Decade-Review of Mid-Decade Progress" 1987 August

c. Design Water Consumption

Design daily average water consumption is calculated as follows:

(Design daily average water consumption) = (Design benefited population) × (Projected unit water consumption)

The calculated results by the above formula are shown in Table-4.

3) Water Source

a. Classification of supply facility and current water supply capacity

The water source in the district concerned is basically groundwater exploited by wells. The planned water source and the water supply facilities are classified as follows.

Purpose of Facilities Improvement

District	Purpose of Facilities Improvement	Remarks
Harasta/Urbin	Source conversion and facilities expansion	Polluted
Jarajir	Source conversion	Polluted and deteriorated
Yabroud	Facilities expansion	
Qara	Source conuersion and Facilities expansion	
Ruheibhe	Facilities expansion	
Deir Atiya	Facilities expansion	
Nabek	Facilities expansion and Pump renewal	
Domair	Source conversion and facilities expansion	Existing well abandoned

- The wells have been contaminated in Harasta/Urbin, therefore, conversion of source is necessary. The demand for water is very high, and the source to be developed is limited. So, new ground water source shall be developed in the near future.

- In Jarajir, the existing wells are getting outdated and have been contaminated, so conversion of groundwater source is necessary. Also, expansion of supply facilities is urgently required.

- In Domair, the current wells are very much affected by salt water that source conversion is of urgent necessity. Also, facilities expansion is needed.

Judging from the purpose of facilities improvement in the above table, the water supply capacity of the existing facilities is shown in the table below, which can supplement the design water consumption.

Water Supply Capacity of Existing Facilities

Project	Capacity×No. of Well	Availability (m^3/hr)	Site
Harasta		(1,205)	
Harasta	40 Wells	700	City interior
Urbin	22 Wells	505	City interior
Jarajir	-	0	
Yabroud	60 m^3/hr×2 Wells	120	Coreine
Qara	7m^3/hr×1Well+9m^3/hr×1Well	16	City interior
Ruheibe	-	0	Wadi Ashab and Sare
Deir Atiya	35×1+15×1+35×1+20×1+42×1	147	Marima
Nabek	15×1+50×2	115	Marcorpe
Domair	15×2	30	Mushruha

b. Capacity of Proposed wells

Table-14 shows the result of the pumping tests for the proposed wells. The tests were conducted in the following manner that the pump capable of meeting the planned pump discharge is operated continuously until the groundwater level reaches the equilibrium. After the equilibrium in groundwater level is confirmed, the pump is put off and recovery to its initial static water level is checked. The water level declining period is generally ranges from 24 to 66 hours. The time required for water level recovery is from 2 to 14 hours. From these data, it can be decided that all the proposed wells have the required pumping capacity. Judging from the amount of production, the pumping is likely to keep its normal strength in sites other than Ruheibe and Deir Atiya. In these districts, however, the pumping capacity excess planned cannot be expected because the pump discharge nearly reaches the limit.

c. Water quality of Proposed wells

Table-1 shows the result of the water quality tests performed for the planned sources of water. The values ensure that the water quality of any well is sufficiently suitable for drinking water. Therefore, it is determined that no special measure in all new wells being proposed is to be taken.

4) Facilities plan

a. Design discharge of Conveyance Pipeline

In general, a design discharge of conveyance pipeline is determined by the design maximum water consumption per day in the target year. In case of pumping by wells, however, the water supply may be restricted by the pumping capacity. Thus, a design maximum hourly water consumption (q) is obtained from a design maximum daily water consumption (Q) by the following formula:

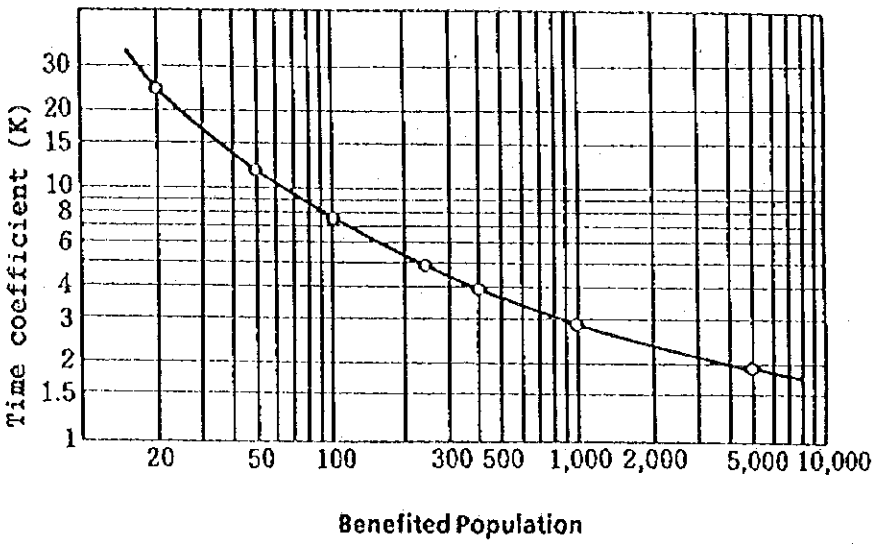
$$q = K \times \frac{Q}{24}$$

Where, q : Design maximum hourly water consumption
Q : Design maximum daily water consumption
K : Time coefficient

Time coefficient K is shown in the figure of next page as a ratio for a design maximum hourly consumption against an average hourly consumption. Based on the figure below and taking into consideration that the population in all districts of the Project area is over 10,000, 1.5 may be adopted as the coefficient K.

Therefore, a design discharge for conveyance pipeline is estimated at 1.5 times of maximum daily consumption.

BENEFITED POPULATION AND TIME COEFFICIENT



Adjustment of water supply amount is performed by regulating the operation time unless it is adjusted by the operation of a source pump. If multiple pumps are installed, the water supply amount may be adjusted by increasing or decreasing the number of pumps during the fixed operation time. In this plan, however, the water supply amount is adjusted with the pump operation time as done in the current pump operating system. Thus, when water is supplied at a design maximum water consumption per day, source pumps shall be operated continuously for 24 hours. When water is supplied at a design average water consumption per day, source pumps shall be operated for 16 hours. Adjustment of supply and demand of water is considered to be carried out by reservoirs installed in the waterworks.

b. Balance between demand and supply

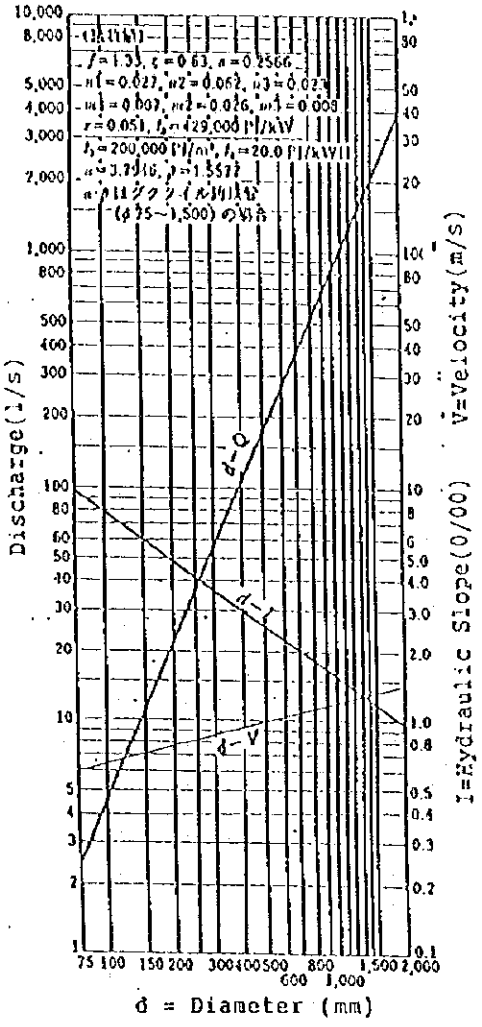
Studies on the balance between demand and supply of water in all project districts in future years are shown in Table 6 to Table 13. Based on these date, the water supply in all Project districts will be unable to satisfy the demand approximately in the year of 2000; viz., the capacities of the pumps installed in the wells generally will become insufficient beyond the year of 2000, and consequently each pumping capacity will be increased or new sources of water sought elsewhere. At Deir Atiya and Nabek, the water supply amount is anticipated to be in short earlier as shown in the table below.

Year Balanced Between Demand and Supply

District	Case	Year
Harasta		2001
Jarajir	1 Pump Case	2010
	2 Pumps Case	2015
Yabroud		2004
Qara		2000
Ruheibe		2007
Deir Atiya		1998
Nabek		1997
Domair		2000

c. Flow Velocity and Discharge

Generally, the flow velocity in ductile cast iron pipes or steel pipes is assumed at an allowable maximum of 3.0 m/s from the safety point of view. In the planning and design standard of the land improvement enterprises recommended by the Ministry of Agriculture, Forestry and Fisheries, Japan (hereinafter referred to as MAFF), the average allowable velocity in hydraulic units (e. g., pipeline networks, etc.) which are combined or connected hydraulically each other is defined at a maximum of 2.0 m/s. Meanwhile, in case of the pump-pressurized transfer pipes, an economical combination of a pipe diameter and flow velocity is selected, taking into account of the relation between the pipeline installation cost and pump power cost. The proposed pipe lines installed in all the project districts in the scope of this plan are basically carrying water by pressure pumping from deep wells. Economical relationship between pipe diameters and discharge, which applies to the pump-pressurized pipelines in Sendai-city in Japan, is indicated in the drawing on page 134 of Guideline and Description for Waterworks Design, 1990 (Refer to the drawing of next page).



Economical Pipe Selection

Relation between Diameter, Velocity and Discharge

Diameter D (m/m)	Velocity V (m/s)	Discharge Q (ℓ/s)
75	0.57	2.52
100	0.62	4.88
125	0.66	8.14
150	0.70	12.37
200	0.76	23.94
250	0.81	39.96
300	0.86	60.79
350	0.90	86.59
400	0.94	117.62
(450)	(0.97)	(154.11)
500	1.00	196.35
600	1.06	298.29

Source : Guideline and Description for Waterworks Design, 1990, page 134, 4.2.4

The above table shows the relations between diameter, velocity and discharge which are obtained from the figure in previous page. Proper flow velocity of each pipe diameter is specified. And the design standard recommended by MAFF provides general flow velocity ranges as follows:

Allowable Velocity in Pump Pressured Pipe

Diameter d (m/m)	Velocity V (m/s)
75-150	0.7-1.0
200-400	0.9-1.6
450-800	1.2-1.8

Source : Design Standard by MAFF.
see Pipeline P.46

From the above table, the relation between flow velocity and flow rate is calculated as follows:

Relation between Velocity and Discharge (by MAFF)

Diameter	Allowable Velocity	Discharge against Allowable Velocity
75	0.7-1.0	0.003-0.004
100	0.7-1.0	0.005-0.008
125	0.7-1.0	0.009-0.012
150	0.7-1.0	0.012-0.018
200	0.9-1.6	0.028-0.050
250	0.9-1.6	0.044-0.078
300	0.9-1.6	0.064-0.113
350	0.9-1.6	0.087-0.154
400	0.9-1.6	0.113-0.201
450	1.2-1.8	0.191-0.286
500	1.2-1.8	0.235-0.353
600	1.2-1.8	0.339-0.509

Fig. 1 shows the relation between pipe diameter and flow rates in the above-mentioned Land Improvement Design Standard of MAFF together with such relation in the Waterworks Standard in Japan. Values provided in the waterworks standard are generally near the lower limits specified by the land improvement standard. Pipe diameters applicable to the districts are selected and shown below:

Applied Pipe Diameter in the Project

Project	Discharge (ℓ/s)	Diameter (WSA) (m/m)	Diameter (MAFF) (m/m)	Selected Diameter (mm)
Jarajir	9.2	ø125	ø125	ø150
Harasta				
Well-Branch point	153.6	ø450	ø400	ø400
Branch point-Harasta	113.9	ø350	ø350	ø350
Branch point-Urbin	39.7	ø250	ø200	ø200
Yabroud	35.8	ø200	ø200	ø200
Qara	36.4	ø200	ø200	ø200
Ruheibe	29.2	ø200	ø200	ø200
Domair	55.6	ø200	ø250	ø250

Note : Although ø125 mm pipe is standardized in ISO, it is not available in international market. Hence,in case ø125 mm pipe were selected, ø150mm pipe is to be used.

All pipe diameters selected in accordance with the waterworks and MAFF standards are the same except for Harasta. Based on the Waterworks Standard, a ø450 mm diameter pipe is desirable for Harasta's pipeline from the reservoir to the branch point. But since a ø450 mm diameter pipe is not included in the ISO standard, a ø400 mm diameter pipe is considered to be reasonable. For the section between the branch point and Urbin, ø250 and ø200 mm may be selected for the pipes diameter according to the Waterworks and MAFF standard, respectively. A ø200 mm diameter pipe is, however, reasonable taking into economical aspect.

Then, collecting pipes from source pumps to ground reservoirs are selected as follows:

Applied Pipe Diameter for Collecting Pipes

Project	Pump Capacity		Diameter (WSA) (mm)	Diameter (MAFF) (mm)	Selected Diameter
	m^3/hr	ℓ/s			
Yabroud	45	12.5	ø150	ø150	ø150
Rheibe					
No.4-No.3	35×1	9.7	ø125	ø125	ø150
No.3-No.2	35×2	19.4	ø150	ø150	ø150
No.2-No.1	35×3	29.2	ø200	ø200	ø200

The pump discharges specified in the above table are equivalent to the Designed Discharge examined in section (e).

d. Hydraulic slope of pipelines and head loss

In any pipeline, the head loss at a designed discharge must be lower than the net actual head of a water supply pipeline. The net actual head is a difference in water level between the starting point and end point of a water supply pipeline. If the head loss of a pipeline of which diameter is selected according to a velocity described above exceeds the net positive head, the flow velocity decreases. Consequently, the larger pipe diameter must be selected. The Correbloc White formula is usually applied in the Establishment, but the Hazen Williams formula indicated below will be applied in this Project as commonly used in Waterworks Projects.

Hydraulic Slope $I = 10.666 \cdot C^{-1.85} \cdot D^{-4.87} \cdot Q^{1.85}$

Loss head $H = I \cdot L$

Where:

I : Hydraulic slope
C : Flow velocity coefficient
D : Diameter (m)
Q : Discharge (m^3/s)
H : Loss head (m)
L : Pipe line length (m)

Since the proposed pipelines are newly installed and provided as nearly straight lines in this Project, A flow velocity coefficient C = 130 is adopted and 5 % of the calculated value is expected for bend and other losses in the estimation of loss head.

The result of calculation is shown in Table-15. For pipelines in all the Project other than Domair, the loss head is less than the net actual head. Thus, it is judged that selected pipe diameters are valid for design discharge.

As for the Domair district, the water pipeline extends 23 kilometers long between the water source site at Adora and delivery tank at Domair. At the middle point of about 19.0 km, the booster station is planned to be installed. The net actual head in the section between Adora and the booster station is about 50 m. When ø250 mm pipes as selected under the previous paragraph are used, the head loss in this section is estimated at about 108 m, which affects the

transfer of designed discharge. As a result of calculation, a ø300 mm diamter pipe is required. In another section of about 3.5 km from the booster station to Domair, the application of a ø250 mm diamter pipe is to be selected.

From the above results, pipe diameters and pipeline lengths for each project district are summarized below.

Dimension of Conveyance Pipe

Project Name	Remarks	Diameter	Length
Jarajir	Source site to delivery tank	150 mm	7,597
Harasta	Branch point to Urbin	200 mm	3,038
	Branch point to Harasta	350 mm	1,734
	Source site to Branch point	400 mm	5,859
Yabroud	Collecting pipe	150 mm	749
	Source site to existing pipe	200 mm	2,140
Qara	Source site to Delivery tank	200 mm	12,145
Ruheibe	Collecting pipe	150 mm	214
	Ground reservoir to Delivery tank	200 mm	2,782
Domair	Source Rite to Booster pump	300 mm	20,330
	Booster pump to Delivery tank	250 mm	3,724
Total			60,312

e. Pumps

Table-15 shows the number of pumps and discharge capacity requested from Syrian Government and the proposed one in the Project for comparison purposes. The pumps to be procured are so planned that their discharge volumes can meet the water supply amount in the year of 2000 as the target year of this Project.

Pump Specification and Units in Comparison with Requested and Proposed

Project Name	Requested $m^3/hr \times unit$	Proposed $m^3/hr \times unit$
Jarajir	50×2	33×1
Harasta	120×5	110×5
Yabroud	45×4	45×4
Qara	50×2+345×	50×2+31×1
Ruheibe	45×4	35×1
Deir Atiya	45×1	45×1
Nabek	55×4	55×1

Table-16 shows total head and motor output of a proposed submersible pump used in each district project, which are calculated from the proposed capacity of the pump with the following conditions:

- Pump and, lift pipe diameter and motor output are selected by referring to the manufacturer's catalog.

- Collecting pipe diameter is determined according to standard velocity examined under previous paragraph (c). Length of pipe is determined based on the result of current status survey.

- Length of lift pipe is determined by adding 5 meters to the pump depth.

- Loss head is based on the Hazen Williams formula described under previous paragraph (d).

f. Generators

The required motor output is obtained by the following equation.

$$P = \frac{k \times r \times Q \times H}{\eta p \times \eta g \times \eta e} \times (1+R)$$

Where; P : Output of motor (KW)
k : Coefficient 0.163 for KW unit, 0.2222 for PS unit.

r	:	Specific gravity of water	1.0
Q	:	Pump discharge	(m^3/min)
H	:	Total Head	(m)
hp	:	Pump efficiency	0.65
hg	:	Transmission ratio	1.0
he	:	Joint ratio	1.0
R	:	Margin ratio	0.15

The above equation is expressed as follows:

$$P = 0.288Q \times H$$

Table-16 shows the required motor outputs for pumps used in each district project.

From the motor capacity for pump, the capacity of a generator is obtained by the following calculation:

(1) Capacity required for steady operation (P_G1)
(2) Generator capacity required from voltage drop at priming (P_G2)
(3) Required capacity determined by the ability to withstand overload due to a short-time priming (P_G3)

The maximum value of each item is used. The following table summarizes calculation results and generator capacities.

Generator Capacity

Project Name	Motor output (KW)	P_G1 (KVA)	P_G2 (KVA)	P_G3 (KVA)	Design Capacity (KVA)
Jarajir	30×1	48	150	135	150
Qara	75×2 45×1	277	375	435	440
Ruheibe	45×3	155	225	277	280
Dier Atiya	55×1	83	275	246	280
Nabek	90×4	405	450	632	640
Harasta/Urbin	75×5	527	375	593	600

Note : Out put of motors are shown in Table 16.

g. Transformer Requested in Qara Project

(1) Transformer capacity (Pr) in Qara is determined by the capacity required for the motor rated operation and thus the same value as P_{G1} obtained in the above table.

$$Pr = 277 \text{ (KVA)}$$

From the above, the standard transformer capacity is assumed as $Pr' = 300$ (KVA).

(2) In case one 75 KW unit and one 45 KW unit are normally operated and one additional 75 KW unit is priming, the total load input (Pi) is as follows:

$$Pi = \frac{75+45}{0.9\times0.8} + \frac{5}{0.8} + \frac{1}{3} \times (7.2\times75/0.9\times0.8) = 423 \text{ (KVA)}$$

(3) Since the impedance of a 300 KVA transformer is 3.6 %, voltage drop (Vd) occurring at the secondary terminal of the transformer is calculated as:

$$Vd = 3.6\times(423/300) = 5.1\% < \underline{10\%}$$

Standard voltage drop

Allowable voltage drop provided in the Standard of Dam in Japan is limited in the range 10 to 15%. While the calculated value as above is within the standard range, a 300 KVA is regarded as sufficient capacity. However, taking the frequent repetition of priming and stopping or use of lighting and other electric apparatus into account, a 400 KVA transformer is selected.

h. Vehicles

The Water supply systems managed by the Establishment are the water distribution systems of the towns and villages in the Rural Province of Damascus. Since the furthest district is located at 150 km from the head office, the centralized control is quite difficult basing on the existing vehicle condition.

Therefore, the Establishment has divided the province into 23 districts namely Water Units which are in charge of operation and maintenance in each district. The daily works of the Water Units are operation works of pumps at water source sites, inspections of facilities and water fee collection. The operation works of the pumps are every day's activity.

The existing water source sites are located mostly in the center of cities and the Water Unit offices are at the same places, therefore it is very convenient for Water Unit to operate pumps. However, due to the water source shortage and contamination, they are transferred to the suburbs of the cities and expansions of facilities are required in this Project. Thus, the source sites become far from the offices and vehicles are required for the daily operation of facilities.

Due to the lack of the budget of the Establishment, the extension works depending on the increasing demand are, however, taken priority against the procurement of O/M equipment. Principally, at least one vehicle such as wagon or pick-up is distributed at each Water Unit office. Seven Water Unit offices out of 23 use rent a car due to the lack of vehicle of the Establishment.

Among the eight districts, Domair district has the longest pipeline with around 23 kilometers long from the water source site to the center of the town. It takes more than 5 hours trip to the pump site and to operate it, therefore, exclusive vehicle for pump operation and pipeline maintenance is necessary.

Qara water unit manages Qara and Jarajir districts. It has around 20 kilometers long pipeline which is composed of 7.5 kilometers for Jarajir district and 12 kilometer for Qara district. Further, there involves two source sites to be managed. The routine work in these two districts for operation and maintenance requires more time than in Domair district.

As for the other districts, the Harasta Water Unit manages Harasta and Urbin districts, the total pipeline length is around 10 kilometers long. The office is located near the Head Office of the Establishment, and therefore head office can easily extend assistance. While in the other districts, the pipeline is only few kilometers long, therefore, no difference from the existing is expected.

Judging from the above reason, two vehicles are recommended for Domair and Qara districts. Access roads to water source site for both districts are not paved, so, 4WD type vehicles is selected.

Vehicles

District	Type	Unit	Remarks
Domair	4WD Pick-up	1	for Operation and Maintenance
Qara	4WD Pick-up	1	for Operation and Maintenance

i. Spare parts

Since submersible pumps are installed in deep-wells, it is very difficult to check their function through optical inspection. In order to keep the life of those expensive pumps long, periodical inspection and parts replacement are necessary. If the pumps were operated without such periodical inspection and parts replacement, the rehabilitation cost becomes big amount. The periodical inspection will be set once a year, necessary spare parts such as impellers, sleeves and bearings for motors shall be prepared.

For generates, optical inspection is available. However, a periodical check by the skilled technician is requested and replacement of spare parts such as stabilizers, silinderheads and bearings for generators are recommended.

Such spare parts shall be required at a quantities for two years, since the target year for this Project is 2,000.

5) Contents of Procurement

Contents of Procurement in each Project are as follows;

Jarajir

- Ductile Iron Pipe ø150mm 7,597 m
- Submersible Pump (33m^3/h, 177m) 1 unit
- Diesel Generator (150KVA) 1 unit

Harasta

- Ductile Iron Pipe	ø200mm	3,038	m
- Ductile Iron Pipe	ø350mm	1,734	m
- Ductile Iron Pipe	ø400mm	5,859	m
- Submersible Pump	(110m^3/h, 136m)	5	units
- Diesel Generator	(600KVA)	1	unit

Yabroud

- Ductile Iron Pipe	ø150mm	749	m
- Ductile Iron Pipe	ø200mm	2,140	m
- Submersible Pump	(45m^3/h, 177m)	4	units

Qara

- Ductile Iron Pipe	ø200mm	12,145	m
- Submersible Pump	(50m^3/h, 270m)	2	units
- Submersible Pump	(31m^3/h, 270m)	1	unit
- Diesel Generator	(440KVA)	1	unit
- Transformer	(400KVA)	1	unit

Ruheibe

- Ductile Iron Pipe	ø150mm	214	m
- Ductile Iron Pipe	ø200mm	2,782	m
- Submersible Pump	(35m^3/h, 250m)	3	units
- Diesel Generator	(280KVA)	1	unit

Domair

- Ductile Iron Pipe	ø250mm	3,724	m
- Ductile Iron Pipe	ø300mm	20,330	m

Deir Atiya

- Submersible Pump	(45m^3/h, 225m)	1	unit
- Diesel Generator	(280KVA)	1	unit

Nabek

- Submersible Pump	(55m^3/h, 345m)	4	units
- Diesel Generator	(640KVA)	1	unit

And other procurement for hole project are:

4WD Pick up	2 units
Spare parts	1 lot

6) Plan of Operation and Maintenance

a. Plan of Operation and Maintenance

The Establishment has 23 subordinate organizations called Water Units in the Rural Province of Damascus under its control. These Water Units perform operation and maintenance of the water supply and distribution facilities in specific districts. A chief engineer is appointed to each Water Unit and under his control, engineers, laborers, accounting staff, clerks, etc. are assigned to carry out their specific works, such as service operation, maintenance, administration, collecting water charges, etc. Although simple repair and remedy can be performed by Water Unit, overhaul, replacement of pumps or generators are left to the head office's workshop. This organization function well and no further improvement is necessary.

b. Plan of Management

The Establishment is basically financed by collection of water charges. Construction of new facilities, improvement of existing facilities and staff's wages are partially supported by national and provincial government. But, in principle, the corporation is managed by itself.

c. Repair System

As mentioned above, routine repair is performed by Water Unit, replacement of pumps or generators and pipe reinstallation are carried out by the Exploitation and Maintenance Department at the Head Office. Each Water Unit maintains tools in preparation for the minimum range of remedy and control. The head office's workshop is not well-equipped, but it is provided with the minimum necessary equipment, spare parts and a sufficient number of trained technician. In addition, the workshop is furnished with laboratory for operation test of repaired pumps and has enough pipe stocks for remedy, so it can function sufficiently.

d. Facilities Management Plan

Water Units takes in charge of water charge collection works, operation of pumps, operation and maintenance works for the facilities which will be contracted in this Project. Wherever an accident is discovered, Water Units shall repair himself in case it is small scale, however the work shop of head office will take care the periodical checks or parts replacement works which are carried out once a year.

2 - 4 Implementation Setup of the Project

2 - 4 - 1 Organization

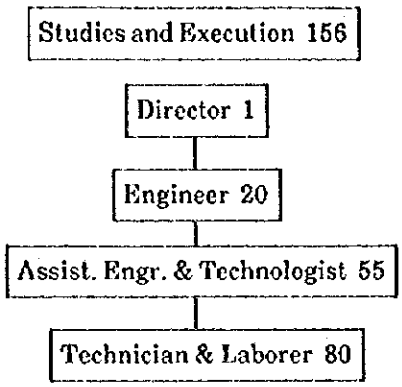
The structure of the Establishment consists of Department of Administration and Legal Affairs, Financial Affairs, Studies and Execution, Exploitation and Maintenance, Planning and Statistics and Internal Inspection, and 23 local Water Units as shown in Figure 3. The type of job and the number of the staff of each job is as follows:

Number of Personnel	
Administrative Staff	10 persons
Financial Staff	20 persons
Engineer	150 persons
Technician and Laborer	550 persons
Total	730 persons

As for the new project, engineering works relating to laying of pipes and construction of facilities are covered by the Studies and Execution Department, while the installation of pumps and generators is covered by the Exploitation and Maintenance Department.

The organizational structure of the Studies and Execution Department is shown below. Engineers are appointed for each project to implement the work.

Organization for Directorate of Studies and Execution



Among the 9 districts which are in need of implementation of the Water Supply Development Project, excluding (Qodsaya District), Deir Atiya and Nabek need only installation of equipment. As a result, the following 6 districts that need civil engineering works including completion of facilities and laying of pipes are proposed:

Proposed Drinking Water Supply Development Project

(1) Jarajir
(2) Harasta
(3) Yabroud
(4) Qara
(5) Ruheibe
(6) Domair

Accordingly, the structure of implementation organization is planned as shown in Figure 4. The required number of the staff for the main works amounts to 73 which is composed of 13 engineers, 24 assistant engineers, 35 technicians, including a chief engineer. Submersible pumps and diesel generators will be installed by the personnel of the work shop as direct works of the Establishment.

2-4-2 Budget

The budget provided for the Establishment during the past three years (1993-1995) are as follows:

Annual Budget - Establishment of Drinking Water and Sewerage in Rural Province of Damascus (Performance and Budget)

Unit:S.P.

Description	1993	1994	1995 (Budget)
Remuneration	34,694,000	46,455,000	54,460,000
Project Cost	173,000,000	203,507,000	213,000,000
Rehabilitation	54,000,000	65,000,000	55,000,000
Drilling	46,500,000	56,978,000	55,000,000
Reservoir Construction	8,500,000	8,000,000	8,000,000
Expansion of Network	35,000,000	42,000,000	44,000,000
New Project			
Harasta/Urbin	10,000,000	12,000,000	9,000,000
Karamoun Basion	14,000,000	17,378,000	20,000,000
Qara	5,000,000	151,000	0
Others	0	2,000,000	22,000,000
Operation & Maintenance	12,400,000	13,800,000	15,200,000
Total	220,094,000	263,762,000	282,660,000

As the table shows, personnel expenses in the total budget are 16 to 19 %. Construction expensis are 75 to 80 %, and rehabilitation cost which is the cost for mainly repair of existing facilities is 25 % or more of the total project cost. The cost for Drilling is for new wells development with the rate of 22 to 27 %. The cost for Reservoir Construction and Expansion of Network is the construction works of elevated tanks and distribution network for the needs of new area due to population growth. The cost for new project is not enough to procure equipment and materials. Operation and Maintenance cost is mainly the cost of electricity charge for pump, simple repair of facilities and fuel for vehicles.

The Establishment has planned the budget of three years starting from 1996, and that works in the districts of the urgent water supply plan above should take first priority when the project is carried out and procurement of equipment and materials becomes possible.

Future Annual Budget-Established of Drinking Water and Sewerage in Rural Province of Damascus

Unit:S.P.

Description	1996	1997	1998
Remuneration	57,200,000	60,060,000	63,060,000
Project Cost	203,000,000	263,040,000	233,040,000
Rehabilitation	60,000,000	65,000,000	70,000,000
Drilling	60,000,000	65,000,000	70,000,000
Reservoir Construction	8,000,000	8,000,000	8,000,000
Expansion of Network	35,000,000	40,000,000	45,000,000
New Project			
Jarajir	1,000,000	7,000,000	0
Harasta/Urbin	2,000,000	15,000,000	0
Yabroud	2,000,000	6,500,000	0
Qara	1,000,000	11,500,000	0
Ruheibe	500,000	2,800,000	0
Domair	0	24,500,000	0
Deir Atiya	0	100,000	0
Nabek	0	400,000	0
Qodsaya	0	15,700,000	7,700,000
Others	33,500,000	1,540,000	32,340,000
Operation & Maintenance	16,700,000	18,400,000	20,200,000
Total	276,900,000	341,500,000	316,300,000

2 - 4 - 3 Personnel and Technical Level

As mentioned above, the number of the staff of the Establishment is 730, including 150 engineers, engineering works concerning pipes installation and construction of facilities are covered by the Studies and Execution Department, 73 staff members of which will carry out a series of works of this project. Installation of pumps and generator is planned to be carried out under the direct management mainly by workshop members of the Exploitation and Maintenance Department.

Generally, engineering works are done on contract basis. The 73 staff member of the Establishment will carry out the construction management. When a pipeline is extended, staff members can be transferred for the temporary work.

Medium and small-sized construction companies are ordered to build small scale structures such as reservoirs and pump house, while large-scaled companies are ordered to construct a long pipelines. This project may take the

same contract conditions. Medium and small-sized construction companies have accumulated technical experience for a long time, and distributing reservoirs and pump houses made by them have caused no particular problems. As for pipelines, they are actually constructed by medium and small-sized companies under the supervision of the main contracted company. Pipelines in this project use pipes of small diameter of ø150-ø400mm. Therefore, the work does not require high degree of technology in particular; accordingly it will be fully dealt with by the construction supervision of the Establishment.

As mentioned above, installation of pumps and generators will be managed directly by the Establishment, and it is judged to have no problem as engineers of the Establishment have enough knowledge and experience in the installation and repair of machines.

CHAPTER 3 IMPLEMENTATION PLAN

CHAPTER 3 Implementation Plan

3 - 1 Implementation Plan

3 - 1 - 1 Implementation Concept

This project is planned to improve water source contamination and drinking water shortage at the existing water works in the Rural Province of Damascus through attainment necessary equipment, such as ductile iron pipes as material of pipelines and submersible pumps for deep wells with the Japan's Grant Aid assistance.

As this Grant Aid project covers only procurement of equipment and materials, and laying of pipes and installation of pumps and generators are to be implemented by the Syrian side, installation works should be carried out immediately after the procurement of the above equipment and materials.

The responsible government body is the Ministry of Housing and Utilities, and the executing agency of the Project is the Establishment of Drinking Water and Sewerage in Rural Province of Damascus. The engineering works for the project is covered by the Studies and Execution Department on contract work basis, while installation of equipment is to be done by the Exploitation and Maintenance Department on direct management basis. The project area which covers the wide range of 30km -150 km area from Damascus City, is divided into eight districts. The Establishment should designate a project engineer for each district sub-project to secure the quality of works, as well as to take effective measures in the budget aspect for the earliest completion of the works.

3 - 1 - 2 Implementation Condition

Procurement of equipment and materials, mainly pipes (ductile iron pipes) for trunk water pipelines and machines such as pumps for deep wells is required under this Project. The Japan's Grant Aid scheme covers procurement of these equipment and materials, and delivery of shipment at Latakia Port, the trading port in Syria. As the place where pipes are laid covers a wide range of area and the pipe diameter differs in each construction area, it is necessary to

clearly specify the packing of materials and the landing place in order to directly transport them to the construction site.

As installation of equipment such as pumps and generators is carried out after completion of wells and the room for the generator, they shall be temporarily stored in the workshop. Therefore each item of the equipment should be packed with its parts and installation manuals. The Syrian Government, after receiving shipment at the port, shall transport it to the workshop, classify the equipment, and store them adequately in the warehouse. When they are inevitably stored outside, it is necessary to cover and protect them with sheets.

The pipe laying works and installation of equipment are not included in this Project. Therefore, the Syrian side shall take good care to lay the pipes and to install the equipment according to the installation manual submitted by the supplier.

3 - 1 - 3 Scope of Work

As the project does not include guidance of laying or installation, the Syrian side shall read installation manuals prepared by the supplier intensively and manage themselves for correct operation.

Equipment and materials shall be delivered at the designated port (Latakia Port), and the whole cost including the receiving and inland transportation is charged to the Syrian side, while transportation by ship to Latakia and insurance for transportation shall be borne by the Japanese side. Laying of pipes, installation of equipment such as pumps, and engineering works of reservoirs, pump houses and other facilities that are necessary for the water supply development project, shall be the responsibility of the Syrian side.

3 - 1 - 4 Consultant Supervision

The main work of the implementation supervision is to inspect the procured equipment and materials before shipment and after arrival in Latakia. In this inspection, appearance, performance, the number of the items and the

number of the required spare parts are checked to conform with the tender documents and the contract, and only the products conformed are approved to be shipped. In the arrival inspection, it is required to cheek whether all the conformed packages arrived at latakia Port or not.

3 - 1 - 5 Procurement Plan

1) Submersible Pump for the Deep Well

Pumps that are used in the districts concerned have been purchased from various origins as Germany, Denmark, the United Kingdom (UK), Italy, Sweden, Austria and the United States of America (USA) depending on the procurement conditions at that time. Therefore, there is no particular type of pumps that are commonly used. The general-purpose standard type pumps cannot be applied to those required in this project, since the well requires a deeper type. The project should be designed and manufactured according to the conditions of each well, therefore, it is very difficult to procure them in a short period, thus making it preferable to use products made in Japan in terms of the tightly scheduled date of delivery and quality control.

2) Generator

As a result of the field survey, most of the generators currently used are of made in the UK, part of which are made of Cyprus or some other countries. There are many types in use whose manufacturers are not specified; moreover, no general-purpose type of products are found. Considering the prices, delivery date, a guarantee of quality, the Japanese products shall be used.

3) Ductile Iron Pipe

The existing ductile iron pipes in the Syrian Arab Republic are imported mainly from France and Sweden, although no particular type is commonly used. As for bend pipes and joint rings, products made in China and Croatia are widely used.

Ductile iron pipes to be procured for the Project amount to more than 2,000 tons, and the cost of the material is expected to reach several hundred million yen.

Accordingly, during the material procurement scheduling, costs including transportation cost were compared between procurement from Japan and France. As a result of the comparison, French products have proved to be advantageous, and it was decided that procurement of ductile shall be from the third country.

As the estimation of French products were difficult to collect, the cost was estimated based on the current unit price applying price escalation through a period of time.

As for Japanese products, 90% of the unit price listed on the periodically published price was adopted.

As for marine transportation cost, the allied unit price was used, while the transportation cost from France to Latakia was estimated since there is no allied route between the two countries.

4) Transformers, Vehicles and Spare parts

While cars made in Japan and Europe are running in the proportion of nearly fifty-fifty in Syria with every Japanese makes and models being widely used. In addition, those cars are easily imported from Japan and therefore procurement should not be coming from the third countries, taking an advantage in transportation cost which can be shipped together with the other equipment such as transformers, pumps and generator.

3 - 1 - 6 Implementation Schedule

The project implementation schedule is formulated as follows:

1) Implementation of Detailed Design

- Field investigation

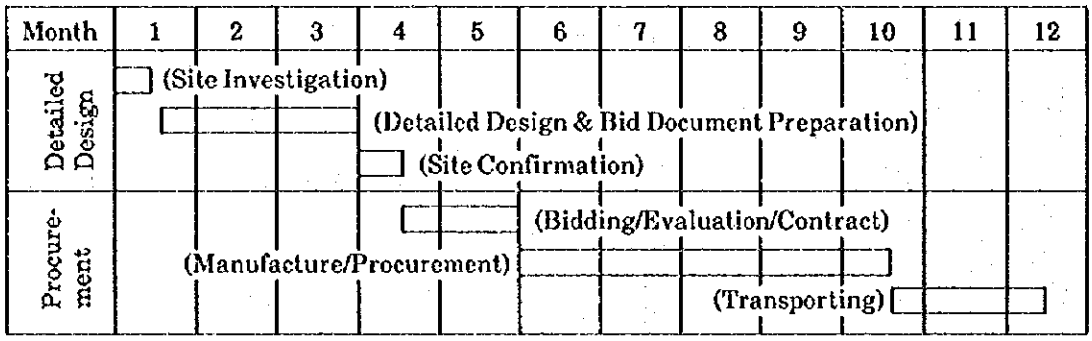
- Detailed design
- Preparation of tender documents 3.5 months

2) Implementation and Procurement

- Tender and tender evaluation
- Contract for procurement of equipment and materials 1.5 months
- Manufacture and procurement 4.5 months
- Transportation 2.0 months

The above items can be presented in the following table:

Implementation Schedule after Signing of E/N



3 - 1 - 7 Obligations of Syrian Government

The Syrian side is obliged to carry out the followings to complete the project under the Japan's grant aid scheme:

1) To facilitate, customs clearance and inland transportation of equipment and materials imported for the Project.

2) To do the domestic duties concerning landing, customs clearance for the items imported for the Project

3) To immediately install or lay equipment and materials procured by the Project according to the prescribed schedule.

4) To facilitate embarkation and disembarkation and staying procedures in Syria for Japanese experts involved in the implementation of the Project.

5) To pay the bank commissions based on the banking arrangement.

6) To issue the authorization to pay based on the agreement between banks.

7) To bear all other project expenses not covered by Japan's grant aid.

3 - 2 Operation and Maintenance Plan

3 - 2 - 1 System of Water Supply Facilities

Water supply facilities consist of a deep well which is to be constructed under the Project, a collecting pipeline, a reservoir, a trunk pipeline, an existing elevated distribution tank and water distributing facilities.

The pipeline from the reservoir to the elevated distribution tank incorporates a pressure reducing valve to work when the difference of water head exceeds 100 m (10 kg/cm^2). For those types of pipe, 10 kg/cm^2 of inner pressure is to be limited for safety purposes. As a safety facility for a pipeline, air valves are installed at its convex parts and blow-off valves are installed at the lower parts of the pipeline. The pipeline is structurally a closed type. Accordingly, water supply from the reservoir will automatically stop depending on the water level of the elevated distribution tank. Therefore, the water supply system from the well to the elevated distribution tank will be automatically operated.

3 - 2 - 2 System for Operation and Maintenance Management

Syria is administratively divided into fourteen (14) divisions including thirteen (13) provinces and a capital, Damascus city.

These provinces have their own Establishments for drinking water and sewerage under the Ministry of Housing and Utilities. The eight (8) project districts requested by the Syrian Government are supervised by the Establishment for Drinking Water and Sewerage in the Rural Province of Damascus.

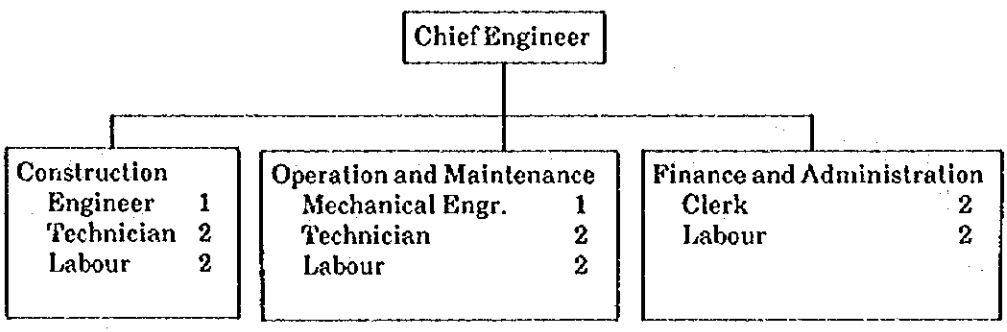
As the operational management system of the water supply and distribution work, the Establishment has 23 branch offices called Water Unit in each municipality. These Units are in charge of the maintenance and management at the lowest level. The Water Units which administer the districts concerned are as follows:

Water Units in charge for the Project

① Harasta Water Unit (Harasta)
② Domair Water Unit
③ Nabek Water Unit
④ Deir Atiya Water Unit
⑤ Qara Water Unit (Qara and Jarajir)
⑥ Yabroud Water Unit
⑦ Urbin Water Unit (Urbin)
⑧ Qoteiha Water Unit (Ruheibe)

The typical organization structure of Water Unit is as follows:

Water Unit Organization Structure



Note:Numbers in the table shows staff numbers

The works of each positions are as follows:

(1) Chief Engineer

Chief engineer, who is the responsible engineer of the Water Unit, manages operation and maintenance works of the district in charge, gives approval within the limit of his responsibility and submit recommendation to the head office. Especially, in case drinking water shortage due to lacks of water source or troubles of the facilities, he has to recommend assistances of tankrolly to the heard office.

(2) Construction Section

Design works and supervision for contract base or direct base.

(3) Operation and Maintenance Section

Daily operation and check of pumps and generators, and valve operation of distribution facilities. Simple repair and maintenance works of the facilities are undertaken by Water Unit, but the difficult repair works for pumps and generators are done by staffs of the Work Shop.

(4) Finance and Administration Section

Finance and administration works and water fee collection works.

3 - 2 - 3 Current Condition of the Workshop

The Establishment with head office in Harasta has a workshop of about 1.5 ha located about 2 km far from the office. The workshop has enough area where there is a building with a room for mechanical repair shop, a room for electrical repair shop and an office room. Also such buildings are equipped with a cabin for a trial run of pumps, booster pumps sheds for Harasta, a warehouse for materials, including a stock yard for pipes and a motor pool.

The workshop belongs to the Investigation and Maintenance Department of the head office of the Establishment, and staffed with four

mechanical engineers, five mechanics, three electrical engineers, four electricians, four clerk officers, and four laborers under the supervision of the Manager. Both of the mechanical and electrical sections are equipped with the minimum apparatus and tools necessary to repair pumps and generators.

The staff of the workshop has a skill to overhaul and repair pumps and generators, and to assemble a switchboard by purchasing its parts independently. Installation of pumps and generators is carried out by the staff member of the workshop at the site.

In the warehouse, there are pumps for replace, valves, bend pipes, joint rings, spare generators, asbestos pipes and ductile iron pipes are placed in the stock yard. The site is also used as a parking area of the vehicles which belong to the Establishment.

The Establishment has 40 vehicles, of which types are as shown below. These vehicles are considerably old, and need periodical repairs and maintenance.

Vehicles owned by Establishment

Vehicles	Quntity	Description
① Sedan	3 units	Head Office
② Jeep	10 units	7 units for Water Units
③ Pick-up	12 units	9 units for Water Units
④ Tank roly	5 units	
⑤ Back hoe	2 units	
⑥ Rocket car	3 units	For pipe installation
⑦ Vacuum car	2 units	
⑧ Truck loader	1 unit	
⑨ Dump truck	1 unit	
⑩ Trailer	1 unit	
Total	40 units	

Among the vehicles above, seven jeeps and nine pickups are allocated to each Water Unit. Seven Units which has no vehicles allocation rent pickup cars for 500S.P a day.

4) Management and Maintenance

As for the management of the facilities, local Water Units perform the field works under the instruction of the Director General. The cost of the management and maintenance is financed basically by collection of water charges. Management and maintenance of facilities shall be carried out by the Water Units above after implementation of the Project. As mentioned above, the organization of the Unit is made of sections in charge of repairs, operations, and collecting water charges. The section in charge of repairs performs a daily work of checking water leakage and providing temporary repairs which are mainly done by civil engineers.

As for maintenance of facilities, the ductile iron pipe which is procured in the Project has a life of 50 years. When repairs are needed due to leakage, the regulating valve of the reservoir or the elevated distribution tank should be closed, and dealt with by the cut pipes and the joint rings. As the life of the pump differs depending on the nature of soil and water, it cannot be judged simply. However, the pump with ten years of official durability may be worn away in several years or require change of parts. Repairs of abrasion and replace of parts shall be performed by the workshop members by using the stored parts in the site. As for the generator and the transformer, the official 20-year life can be forecasted, and the products made in Japan may need no repairs. When repair are needed, workshop members shall proceed with the required works.

5) Costs of Operation and Maintenance Management

The standard structure of the system and the staff members of the Water Unit are as described above. These staff members shall manage all the facilities in the district including new facilities and collect water charges. The yearly operation cost of the units is as follows;

Operation and Maintenance Cost in 1995

Remuneration	22,600,000	S.P.
Electrical Consumption Fee	9,700,000	
Fuel and Maintenance	1,100,000	
Rehabilitation	3,000,000	
Total	36,400,000	

The cost above represents the whole maintenance and management costs of the public corporation including current facilities, and it is included in the budget described (refer to item of 2-4-2 of this report). Among the management cost above, personnel cost is included in the personnel expenses in the budget.

CHAPTER 4 PROJECT EVALUATION AND RECOMMENDATION

CHAPTER 4 Project Evaluation and Recommendation

4 - 1 Project Effect

The population growth rate in towns and villages in the Rural Province of Damascus is very high as 3.3 % to 4.0 %. Due to the serious shortage of drinking water, the inhabitants of the Project area are forced to drink and use the contaminated water produced from the existing wells or individual shallow wells. Many people who can not obtain even such water are leaving their homes and migrate to the nearest city or Damascus to seek for clean drinking water for their family.

There are very few surface water resources available in the area due to lack of rivers and lakes in the southern part of Syria, and ground water resources can be observed only at quite limited points at the eastern foot of the Anti Lebanon mountain range. As a result, groundwater obtained from such limited points must be transported to the center of those cities by means of long pipelines.

To solve these problems, the Syrian Government has been implementing the plan of water supply development project which is composed of deep wells drilled at the limited groundwater resources and long pipeline to convey water to the beneficiary. Exploitation and drilling of wells had been undertaken by the Water Resources Development Cooperation. On the other hand, ground reservoirs and elevated tanks have been constructed by the Establishment. However due to the shortage of foreign exchange, the Syrian Government could not purchase necessary equipment and materials for the water supply project such as pipes, pumps and diesel generators. Hence, the project implementation has been suspended. Accordingly, the plan is formulated to procure the necessary equipment and materials under the Japan's Grant Aid assistance and to complete the Project for supplying drinking water in the project area.

Thus, the Project will aim directly;

- to dissolve water shortage for inhabitants of about 350 thousand people which is estimated at about 25 % of total population of 1.4 million in the Rural Province of Damascus.

- to supply safe drinking water steadily.
- to dissolve rotational supply or use of tankroly.

And indirectly;

- to ensure inhabitants' health by supplying safe drinking water.
- to protect excessive migration to Damascus City and to promote agriculture as main industry in the Project area.

The Establishment is preparing to execute the Project with enough budget for installation of pipelines, pumps and diesel generators to be procured by the Japan's Grant Aid assistance. The project under Japan's Grant Aid is first experience for the Establishment. But the agency has a strong will to get successful result.

After the completion of the Project, the Establishment will properly operate and maintain the water supply facilities using the existing O/M organization. And the collected water fee will be allocated to the rehabilitation of the attachments such as water meters, valves, etc. and remuneration for O/M personnel.

4 - 2 Recommendation

The Project will bring the following effects as mentioned above:

- to dissolve water shortage for inhabitants of eight (8) districts in the Rural Province of Damascus.
- to dissolve the water supply manners by rotational system or tankroly.
- to protect the inhabitants suffering from various diseases caused by contaminated water.
- to protect excessive migration to Damascus by improving the supply water condition, then to promote agriculture as main industry in the Project area.

In order to achieve the above purposes, the Syrian Government must execute the Project using the procured equipment and materials as early as possible. Accordingly, the Establishment must obtain sufficient budget and prepare the necessary organization. After completion of the Project, the Establishment shall promote the following:

(i) to improve water supply efficiency by rehabilitating distribution network.

(ii) to design appropriate water fee collection rule by grasping accurate supply water volume.

(iii) to secure proper manner to operate and to maintain the water supply facilities and systems.

As for, Qdosaya district, which was excluded from the present Project due to the immature project preparation, adequate follow-up is required. The population growth rate is quite high and the improvement of the water supply system is therefore urgently needed in this district. Therefore, required actions aiming at implementation for the Project in Qdosaya district at the soonest is recommended.

APPENDICES

APPENDICES

1. Member List of the Survey Team

(1) Basic Design Study on the Project for of Water Supply Development in the Rural Province of Damascus.

①	Leader	: Hisao USHIKI Water Resources Development Specialist, JICA
②	Coordinator	: Shokichi SAKATA First Basic Design Study Division, Grant Aid Study & Design Department, JICA
③	Chief Consultant/Maintenance & Operation Planner	: Yasuo TERAMURA Sanyu Consultants Inc.
④	Water Supply Planner	: Tatsuhiko MORI Sanyu Consultants Inc.
⑤	Facility Design	: Hiroshi KONDO Sanyu Consultants Inc.
⑥	Equipment Planner	: Etuji TANAKA Sanyu Consultants Inc.

(2) Explanation of Basic Design Study on the Project for Water Supply Development in the Rural Province of Damascus

①	Leader	: Hisao UHIKI Water Resources Development Specialist, JICA
②	Chief Consultant/Maintenance & Operation Planner	: Yasuo TERAMURA Sanyu Consultants Inc.
③	Facility Design	: Hiroshi KONDO Sanyu Consultants Inc.

2. Schedule

Annex-1 Schedule for Site Survey on the Basic Design Study

Annex-2 Schedule for Explanation of Basic Design Study

3. List of Party Concerned in the Syrian Arab Republic

State Planing Commission

Director of Technical & Scientific Cooperation	Mr. Bassam Al Siabi
In charge of Japan Desk	Ms. Elham Morad

Ministry of Housing and Utilities

Director of Planing and Static	Eng. Farouk Al Kadri

Establishment of Drinking Water and Sewerage in Rural Province of Damascus

General Director	Eng. Adnan Deeb
Director of Studies & Execution	Eng. Mamdouh Youness
Director of Exploitation & Maintenance	Eng. Faouzi Assagga
Water Resources Exploitation Geologist	Eng. Najdet Maqsoud
Work Shop, Chief Engineer	Eng. Ali Grue
Harasta Water Unit, Head of Unit	Eng. Mahmoud Bakireh
Domair Water Unit, Head of Unit	Eng. Ibrahim Hisham
Qteifeh Water Unit, Head of Unit	Eng. Samir Zeidan
Nabek Water Unit, Head of Unit	Eng. A. Rahman Aynieh
Deir Atiya Water Unit, Head of Unit	Eng. Khaled Ghanum
Qara Water Unit, Head of Unit	Eng. Souleiman Khoudor
Yabroud Water Unit, Head of Unit	Eng. Yahia Hababeh
Urbin Water Unit, Head of Unit	Eng. Yousef Biski

Japanese Embassy

Ambassador	Mr. Tomio Uchida
Councilor	Mr. Keiichi Hasegawa
First Secretary	Mr. Hideaki Yamamoto

JICA, Damascus Office

Representative	Mr. Tsuyoshi Komori
	Mr. Izumi Tanaka

4. Minute of Discussion

Annex-3 Minute of Discussion on Site Survey of the Basic Design Study

Annex-4 Minute of Discussion on Explanation of the Basic Design Study

5. Collected Data

General Data

1	Statical Abstract	(1992)	Central Bureau of Statistics
2	- do -	(1993)	- do -
3	- do -	(1994)	- do -
4	The Oxford Business Guide	(1995-6)	Oxford Business Guide Publication
5	Rapport Economique Syrien	(1993-1994)	Löffice Arabe de Presse et de Documentation
6	Report on the 1995 Syria's Budget		- do -
7	1995 Syria's Budget		- do -
8	Guide to Syria		Al Salhani Establishment
9	Travel survival kit Jordan & Syria		
10	Syria a Historical and Architectural Guide		Scorpion Publishing Ltd.
11	Hotel Directory - Sheraton Hotel -		
12	Syria in View		
13	Road Map Syria	1 : 1,000,000	Librairie International
14	Syria Road Map for Tourists	1 : 1,250,000	Ministry of Truism

Design Data by Establishment of Drinking Water and Sewerage in the Rural Province of Damascus

15	Plan of Project	
16	Profile of Project	
17	Typical Drawing of the Structures	
18	Maps of the Site	1 : 250,000
19	-do-	1 : 200,000
20	-do-	1 : 250,000
21	Technical Specification of Submersible Pumps	

22 Tender Document of Submersible Pumps

23 Technical specification of Ductile Cast Iron Pipe

24 Tender Document of Ductile Cast Iron Pipe

25 Syrian Standard for Water Quality

26 Water Quality Test Sheet for Existing Well

27 Chemical Test Result (Heavy Metal) for Proposed Well

28 Water Quality Test Sheet for Proposed Well

29 Chemical Test Result (Bacteria) for Existing and Proposed Well

30 Possible Capacity of Well

i) Data Sheet for Pump Test

ii) Pump Test Result Diagram of Wells in Yabroud

iii) Typical drawing of casing in Wells

31 Population and Supply Water Volume

- Statical Sensus in 1993

32 Supply Water Volume

- Supply Water Volume assumed from the collected Water fee

Annex-1 Schedule for Site Survey on the Basic Design Study

Date		Itinerary
Nov.	10 (Fri.)	Narita to Frankfurt
	11 (Sta.)	Frankfurt to Damascus
	12 (Sun.)	Courtesy call on JICA, Damascus Office, Japanese Embassy, State Planing Commission, MHU, Establishment
	13 (Mon.)	Field inspection
	14 (Tue.)	Discussion with Establishment
	15 (Wed.)	-Ditto-
	16 (Thu.)	Signing, Ceremony for Minute of Discussion
	17 (Fri.)	Site survey
	18 (Sta.)	Site survey and data collection
	19 (Sun.)	-Ditto-
	20 (Mon.)	-Ditto-
	21 (Tue.)	-Ditto-
	22 (Wed.)	-Ditto-
	23 (Tue.)	-Ditto-
	24 (Fri.)	Off
	25 (Sta.)	Discussion with Establishment
	26 (Sun.)	-Ditto-
	27 (Mon.)	-Ditto-
	28 (Tue.)	-Ditto-
	29 (Wed.)	-Ditto-
	30 (Thu.)	-Ditto-
Dec.	1 (Fri.)	Off
	2 (Sta.)	Site survey and data collection
	3 (Sun.)	-Ditto-
	4 (Mon.)	-Ditto-
	5 (Tue.)	-Ditto-
	6 (Wed.)	Courtesy call on Establishment, JICA Damascus office and Japanese Embassy
	7 (Thu.)	Damascus to Frankfurt
	8 (Fri.)	Leaved Frankfurt
	9 (Sta.)	Arrived at Narita

Annex-2 Schedule for Explanation of Basic Design Study

Date		Itinerary
Jan.	16 (Tue.)	Narita to Frankfurt
	17 (Wed.)	Frankfurt to Damascus
	18 (Thu.)	Courtesy call on JICA, Damascus Office, Japanese Embassy, State Planing Commission, MHU, Establishment
	19 (Fri.)	Team meeting
	20 (Sta.)	Explanation of Basic Design Study to Establishment, and discussion with Establishment
	21 (Sun.)	Preparation of M/D
	22 (Mon.)	Discussion with Establishment
	23 (Tue.)	Signing Ceremony for Minute of Discussion Courtesy call on Governor of Rural Province of Damascus
	24 (Wed.)	Courtesy call on Establishment, JICA Damascus office and Japanese Embassy
	25 (Tue.)	Damascus to Frankfurt
	26 (Fri.)	Leaved Frankfurt
	27 (Sta.)	Arrived at Narita

MINUTES OF DISCUSSIONS

BASIC DESIGN STUDY ON THE PROJECT FOR WATER SUPPLY DEVELOPMENT IN THE RURAL PROVINCE OF DAMASCUS IN THE SYRIAN ARAB REPUBLIC

In response to the request from the Government of the Syrian Arab Republic, the Government of Japan decided to conduct a Basic Design Study on the Project for Water Supply Development in Rural Province of Damascus in the Syrian Arab Republic (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to the Syrian Arab Republic a study team (hereinafter referred to as "the Team"), which was headed by Mr. Hisao; Ushiki Development Specialist, JICA, and was scheduled to stay in the country from 8 November to 7 December , 1995.

The Team held discussions with the officials concerned of Syrian Arab Republic and conducted a field survey at the study area.

In the course of the discussions and field survey, both sides confirmed the main items described in the attached sheets. The Team will proceed to further work and prepare a Basic Design Study report.

Damascus, 16 November, 1995

Mr. Hisao Ushiki
Leader
Basic Design Study Team
JICA

Mr. Adnan Deeb
General Director
Establishment of Drinking Water
and Sewerage in the Rural Province
of Damascus

ATTACHMENT

1. Objective

The objective of the Project is to supply safe drinking water for people living in the Rural Province of Damascus by procurement of the necessary equipment.

2. Project site

The project sits are located in the Rural Province of Damascus as shown in ANNEX I.

3. Executing Organization

The Ministry of Housing and Utilities is responsible for the administration of the project.

The Establishment of Drinking Water and Sewerage in the Rural Province of Damascus(hereinafter referred to as the Establishment)is responsible for the implementation of the Project.

4. Items requested by Syrian Arab Republic

After discussions with the Team, the items finally requested by the Syrian side are shown in Annex II.

However, the final components of the Project will be specifically decided after the completion of further studies.

5. Japan's Grant Aid System

(1) The Syrian side has understood Japan's Grant Aid system in ANNEX III as explained by the Team.

(2) The Syrian side will take necessary measures described in ANNEX IV for the smooth implementation of the Project, in the event the Grant Aid Assistance by the Japanese Government is extended to the Project.

6. Schedule of the Study

(1) The consultants of the Team will proceed to further studies in the Syrian Arab Republic until 7 December, 1995.

(2) JICA will prepare the draft final report and dispatch a mission in order to explain its contents at the end of January, 1996.

(3) In the event the contents of the report is accepted in principle by the Syrian sides,

JICA will complete a final report and send it to the Syrian Arab Republic by April, 1996.

7. Major Points of Discussions

(1)The following priority was confirmed.

A)First priority

Jarajir

Harasta/Urbin

Yabroud

Qara

Ruheibeh

B)Second priority

Deir Atiya

Nabek

Vehicle

C)Third priority

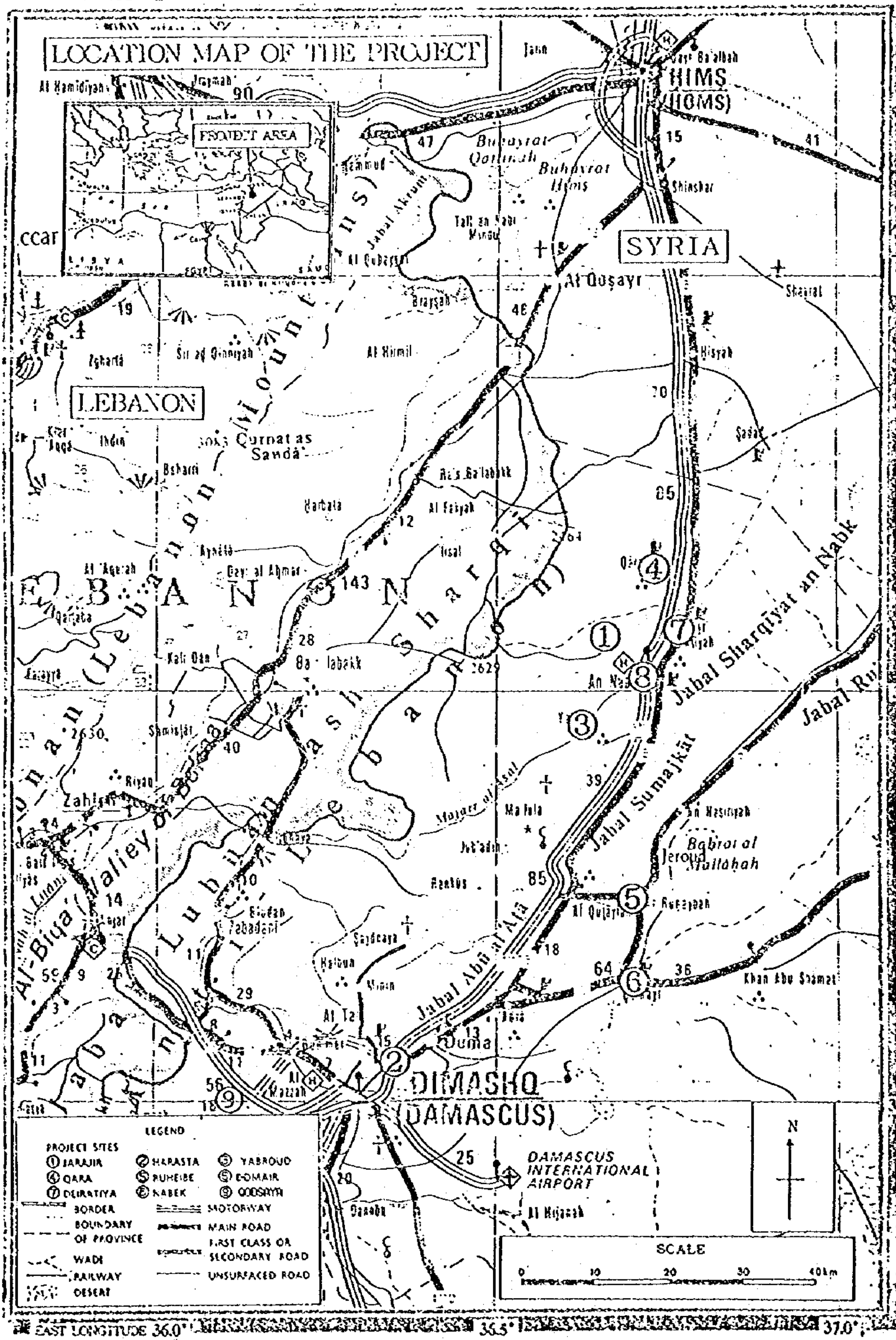
Domair

Qodsaya

(2)The following was confirmed;

1)Syrian side shall submit the data concerning quality and quantity of each water source to the Team by 7 December,1995. In the case, quality of water source can not satisfy the Syrian standard for potable water, based on WHO standard, including Pb and Hg, and/or productivity of water source is found insufficient, such sites shall be excluded from the original request, regardless of the priority mentioned 7-(1).

2)Syrian side shall make the financial plan to construct and maintain the water supply system, and submit it to the Team by 7 December,1995.


LOCATION MAP OF THE PROJECT
PROJECT AREA
LEBANON
SYRIA
HIMS (HOMS)
DIMASHQ (DAMASCUS)
DAMASCUS INTERNATIONAL AIRPORT
LEGEND
PROJECT SITES
① JARAJIR
② HARASTA
③ YABROUD
④ QARA
⑤ RUHEIBE
⑥ DOMAIR
⑦ DEIRATIYA
⑧ NABEK
⑨ QODSAYA
BORDER
MOTORWAY
BOUNDARY OF PROVINCE
MAIN ROAD
FIRST CLASS OR SECONDARY ROAD
WADI
RAILWAY
UNSURFACED ROAD
DESERT
SCALE
0 10 20 30 40km
N
N. L.
34.5°
34.0°
33.5°
EAST LONGITUDE 36.0°
36.5°
37.0°

ANNEX II
List of Equipment

Items			Unit	Original request	Priority
Jarajir	Ductile iron pipes	150mm dia	m	7,000	A
	Submersible pumps(50m^3/h,260m lift)		Unit	2	
	Diesel Generator(100KVA)		Unit	1	
Harasta/ Urbin	Ductile iron pipes	250mm	m	2,900	A
		400mm	m	1,530	
		500mm	m	5,500	
Yabroud	Ductile iron pipes	125mm	m	700	A
		250mm	m	2,000	
	Submersible pumps(45m^3/h,90m)		Unit	4	
Qara	Ductile iron pipes	250mm	m	11,500	A
	Submersible pumps(50m^3/h,275m)		Unit	3	
	Diesel Generator(300KVA)		Unit	1	
	Transformer(400KVA)		Unit	1	
Ruheibeh	Ductile iron pipes	150mm	m	250	A
		250mm	m	2,550	
	Submersible pumps(45m^3/h,250m)		Unit	4	
	Diesel Generator(500kVA)		Unit	1	
Domair	Ductile ion pipes	300mm	m	23,254	C
Deir Atiya	Submersible pump(45m^3/h,240m)		Unit	1	B
	Diesel Generator(325KVA)		Unit	1	
Nabek	Submersible pumps(55m^3/h,360m)		Unit	4	B
	Diesel Generator(365KVA)		Unit	1	
Qodsaya	Ductile iron pipes	200m	m	1,500	C
		300mm	m	1,570	
		450mm	m	900	
		500mm	m	13,715	
	Submersible pumps(90m^3/h,260m)		Unit	11	
	Horizontal pumps(130m^3/h,80m)		Unit	3	
	Diesel Generators	150KVA	Unit	1	
		900KVA	Unit	2	
	Transformers	200KVA	Unit	1	
		1800-2000KVA	Unit	1	
Vehicles	2WD pickups		Unit	3	B
	4WD pickups		Unit	2	
spare parts			set	adequate amount	——

Notes; Final components of the Project shall be decided after further studies.

ANNEX III

ON JAPAN'S GRANT AID PROGRAM

1. Japan's Grant Aid Procedures

(1) The Japan's Grant Aid Program is executed by the following procedures.

- **Application**
  (request made by a recipient country)
- **Study**
  (Preliminary Study / Basic Design Study conducted by JICA)
- **Appraisal & Approval**
  (Appraisal by the Government of Japan and Approval by the Cabinet of Japan)
- **Determination of Implementation**
  (Exchange of Notes between the both Governments)
- **Implementation**
  (Implementation of the Project)

(2) Firstly, an application or a request for a project made by the recipient country is examined by the Government of Japan (the Ministry of Foreign Affairs) to see whether or not it is suitable for Japan's Grand Aid. If the request is deemed suitable, the Government of Japan entrusts a study on the request to JICA (Japan International Cooperation Agency)

Secondly , JICA conducts the Study (Basic Design Study) , using a Japanese consulting firm. If the background and objective of the requested project are not clear, a Preliminary Study is conducted prior to a Basic Design Study.

Thirdly, the Government of Japan appraises to see whether or not the Project is suitable for Japan's Grant Aid Program, based on the Basic Design Study report prepared by JICA and the results are then submitted for approval by the Cabinet.

Fourthly, the Project approved by the Cabinet becomes official when pledged by the Exchange of Notes signed by the both Governments.

Finally, for the implementation of the Project, JICA assists the recipient country in preparing contracts and so on.

2. Basic design Study

1) Contents of the Study

The purpose of the Study (Preliminary Study/Basic Design Study) conducted on a project requested by JICA is to provide a basic document necessary for appraisal of the project by the Japanese Government. The contents of the Study are as follows:

a) to confirm background, objectives, benefits of the project and also institutional capacity of agencies concerned of the recipient country necessary for project implementation,
b) to evaluate appropriateness of the Project for the Grant Aid Scheme from a technical, social and economical point of view,
c) to confirm items agreed on by the both parties concerning a basic concept of the project,
d) to prepare a basic design of the project,
e) to estimate cost involved in the project.

Final project components are subject to approval by the Government of Japan and therefore may differ from an original request.

Implementing the project, the Government of Japan requests the recipient country to take necessary measures involved which are itemized on Exchange of Notes.

2) Selecting (a) Consulting Firm(s)

For smooth implementation of the study, JICA uses (a) consulting firm(s) registered. JICA selects (a) firm(s) through proposals submitted by firms which are interested. The firm(s) selected carry(ies) out a Basic Design Study and write(s) a report, based upon terms of reference made by JICA.

The consulting firm(s) used for the study is(are) recommended by JICA to a recipient country after Exchange of Notes, in order to maintain technical consistency and also to avoid possible undue delay in implementation caused if a new selection process is repeated.

(3) Status of a Preliminary Study in the Grant Aid Program

A Preliminary Study is conducted during the second step of a project formulation & preparation as mentioned above.

A result of the study will be utilized in Japan to decide if the Project is to be suitable for a Basic Design Study.

Based on the result of the Basic Design Study, the Government would proceed to the stage of decision making process(appraisal and approval).

It is important to notice that at the stage of Preliminary Study, no commitment is made by the Japanese side concerning the realization of the Project in the scheme of Grant Aid Program.

3. Japan's Grant Aid Scheme

1) What is Grant Aid?

The Grant Aid Program provides a recipient country with non reimbursable funds needed to procure facilities, equipment and services for economic and social development of the country under the following principles in accordance with relevant laws and regulations of Japan. The Grant Aid is not in a form of donation or such.

2) Exchange of Notes (E/N)

The Japan's Grant Aid is extended in accordance with the Exchange of Notes by both Governments, in which the objectives of the Project, period of execution, conditions and amount of the Grant etc. are confirmed.

3) "The period of the Grant Aid" means one Japanese fiscal year which the Cabinet approves the Project for. Within the fiscal year, all procedure such as Exchange of Notes, concluding a contract with (a) consulting firm(s) and (a) contractor(s) and a final payment to them must be completed.

4) Under the Grant, in principle, products and services of origins of Japan or the recipient country are to be purchased.

When the two Governments deem it necessary, the Grant may be used for the purchase of products or services of a third country origin.

However the prime contractors, namely, consulting, contractor and procurement firms, are limited to "Japanese nationals". (The term "Japanese nationals" means Japanese physical persons or Japanese juridical persons controlled by Japanese physical persons.)

5) Necessity of the "Verification"

The Government of the recipient country or its designated authority will conclude into contracts in Japanese yen with Japanese nationals. Those contracts shall be verified by the Government of Japan. The "Verification" is deemed necessary to secure accountability to Japanese tax payers.

6) Undertakings required to the Government of the recipient country

In the implementation of the Grant Aid, the recipient country is required to undertake necessary measures such as the following:

① to secure land necessary for the sites of the project and to clear and level the land prior to commencement of the construction work,

② to provide facilities for distribution of electricity, water supply and drainage and other incidental facilities in and around the sites,

③ to secure buildings prior to the installation work in case the Project is providing equipment,

④ to ensure all the expenses and prompt execution for unloading, customs clearance at the port of disembarkation and internal transportation of the products purchased under the Grant Aid,

⑤ to exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which will be imposed in the recipient country with respect to the supply of the products and services under the Verified Contracts,

⑥ to accord Japanese nationals whose services may be required in connection with the

supply of the products and services under the Verified Contracts, such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work.

7) Proper Use

The recipient country is required to maintain and use facilities constructed and equipment purchased under the Grant Aid properly and effectively and to assign staff necessary for their operation and maintenance as well as to bear all expenses other than those to be borne by the Grant Aid.

8) Re-export

The products purchased under the Grant Aid shall not be re-exported from the recipient country.

9) Banking Arrangement (B/A)

(a) The Government of the recipient country or its designated authority shall open an account in the name of the Government of the recipient country in an authorized foreign exchange bank in Japan (hereinafter referred to as "the Bank"). The Government of Japan will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by Government of the recipient country or its designated authority under the contracts verified.

(b) The payments will be made when payment requests are presented by the Bank to the Government of Japan under an Authorization to Pay issued by the Government of the recipient country or its designated authority.

ANNEX IV

Necessary measures to be taken by the Syrian Arab Republic on condition that Japan's Grant Aid is executed;

1. To secure land necessary for sites of the project, such as final disposal site, and clear, level and reclaim the site prior to the procurement of the equipments.

2.To construct the access road to the site such as final disposal site, prior to procurement of the equipments.

3.To secure buildings prior to the procurement of the equipment.

4.To ensure all expanses and prompt execution for unloading, customs clearance at the port/airport of disembarkation and international transportation of the products purchased under the Grand Aid.

5.To exempt Japanese nationals from customs duties, international taxes and other fiscal lives which will be imposed in the recipient country with respect to the products and services under the verified Contract.

6. To accord Japanese nationals, whose services may be required in connection with the supply of products and the services under the verified contracts, such facilities as may be necessary for their entry into the Syrian Arab Republic and stay therein for the execution of the Project.

7."Proper use"

The Syrian Arab Republic is required to maintain and use the equipment purchased under the Grant Aid properly and effectively and to assign staff necessary for this operation and maintenance as well as to bear all the expenses other than those covered by the Grand Aid.

8."Re-export"

the products purchased under the Grant Aid shroud not be re-exported from the Syrian Arab Republic.

9.Banking Arrangements (B/A)

a) The Government of the Syrian Arab Republic or its designated authority shroud open an amount in the name of the Government of the Syrian Arab Republic in an authorized foreign exchange bank in Japan (hereinafter referred to as "Bank"). The Government of Japan will execute the Grand Aid

by making payments in Japanese yen to cover the obligations incurred by the Government of the Syrian Arab Republic or its designated

b) The payment will be made when payment request are presented by the Bank to the Government of Japan under an authorization to pay issued by the Bank to the government of the Syrian Arab Republic or its designated authority.

The detail are shown in ANNEX V.

ANNEX V

Major Undertaking to be taken by Each Goverment

No.	Items	To be covered by Grant Aid	To be covered by Recipient Side
1	To secure land		●
2	To clear, level and reclaim the site when needed		●
3	To construct gates and fences in and around the site		●
4	To construct the parking lot	●	
5	To construct roads		
	1) Within the site	●	
	2) Outside the site		●
6	To construct the buildings	●	
7	To provide facilities for the distribution of electricity, water supply, drainage and other incidental facilities		
	1) Electricity		
	a. The distributing line to the site		●
	b. The drop wiring and internal wiring within the site	●	
	c. The main circuit breaker and transformer	●	
	2) Water Supply		
	a. The city water distribution main to the site		●
	b. The supply system within the site (receiving and elevated tanks)	●	
	3) Drainage		
	a. The city drainage main (for storm, sewer and others) to the site		●
	b. The drainage system (for toilet sewer, ordinary waste, storm drainage and others) within the site	●	
	4) Gas Supply		
	a. The city gas main to the site		●
	b. The gas supply system within the site	●	
	5) Telephone System		
	a. The telephone trunk line to the main distribution frame/panel (MDF) of the building		●
	b. The MDF and the extension after the frame/panel	●	
	6) Furniture and Equipment		
	a. General furniture		●
	b. Project equipment	●	
8	To bear the following commissions to the Japanese foreign exchange bank for the banking services based upon the B/A		
	1) Advising commission of A/P		●
	2) Payment commission		●
9	To ensure unloading and customs clearance at port of disembarkation in recipient country		
	1) Marine (Air) transportation of the products from Japan to the recipient country	●	
	2) Tax exemption and custom clearance of the products at the port of disembarkation		●
	3) Internal transportation from the port of disembarkation to the project site		●
10	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contact such facilities as may be neccessary for their entry into the recipient country and stay therein for the performance of their work.		●
11	To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the verified contracts.		●
12	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant.		●
13	To bear all the expenses, other than those to be borne by the Grant, necessary for construction of the facilities as well al for the transportation and installation of the equipment.		●

MINUTES OF DISCUSSIONS

BASIC DESIGN STUDY ON THE PROJECT FOR WATER SUPPLY DEVELOPMENT IN THE RURAL PROVINCE OF DAMASCUS IN THE SYRIAN ARAB REPUBLIC (CONSULTATION ON DRAFT REPORT)

In November 1995, the Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched a team to the Syrian Arab Republic for the Basic Design Study on the Project for Water Supply Development in the Rural Province of Damascus in the Syrian Arab Republic (hereinafter referred to as "the Project"). A study report was drafted through the technical examination of the field survey and discussions with the Syrian side : Establishment of Drinking Water and Sewerage in the Rural Province of Damascus (hereinafter referred to as "the Establishment")

In order to explain the report and consult the Syrian side on the components of the draft report, JICA has sent another study team (hereinafter referred to as "the Team") headed by Mr. Hisao Ushiki, a Development Specialist, JICA, with a schedule to stay in Syria from 17 to 25 January, 1996.

After a series of discussion, both sides have confirmed and agreed upon the main items described on the attached sheet.

Damascus, 23 January, 1996

Mr. Hisao Ushiki
Leader
Basic Design Study Explanation Team
JICA

Mr. Adnan Deeb
General Director
Establishment of Drinking Water
and Sewerage in the Rural Province
of Damascus

ATTACHMENT

1. Components of the Draft Report

The Government of the Syrian Arab Republic(referred to as "Syrian side" elsewhere in this document), represented by Mr.Adnan Deeb, General Director of the Establishment, has agreed and accepted in principle the components of the draft report proposed by the Team.

2.Japan's Grant Aid System

(1) The Government of the Syrian Arab Republic has understood the System of the Japanese Grant Aid explained by the Team, as described in ANNEX I.

(2) The Government of the Syrian Arab Republic will take the necessary measures, described in Annex II, for smooth implementation of the Project, so that the Grant Aid by the Government of Japan is extended to the Project.

3. Further Schedule

The Team will make the final report in accordance with the confirmed items, and submit it to the Government of the Syrian Arab Republic by the end of April, 1996.

4. Other Relevant Issues

The following has been confirmed;

(1) Syrian side will allocate the necessary budget, staff and system to construct the water supply systems with the materials and the equipment procured by the Project.

(2) Syrian side will complete the water supply systems promptly according to the prescribed schedule of the Project.

(3) Syrian side will prepare the warehouse and garage for the materials and equipment, and vehicles, respectively, procured by the Project.

(4) Syrian side will undertake the works such as constructing pump houses, water reservoirs and fuel tanks.

ANNEX I

ON JAPAN'S GRANT AID PROGRAM

I. Japan's Grant Aid Procedures

(1) The Japan's Grant Aid Program is executed by the following procedures.

- **Application**
  (request made by a recipient country)
- **Study**
  (Preliminary Study / Basic Design Study conducted by JICA)
- **Appraisal & Approval**
  (Appraisal by the Government of Japan and Approval by the Cabinet of Japan)
- **Determination of Implementation**
  (Exchange of Notes between the both Governments)
- **Implementation**
  (Implementation of the Project)

(2) Firstly, an application or a request for a project made by the recipient country is examined by the Government of Japan (the Ministry of Foreign Affairs) to see whether or not it is suitable for Japan's Grant Aid. If the request is deemed suitable, the Government of Japan entrusts a study on the request to JICA (Japan International Cooperation Agency).

Secondly, JICA conducts the Study (Basic Design Study), using a Japanese consulting firm. If the background and objective of the requested project are not clear, a Preliminary Study is conducted prior to a Basic Design Study.

Thirdly, the Government of Japan appraises to see whether or not the Project is suitable for Japan's Grant Aid Program, based on the Basic Design Study report prepared by JICA and the results are then submitted for approval by the Cabinet.

Fourthly, the Project approved by the Cabinet becomes official when pledged by the Exchange of Notes signed by the both Governments.

Finally, for the implementation of the Project, JICA assists the recipient country in preparing contracts and so on.

2. Basic design Study

(1)Contents of the Study

The purpose of the Study (Preliminary Study/Basic Design Study) conducted on a project requested by JICA is to provide a basic document necessary for appraisal of the project by the Japanese Government. The contents of the Study are as follows:

a) to confirm background, objectives, benefits of the project and also institutional capacity of agencies concerned of the recipient country necessary for project implementation,
b) to evaluate appropriateness of the Project for the Grant Aid Scheme from a technical, social and economical point of view,
c) to confirm items agreed on by the both parties concerning a basic concept of the project,
d) to prepare a basic design of the project,
e) to estimate cost involved in the project.

Final project components are subject to approval by the Government of Japan and therefore may differ from an original request.

Implementing the project, the Government of Japan requests the recipient country to take necessary measures involved which are itemized on Exchange of Notes.

(2)Selecting (a) Consulting Firm(s)

For smooth implementation of the study, JICA uses (a) consulting firm(s) registered. JICA selects (a) firm(s) through proposals submitted by firms which are interested. The firm(s) selected carry(ies) out a Basic Design Study and write(s) a report, based upon terms of reference made by JICA.

The consulting firm(s) used for the study is(are) recommended by JICA to a recipient country after Exchange of Notes, in order to maintain technical consistency and also to avoid possible undue delay in implementation caused if a new selection process is repeated.

(3)Status of a Preliminary Study in the Grant Aid Program

A Preliminary Study is conducted during the second step of a project formulation & preparation as mentioned above.

A result of the study will be utilized in Japan to decide if the Project is to be suitable for a Basic Design Study.

Based on the result of the Basic Design Study, the Government would proceed to the stage of decision making process(appraisal and approval).

It is important to notice that at the stage of Preliminary Study, no commitment is made by the Japanese side concerning the realization of the Project in the scheme of Grant Aid Program.

3. Japan's Grant Aid Scheme

(1)What is Grant Aid?

The Grant Aid Program provides a recipient country with non reimbursable funds needed to procure facilities, equipment and services for economic and social development of the country under the following principles in accordance with relevant laws and regulations of Japan. The Grant Aid is not in a form of donation or such.

(2)Exchange of Notes (E/N)

The Japan's Grant Aid is extended in accordance with the Exchange of Notes by both Governments, in which the objectives of the Project, period of execution, conditions and amount of the Grant etc. are confirmed.

(3)"The period of the Grant Aid" means one Japanese fiscal year which the Cabinet approves the Project for. Within the fiscal year, all procedure such as Exchange of Notes, concluding a contract with (a) consulting firm(s) and (a) contractor(s) and a final payment to them must be completed.

(4)Under the Grant, in principle, products and services of origins of Japan or the recipient country are to be purchased.

When the two Governments deem it necessary, the Grant may be used for the purchase of products or services of a third country origin.

However the prime contractors, namely, consulting, contractor and procurement firms, are limited to "Japanese nationals". (The term "Japanese nationals" means Japanese physical persons or Japanese juridical persons controlled by Japanese physical persons.)

(5)Necessity of the "Verification"

The Government of the recipient country or its designated authority will conclude into contracts in Japanese yen with Japanese nationals. Those contracts shall be verified by the Government of Japan. The "Verification" is deemed necessary to secure accountability to Japanese tax payers.

(6)Undertakings required to the Government of the recipient country

In the implementation of the Grant Aid, the recipient country is required to undertake necessary measures such as the following:

① to secure land necessary for the sites of the project and to clear and level the land prior to commencement of the construction work,

② to provide facilities for distribution of electricity, water supply and drainage and other incidental facilities in and around the sites,

③ to secure buildings prior to the installation work in case the Project is providing equipment,

④ to ensure all the expenses and prompt execution for unloading, customs clearance at the port of disembarkation and internal transportation of the products purchased under the Grant Aid,

⑤ to exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which will be imposed in the recipient country with respect to the supply of the products and services under the Verified Contracts,

⑥ to accord Japanese nationals whose services may be required in connection with the supply of the products and services under the Verified Contracts, such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work.

(7)Proper Use

The recipient country is required to maintain and use facilities constructed and equipment purchased under the Grant Aid properly and effectively and to assign staff necessary for their operation and maintenance as well as to bear all expenses other than those to be borne by the Grant Aid.

(8)Re-export

The products purchased under the Grant Aid shall not be re-exported from the recipient country.

(9)Banking Arrangement (B/A)

(a) The Government of the recipient country or its designated authority shall open an account in the name of the Government of the recipient country in an authorized foreign exchange bank in Japan (hereinafter referred to as "the Bank") . The Government of Japan will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by Government of the recipient country or its designated authority under the contracts verified.

(b) The payments will be made when payment requests are presented by the Bank to the Government of Japan under an Authorization to Pay issued by the Government of the recipient country or its designated authority.

ANNEX II

Necessary measures to be taken by the Government of the Syrian Arab Republic on condition that Japan's Grant Aid is executed;

1. To provide necessary data and information for the Project.

2. To secure and clear the sites for the Project prior to the commencement of procurement under the Grant Aid Program.

3. To construct the access road to the sites prior to the commencement of the procurement.

4. To secure facilities such as garage for vehicles and warehouse for pipes, pumps, generators, and transformers until installing and laying them, and for spare parts procured by this project.

5. To undertake incidental work such as constructing pump houses, water reservoirs and fuel tanks.

6. To bear advising commission of Authorization to Pay (A/P) and payment commission to a Japanese foreign exchange bank for the banking services based on the Banking Arrangement (B/A).

7. To exempt taxes and to take necessary measures for customs clearance of the materials and equipment brought for the Project at the port /airport of disembarkation.

8. To ensure prompt unloading and internal transportation of the equipment procured under the Grant.

9. To accord Japanese nationals, whose services may be required in connection with the supply of products and the services under the verified contracts, such facilities as may be necessary for their entry into Syrian Arab Republic and stay therein for the execution of the Project.

10. To provide necessary permissions, licenses and other authorization for carrying out the project.

11. To provide necessary actions to expedite the approval for execution of the project by the authorities concerned in the Syrian Arab Republic.

12. To maintain and make proper and effective use of the equipment purchased under the Grant.

13. To bear all the expenses, other than those covered by the Grant, necessary for execution of this project.