PALESTINIAN WATER AUTHORITY

MINISTRY OF LOCAL GOVERNMENT

THE PALESTINIAN INTERIM SELF-GOVERNMENT AUTHORITY

BASIC DESIGN STUDY REPORT
ON
THE PROJECT FOR
IMPROVEMENT OF WATER DISTRIBUTION FACILITIES
IN THE NORTHERN DISTRICTS OF THE WEST BANK
IN THE
PALESTINIAN INTERIM SELF-GOVERNMENT AUTHORITY
(PHASE I)

JANUARY, 2000

JAPAN INTERNATIONAL COOPERATION AGENCY

YACHIYO ENGINEERING CO., LTD.

PREFACE

In response to a request from the Palestinian Interim Self-Government Authority, the Government of Japan decided to conduct a basic design study on the Project for Improvement of Water Distribution Facilities in the Northern Districts of the West Bank (Phase I) and entrusted the study to the Japan International Cooperation Agency (JICA).

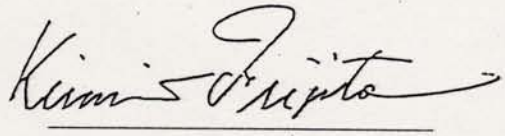
JICA sent to the Palestinian Interim-Self Government Authority a study team from July 7 to August 5, 1999.

The Team held discussions with the officials concerned of the Palestinian Interim Self-Government Authority, and conducted a field survey at the study area. After the Team returned to Japan, further studies were made. Then, a mission was sent to the Palestinian Interim Self-Government Authority 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 the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Palestinian Interim Self-Government Authority for their close cooperation extended to the teams.

January, 2000



Kimio Fujita
President
Japan International Cooperation Agency

January, 2000

LETTER OF TRANSMITTAL

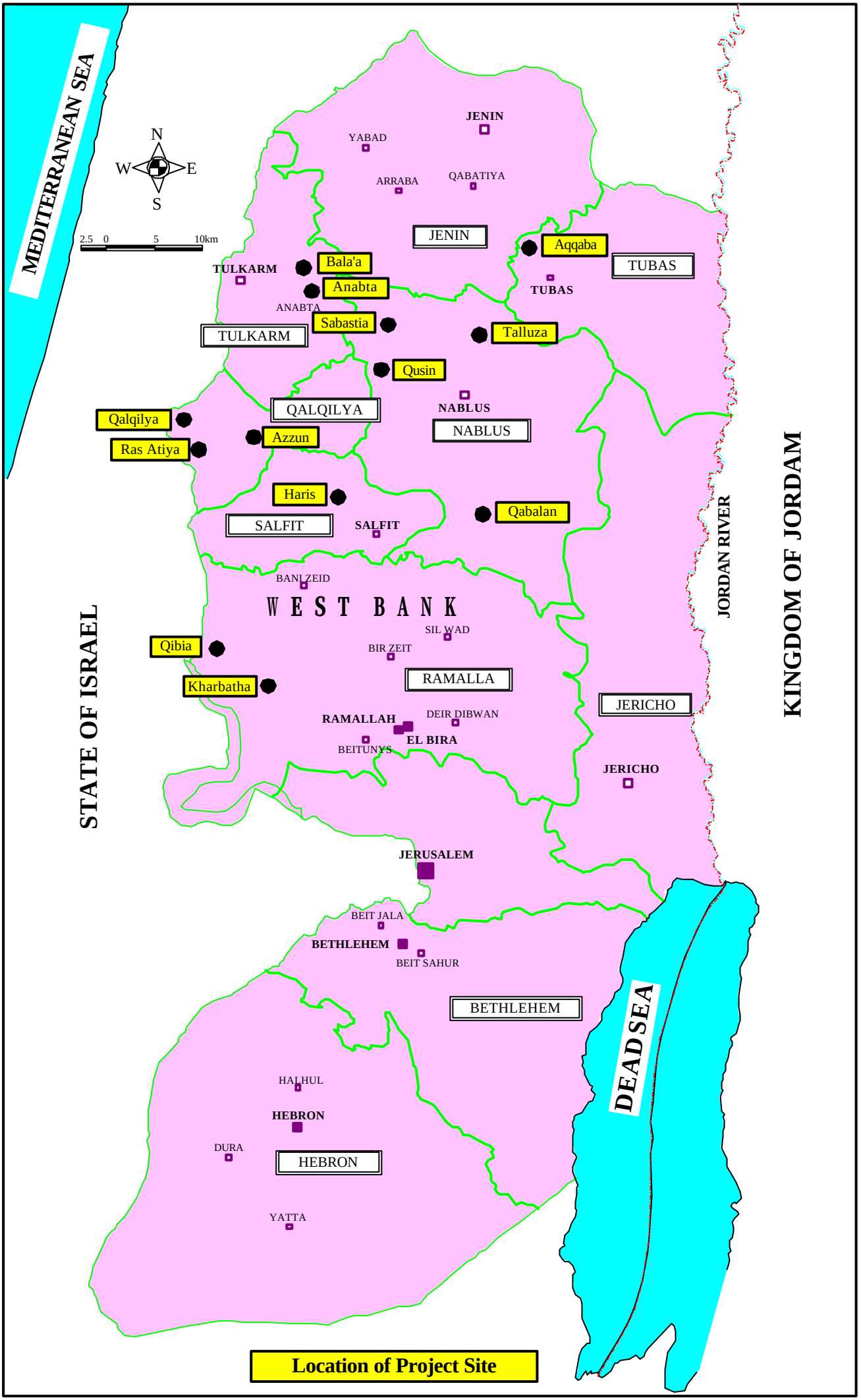
We are pleased to submit to you the basic design study report on the Project for Improvement of Water Distribution Facilities in the Northern Districts of the West Bank (Phase I) in the Palestinian Interim Self-Government Authority.

This study was conducted by Yachiyo Engineering Co., Ltd., under a contract to JICA, during the period from July 2, 1999 to January 31, 2000. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of the Palestinian Interim-Self Government Authority 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,

Noboru Saeki
Project Manager,
Basic design study team on
the Project for Improvement of Water Distribution Facilities in the Northern Districts of the West Bank (Phase I)
Yachiyo Engineering Co., Ltd.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BETHLEHEM
DEADSEA
HALHUL
HEBRON
DURA
HEBRON
YATTA
STATE OF ISRAEL
JORDAN RIVER
KINGDOM OF JORDAM
Location of Project Site

ABBREVIATIONS

PA	The Palestinian Interim Self-Government Authority
JWC	Joint Water Committee
NWC	National Water Council
PWA	Palestinian Water Authority
MOLG	Ministry of Local Government
WBWD	West Bank Water Department
Mekorot	Israeli National Water Company
JWU	Jerusalem Water Undertaking
MOPIC	Ministry of Planning and International Cooperation
PEA	Palestinian Energy Authority
PDP	Palestinian Development Plan
USAID	U.S.Agency for International Development
GTZ	Deutsche Gesellschaft für Techniche Zusammenarbeit
KfW	Kreditanstalt für Wiederaufbau
SCF	Save Children Federation
UNDP	United Nation Development Programme
PECDAR	Palestinian Economic Development and Reconstruction
NIS	New Israeli Shekel
E/N	Exchange of Notes

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CHAPTER 1

BACKGROUND OF THE PROJECT

CHAPTER 1 BACKGROUND OF THE PROJECT

At the West Bank of Palestine, the autonomy of the Palestinian people was agreed following the Provisional Declaration of Autonomy between Israel and the Palestinian Liberation Organization (PLO) in 1993 together with a similar arrangement for the Gaza Strip. The West Bank has an area of 5,572 km^2 and a population of some two million (1997 Census). In terms of the climate, it belongs to the semi-arid zone and the different climatic conditions in different areas mean a diversity of agriculture which is the main local industry.

Since Independence, Israel has regarded water as an important strategic resource and has given priority to the securing of water supply. As a result, the development of water resources by Palestinians in the West Bank is restricted even today, creating a major problem of the securing of not only agricultural water but also drinking water for Palestinian areas. Indeed, water resources were one of the major conflicting issues in the Middle East peace negotiations. In order to eradicate the disparity between Israel and Palestine in terms of water supply, the Joint Water Committee (JWC) was established by the two parties in accordance with the Oslo 2 Agreement and the JWC was given the authority to deal with all issues relating to water supply and sewerage in Palestine. The JWC also examines and approves water supply plans and is particularly careful when examining any plan which could affect the groundwater quality and available water volume.

Water supply in the West Bank is currently available for 88% of all households, which is not much lower than the Japanese figure of 97%. However, the actual water supply volume is as low as 50 L/c/d in some areas because of the absolute shortage of raw water and leakage from the aged water transmission and distribution mains. An increase of the water supply volume is urgently required to achieve the target volume (90 L/c/d) of the Palestine Development Plan (1998 - 2000) and also to ensure adequate water supply for the increasing population. While groundwater, including spring water and river water (including wadi water), are possible new water supply sources, the development of river water for drinking water purposes is unlikely, partly because of its priority use by Israel and partly because of the large seasonal fluctuations as well as unfavorable water quality. Meanwhile, a substantial supply increase using groundwater is also unlikely because the JWC restricts the development of new wells and intake from existing wells and springs.

Given the practical difficulty of developing new water supply sources described above, the Palestinian Interim Self-Government Authority (hereinafter referred to as "the PA") has prepared a project to improve the water distribution facilities in 26 municipalities and villages in the northern districts of the West Bank (hereinafter referred to as "the Project") and has

made a request for grant aid for the project after applying to the JWC for the approval of such improvement.

For the present project (the Project), however, 13 municipalities and villages have been selected as the study concerned through the screening process using four criteria, i.e. (i) the approval of the JWC had already been granted at the time of the request, (ii) the concerned public body will manage the improved facilities, (iii) the ownership of the water sources has been clearly established and (iv) the anticipated construction period will be short.

At the early stage of the field survey, the Basic Design Study Team consulted with the Palestinian side to confirm the contents of the original request in detail. The original contents of the request and the confirmed contents of the amended request at the signing of the BD minutes on 17th July, 1999 after consultation are shown in Table 1-1.

Table 1-1 Contents of Palestinian Request

No.	Municipality and Village	District	Original Request			Amended Request at Signing of BD Minutes		
			Construction of Transmission and Distribution Mains		Construction of Water Reservoir	Construction of Transmission and Distribution Mains		Construction of Water Reservoir
			Pipe Diameter (mm)	Total Length (m)		Pipe Diameter (mm)	Total Length (m)	
1	Aqqaba (v)	Tubas	50 - 150	9,800	-	**50 - 100**	9,800	Ground Type 300 m^3
2	Bala'a (m)	Tulkarm	50 - 100	4,900	-	50 - 100	4,900	-
3	Anabta (m)		50 - 100	12,610	-	50 - 100	12,610	-
4	Sabastia (m)	Nablus	50 - 100	9,600	-	**50 - 150**	9,600	-
5	Talluza (v)		50 - 150	7,370	-	**50 - 100**	**15,270**	-
6	Qusin (v)		50 - 150	19,750	-	50 - 150	**6,930**	-
7	Qabalan (m)		50 - 150	12,100	-	50 - 150	12,100	**Ground Type 200 m^3**
8	Qalqilia (m)	Qalqilia	200 -250	2,300	Ground Type 2,000 m^3	200 - 250	2,300	Ground Type 2,000 m^3
9	Azzun (m)		50 - 100	13,300	-	50 - 100	13,300	-
10	Ras Atiya (v)		50 - 100	3,950	-	50 - 100	3,950	-
11	Haris (v)	Salfit	50 - 100	7,100	Elevated Type 300 m^3	50 - 100	**7,980**	Elevated Type 300 m^3
12	Qibia (v)	Ramallah	50 - 100	12,750	-	50 - 100	12,750	-
13	Kharbatha (v)		50 - 100	6,350	-	50 - 100	6,350	-
	Total			121,880			117,840	

Note: Those in bold squares represent changes of the original request.

The underlying reasons for the changes of and additions to the original request are explained below.

Aqqaba Village: Addition of Water Reservoir

The water source for Aqqaba Village is the Qabatiya Well that is owned by the WBWD and managed by Israel Water Corporation (Mekorot). This well supplies water for Jenin Municipality and Israel's Arite Army Camp through two trunk transmission routes. Aqqaba receives water supply from a transmission main that branches from the Arite route. Aqqaba Village has an existing water storage tank of 100 m^3. The present operation system is that water supply from the well stops whenever the water reservoir at the Arite Camp is full, resulting in intermittent water supply to Aqqaba Village. The actual water supply results in the past indicates a low supply volume of approximately 10 L/c/d.

In view of this situation, the Palestinian side originally requested a water reservoir of 300 m^3 at Aqqaba Village to create a system whereby water distribution to the village is secured by means of storing water at this new reservoir during water supply to the Arite Camp. The addition of this water reservoir, however, will be dropped from the Project if the relevant approval of the JWC is not obtained by the end of September, 1999.

Talluza Village: Addition of El Badan Area

The name of Talluza Village was mentioned in the original request. The field survey found that Talluza Village consists of the Talluza area and the El Badan area and that the El Badan area was not included in the original request. During the field survey, the Talluza Village Council makes a strong request for the inclusion of the El Badan area in the Project to improve its water supply as it forms part of Talluza Village. This request was backed by the fact that the water supply improvement plan for the El Badan area has already been approved by the JWC.

Qabalan Municipality: Addition of Water Reservoir

The field survey found the existence of some areas of which the elevation is higher than that of the existing water reservoir, making the distribution of water to these areas difficult. Accordingly, the Palestinian side requested the addition of a 200 m^3 water reservoir at an elevated site. The Study Team decided to examine this request as a stable water supply for the municipality would be feasible using the existing water reservoir for low elevation areas and an additional water reservoir for high elevation areas.

CHAPTER 2

CONTENTS OF THE PROJECT

CHAPTER 2 CONTENTS OF THE PROJECT

2-1 Objectives of the Project

There are still many villages that lack water supply facilities (more than 145 villages out of 294 municipalities and villages as of December 1998) in the Project Area, i.e. northern districts of the West Bank. Although all of the concerned municipalities and villages of the Project have such facilities, these facilities were mainly constructed before the late 1970's, causing a high level of water leakage due to deterioration.

The average water supply volume in the target municipalities and villages excluding Qalqilia, one of the West Bank's major municipalities, is 87 L/c/d, but since the ineffective water ratio is approximately 40% it is estimated that the actual water consumption of residents is roughly 50 L/c/d, which is an extremely low level (see Table 2-3-2).

Meanwhile, the northern districts of the West Bank with scarce water sources have almost reached the limit for groundwater development and, therefore, a sufficient water supply volume has not been secured. Under these circumstances, the Project aims at securing the specified water supply level and improving the water supply service through the renewal and new construction of water transmission and distribution systems (water transmission main and distribution pipe networks and water reservoirs) in the concerned municipalities and villages. And thus the Project will help to improve the living standard of citizens living in the said municipalities and villages.

2-2 Basic Concept of the Project

2-2-1 Basic Concept

Design Year

Given the purpose of the Project, i.e. improvement of the water transmission main and distribution networks, the design year must be determined with a minimum margin in order to avoid any necessity to further extend the facilities immediately after completion. Accordingly, the design year is determined to be 2005, five years after the completion of the planned facilities under the Project.

Design Population

The design population for the water distribution facilities for the Project shall be determined based on the result of the statistics conducted by the Palestinian Central Bureau of Statistics in

1997 and taking into account the annual population growth rate and returnee after the development of peace negotiation between the PA and Israel.

Design Water Supply

As far as the existing water supply sources are concerned, the amount of available groundwater in the southern and eastern districts of the West Bank still has room for further exploitation (78 million m^3/yr). In contrast, the exploitation of groundwater in the northern districts, i.e. the Project Area, has almost reached its limit and further extraction appears extremely difficult. In regard to surface water, while the PA claims the annual water right to use 257 million m^3 of water from Jordan River, its actual use will depend on the future outcome of the peace negotiations.

Table 2-2-1 Exploitable Amount of Groundwater in Palestine

(Unit: million m^3/yr)

Item	Western Aquifer	Northeastern Aquifer	Eastern Aquifer
Israeli Utilization	340	103	40
Palestinian Utilization	20	42	24
Palestinian Springs	2	0	30
Remaining Capacity for Palestinian Use	0	0	78
Total	362	145	172

The design water supply for planning the water distribution facilities should be set through the future water supply target of each municipality/village and the water supply derived from the potential of the well. However, the actual water supply will be depending on the negotiation with Israeli authority. Therefore, the design water supply for the Project shall be determined based on the agreed allocation of water, the average water supply that has been agreed by JWC and the water distribution/supply volume for the past few years.

House Connection

The original request included house connection in the scope of the Project but it was confirmed that the procurement of materials and the actual connection work to new user households will be undertaken by the PA side.

Under the Project, it will be necessary to replace existing service pipes for almost all households in the concerned municipalities and villages except Qalqilia and such work will be impossible to complete by the Japanese side in view of the limited work period. It has, therefore, been decided to provide part of the service pipes to facilitate the effective use of the new facilities so that the intended positive effects of the Project will be quickly manifest after the completion of the Project. In addition, recommendations will be made to promote the intended work with the

participation of benefiting local people and to establish a proper maintenance system by the concerned municipalities and villages.

Basic concept of the Project is, therefore, summarized that the Project is aiming at offering fund to the construction of water transmission main, water distribution network and water reservoirs and the provision of piping materials for facilitating house connection by the PA in order to achieve improvement of water distribution facilities enabling daily average water supply of 96L/c/d in the target year at 13 municipalities and villages in the northern districts of the West Bank.

2-2-2 Examination of Contents of the Request

In accordance with the main frames of the Project mentioned above, the basic design study has been done using the requested plans from the PA side, taking into account the results of the field survey, the discussions between the concerned authorities of PA and consultation with the related authorities in Japan. The comparison between the confirmed contents of the amended request at the signing of the BD minutes and the basic design study results are shown in Table 2-2-2.

Table 2-2-2 Comparison between the Requested Contents and the Study Results

No.	Municipality and Village	District	Requested Items			Basic Design Study Results		
			Construction of Transmission and Distribution Mains		Construction of Water Reservoir	Construction of Transmission and Distribution Mains		Construction of Water Reservoir
			Pipe Diameter (mm)	Total Length (m)		Pipe Diameter (mm)	Total Length (m)	
1	Aqqaba (v)	Tubas	50 - 150	9,800	Ground Type 300 m^3	50 - 100	9,701	Ground Type 300 m^3
2	Bala'a (m)	Tulkarm	50 - 100	4,900	---	50 - 100	4,930	---
3	Anabta (m)		50 - 100	12,610	---	50 - 100	11,316	---
4	Sabastia (m)	Nablus	50 - 100	9,600	---	50 - 150	12,209	---
5	Talluza (v)		50 - 150	7,370	---	50 - 100	29,171	---
6	Qusin (v)		50 - 150	19,750	---	50 - 150	6,859	---
7	Qabalan (m)		50 - 150	12,100	---	50 - 150	11,962	Ground Type 200 m^3
8	Qalqilia (m)	Qalqilia	200 -250	2,300	Ground Type 2,000 m^3	100 - 250	2,897	Ground Type 2,000 m^3
9	Azzun (m)		50 - 100	13,300	---	50 - 100	12,562	---
10	Ras Atiya (v)		50 - 100	3,950	---	50 - 100	3,735	---
11	Haris (v)	Salfit	50 - 100	7,100	Elevated Type 300 m^3	50 - 100	7,735	Elevated Type 300 m^3
12	Qibia (v)	Ramallah	50 - 100	12,750	---	50 - 100	12,536	---
13	Kharbatha (v)		50 - 100	6,350	---	50 - 100	6,097	---
Total				117,840			131,860	

The amended request and the examination results based on the basic design study are described below.

1) Aqqaba Village: Addition of Water Reservoir

In order to solve the shortage of distribution volume as described in the previous chapter, an additional water reservoir with a capacity of 300 m^3 to increase the volume has been requested from the PA side. The Study Team studied the request and judged to be appropriate as a method securing the specific water distribution volume.

The approval of the JWC by the end of September 1999 was a condition attached to the addition of this reservoir. As this approval was granted by the JWC Technical Committee at its meeting on 28th September 1999, this water reservoir is now included in the Project.

2) Talluza Village: Addition of El Badan Area

During the field survey, the Study Team obtained the minutes regarding the approval of the JWC related to the original request. It was found that applications for JWC approval were simultaneously made for the Talluza area and the El Badan area of Talluza Village and were approved at the same time. Accordingly, the inclusion of the El Badan area in the requested work for Talluza Village is judged to be appropriate.

3) Qabalan Municipality

The inclusion of an additional water reservoir is judged to be appropriate as this will not only secure water for high areas but will also contribute to securing stable water distribution in the entire Qabalan Municipality.

4) Extension of Transmission and Distribution Mains

Talluza Village

Talluza Village consists of the Talluza area and the El Badan area and the requested extension of the water transmission mains and distribution network was calculated based on the WBWD's plan map. Detailed examination of this map found that the correct scale is 1/2,500 instead of the indicated 1/1,250 on the map. As a result, the actual length is increased by approximately 1.7 times that of the original request.

Sabastia Municipality

It was found that the WBWD's plan map erroneously omitted the 50 mm and 75 mm distribution pipelines. After examination, it was judged appropriate to include these

pipelines in the Project on the grounds that these mains will serve urban areas that are already inhabited by a large number of people. As a result, the total length was increased.

Other Municipalities and Villages

As mentioned above, the requested length was calculated by the WBWD based on its plan map. Detailed calculation, taking the topographical undulations into consideration, produced slightly different figures from the requested figures.

2-2-3 Outline of the Project

The project outline (superior targets, design targets, expected results and activity-input plan, etc.) is shown in Fig. 2-2-1.

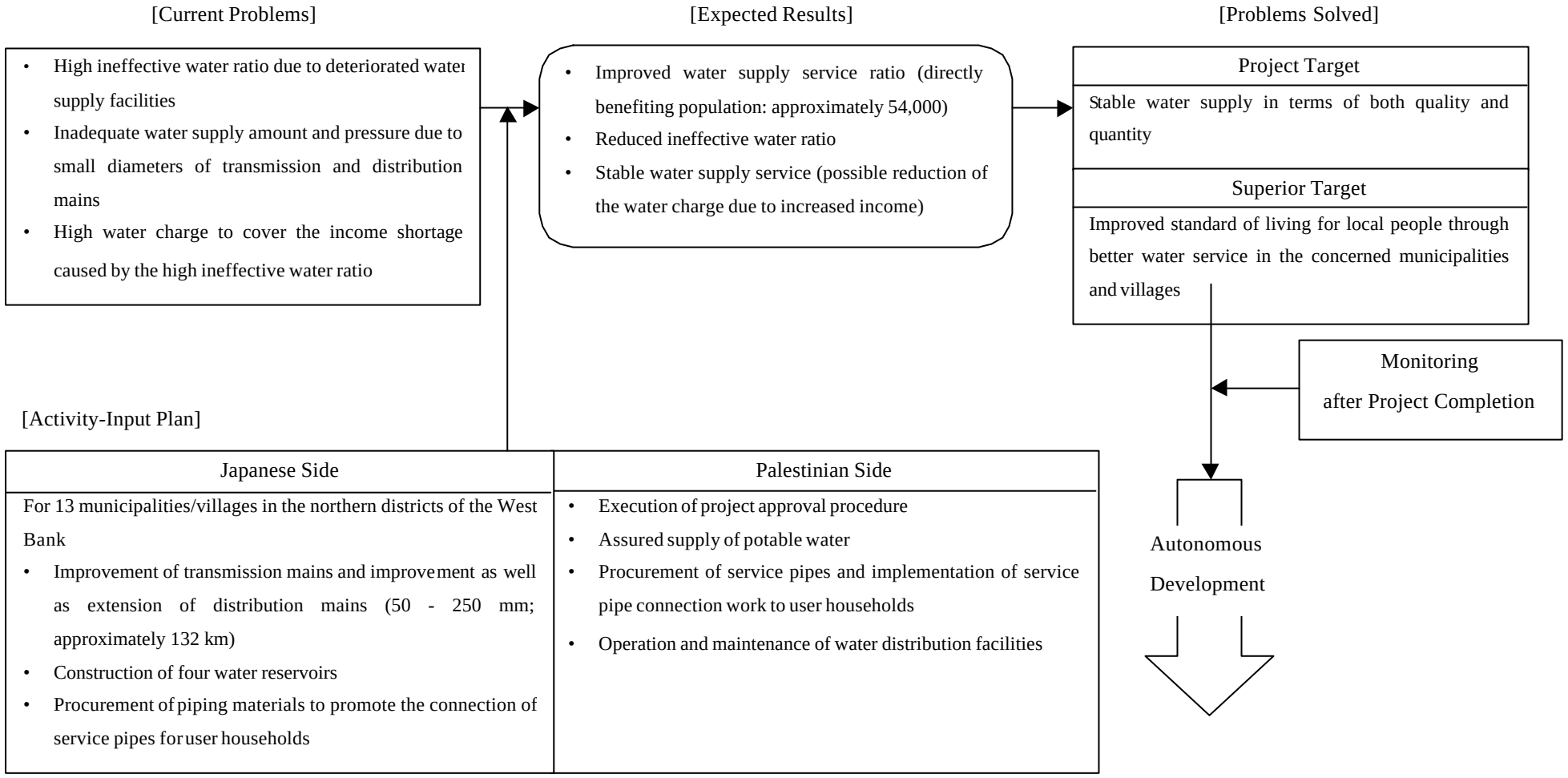


Fig. 2-2-1 Outline of the Project

2-3 Basic Design

2-3-1 Design Concept

(1) Natural Conditions

1) Climate

The climate in the northern districts of the West Bank where the municipalities and villages are located is generally a Mediterranean one. Having an average annual rainfall of 600-700 mm/yr, this area is rainy compared to the area around Jericho, which has a desert arid climate and annual rainfall of 150 mm per year.

The annual average temperature is 17-20℃, but the monthly average temperature reaches a peak of 32-34℃ in August and a low of 6-8℃ in January. There have been reports of snowfall in the middle and southern districts, but snow is hardly ever seen in the north.

In conclusion, it is not deemed necessary to take any special measures concerning rainfall and freezing in the water supply facilities plan of the Project. When laying water transmission mains and distribution pipes, the minimum earth covering will be secured with respect to the pipe diameter.

2) Topography and Geology

All the concerned municipalities and villages are located on hilly land, and internal pressure at connection points with water wells and the Mekorot water transmission main is high at 7-38 kg/cm^2. In order to prevent water leakage from pipes, which is apt to occur under conditions of such high internal pressure, it is necessary to make effective use of pressure-reducing valves and set pressure zones of differing rank and to carry out pipeline design according to pressure.

Moreover, there are no railroad or river crossings in the concerned municipalities and villages. Concerning sites where pipelines cross major roads that connect municipalities and villages, it is necessary to lay pipes inside steel pipe casing.

Concerning the geological makeup of the hilly land in the northern districts of the West Bank, a limestone stratum can be uniformly found below a depth of around 30 cm from the surface. Since the Project water reservoirs will be constructed on hilly land, there will be no problems concerning uneven settlement and bearing capacity, and this is true

of both ground type water reservoirs, where load is constant, and elevated water tank, on which eccentric load caused by winds will be imposed. However, concerning the limestone strata, since it is thought that hollows caused by erosion may exist, mat foundations will be adopted because these enable load to be distributed.

3) Water Quality Analysis

In the field survey for the Project, water quality analysis shall be done for the supplied water from each source in the related municipality and village. However, even if the analysis results show the necessity for taking some countermeasures to improve the water quality, only recommendations will be made for the Project.

4) Load Conditions

For the design of structures to be constructed under the Project, Japanese design standards will be adopted because of (i) their extremely high reliability originating from many cases of application, in turn reflecting their systematic provisions by international criteria, and (ii) their familiarity to people involved in the Project through previous Japanese grant aid projects.

With respect to design load criteria, it will be necessary to respect local characteristics, however, Japanese standards will be adopted because no such standards exist on the PA side.

Regarding seismic load, although the earthquake has occurred once or so every 100 years in this region, it shall be applied to the structural analysis in the Project taking into account that the seismic load has recently been considered in the building projects in PA to enhance the safety of the building. Japanese standards will be adhered to with respect to wind load. Snow and wind load will not be taken into account.

(2) Social Conditions

1) Service ratio

Construction of the water distribution facilities in the municipalities and villages has been carried out through the self-efforts of the municipalities and villages since the early 1970s. Due to high awareness of the need for connection to individual households among residents, there are some municipalities where the water service ratio is 100%, and the average service ratio is extremely high at around 90%.

However, since network planning and pipe laying works have not been carried out based on appropriate design criteria and engineering specifications, work quality is poor and this combined with the deterioration of facilities leads to a high ineffective water ratio (approximately 30% in Qalqilia and 42% on average in the 12 remaining municipalities and villages). In view of these circumstances, the target service ratio in the Project target year will be set as 100% and among existing water transmission and distribution pipelines, the deteriorated ones will be reinstalled.

2) Approval by JWC

It is the precondition that all the requested facility plan for each municipality and village from the PA side, from which the facility plan in the Project is formulated, has already been approved by Joint Water Committee (JWC).

In the formulation of the facility plan in the Project, it shall be considered that in case of the modification for the requested plan related to the water sources such as the increase of water reservoir capacity, reapproval by JWC will be required (for the modification related to the water transmission and distribution pipeline, the reapproval by JWC is not needed).

For acquisition of construction permission, since all the Project areas for the facility plan are located in Area-A and Area-B except that some areas include a small portion of Area-C, the permission of project implementation from JWC is not required. For Area-C in some Project areas, it is the precondition that the permission from JWC has already been obtained.

Moreover, when the permission and/or approval from JWC or Israeli authorities is required in the execution stage, it shall be managed by the PA side.

(3) Execution Conditions and Equipment and Materials

1) Execution Conditions

The number of public works projects that have been implemented by aid agencies on the West Bank has been increasing since 1995, and there are a number of contractors who have experience in building the kind of facilities that are planned under the Project. However, these are medium to small-scale work forces of 20 employees at most and conducting three or four construction works per year.

The contractors who have experienced similar works in the northern districts of the West Bank are based in Ramallah and Nablus, and their marketing activities are focused throughout the northern districts.

The target area of the Project covers 13 municipalities and villages and the works period is short at around 10 months. Therefore, a Japanese general construction contractor, working under a permanently stationed supervisor, will divide the works sites into groups (around three municipalities and villages per group). And work on each group will be executed upon binding a subcontractor contract with one local operator.

Concerning the methods of execution (in particular forms and scaffolding, etc.), local methods will be applied as far as quality control and safety control concerns allow.

2) Local Equipment and Materials

Ready-mixed concrete, reinforcing steel, sand, gravel, and other basic materials necessary for executing the Project works can be procured locally.

On the other hand, regarding water pipe materials, welding steel pipe will be adopted for piping with a diameter of 75 mm and more, and galvanized steel pipe will be used for piping with a diameter of 50 mm or less. Since these materials are manufactured by two companies in Israel and are widely available on the West Bank via Palestinian agents, they can be procured locally. However, in consideration of lack of competition and the possibility of unforeseen situations such as stoppage of supply, a procurement plan will be adopted that also makes it possible to procure materials from Egypt and other third countries in Europe.

(4) Use of Local Companies

Since the water transmission main and distribution pipe laying and water reservoir works of the Project are not difficult, similar works have been conducted on numerous occasions in the past, and many local contractors have experience of such works, an execution plan based around the utilization of local contractors will be adopted.

However, in order to support execution planning for the whole Project and matters concerning process control and quality control, it is necessary to dispatch Japanese engineers in order to supervise and instruct the local contractors. Moreover, concerning scaffolding and form supports, since local methods leave much to be desired in terms of safety control and quality control, frame and round pipe scaffolding and form supports

which are commonly used in Japan will be adopted. And since skilled workers cannot be recruited in Palestine, special engineers will be dispatched from Japan to carry out work guidance.

(5) Technical Level and Maintenance Capability of the Implementing Agencies

1) Municipalities and Villages (Local Governments)

The implementing agencies of the Project are the Palestinian Water Authority (PWA) and the Ministry of Local Government (MOLG). Following completion of the Project, the facilities will be transferred to each municipality and village to be operated and maintained.

In major municipalities such as Qalqilia and Anabta, waterworks sections have been established within the local government and the operation and maintenance setup for the water supply utility is in place. In the smaller municipalities and villages, however, there are only water tariff collectors but no maintenance staff, and the maintenance setup is such that plumbers are employed only after repairs have become necessary.

In the Project, in order to ensure that operation and maintenance can be carried out in even the smaller municipalities and villages after the Project is finished, a maintenance plan will be compiled that incorporates the establishment of a 'Joint Service Council' organized in a joint effort among the municipalities and villages.

2) Palestinian Water Authority (PWA) and Ministry of Local Government (MOLG)

The PWA carries out the maintenance of water supply transmission pipelines and water wells under its ownership, and it possesses the equipment (including heavy machinery), piping materials, piping materials stores, and water analysis facilities needed to perform this maintenance.

Concerning the transmission and distribution facilities leading downstream from the water wells belonging to each municipality and village, since these are operated and maintained by each municipality and village, the PWA will not directly be involved in the operation and maintenance for concerned municipalities and villages after Project completion. However, concerning the works to reconnect water transmission mains to new distribution pipes, it will be necessary for the PWA to store and allocate supplied equipment and materials and to supervise and coordinate the municipalities and villages.

Moreover, the MOLG acts as the superior supervisory agency over municipalities and villages, and it will be responsible for coordinating and promoting work when it comes to establishing the joint service association.

(6) Design Scope and Grading of Facilities, Equipment and Materials

In consideration of the conditions described in (1) through (5) above, the scope and grade of facilities, equipment and materials, etc. will be set based on the following basic principles.

1) Design Scope for Facilities, Equipment and Materials

Concerning the scope of the water transmission and distribution facilities, areas which it is imagined will be urbanized by the Project target year of 2005 will be the assumed service districts, and the scale of facilities will be set based on the maximum daily water supply per person.

Concerning the re-installation of service pipes from each household (work to be carried out by the Palestinian side), in order to make the connecting works to the new distribution pipeline easier, secondary distribution pipes will be included in the scope of work of the Japanese side for distribution pipes with a diameter of 75 mm or more. For distribution pipes with a diameter of 50 mm, piping materials from distribution pipe junctions to roadside sluice valves will be procured in the Project.

2) Grading of Facilities

Concerning the specifications of the water transmission mains, distribution pipes and water reservoirs to be constructed in the Project, consideration will be given to ensure that the technical levels of municipalities and villages, which will operate and maintain facilities following the Project, are adhered to.

Also, concerning the materials of water transmission mains and distribution pipes, these will be selected upon first giving consideration to topographical conditions, the current state of operation and maintenance, and the ease or difficulty of procuring materials locally.

(7) Construction Schedule

In accordance with regulations of the Grant Aid Scheme of the Government of Japan, it is necessary for the grant aid Project in Palestine to be implemented within a single fiscal year.

Therefore, it should be taken into account that the implementation period is short in relation to the contents of work including construction of about 132 km water transmission and distribution pipelines and 4 (four) water reservoirs in 13 municipalities and villages scattered widely in the northern districts of the West Bank.

2-3-2 Basic Design

2-3-2-1 Design Conditions

(1) Project Target Year

Concerning the major Project component of installing water transmission mains and distribution pipes, since it is difficult to steadily increase the capacity of such facilities in line with increases in population and the supply volume, only the bare minimum allowance will be taken into account and 2005 (five years after completion of facilities) will be adopted as the Project target year.

(2) Design Population and Design Service Population

The design population will be set based on population statistics that were gathered by the Palestinian Central Bureau of Statistics in 1997. Concerning the rate of population increase (natural increase), the PWA has set a figure of 3.0% for up until 2010 and 2.5% for the period between 2011 and 2020. On the other hand, the UNDP applies a figure of 3.0-3.5% in its projects on the West Bank.

For the purposes of the Project, in addition to the natural rate of population increase of 3.0%, a further 0.5% will be added to account for refugees returning to Palestine from 2001 onwards as a result of progress in peace negotiations. Accordingly, the rate of population increase will be 3.0% for the period 1997-2000 and 3.5% for the period 2001-2005.

Out of the municipalities and villages targeted by the Project, except for Bala'a and Qalqilia, where expansion of distribution facilities is planned in designated areas, and Anabta and Azzun, where partial development of distribution facilities is being implemented by other aid agencies, since supply districts are basically made up of the whole urbanized area of each municipality and village, the design population will be used as it is to represent the design service population.

Table 2-3-1 shows the design population and design service population in each target municipality and village. According to this table, the total design service population is 53,995.

Table 2-3-1 Design Population and Design Service Population in the Target Municipalities and Villages

No	Municipality and Village	Current Population (1997)	Design Population (2005)	Design Service population (2005)	Design Distribution Volume (for whole service district)	
					m^3/d	m^3/yr
1	Aqqaba (v)	4,443	5,766	5,766	554	202,210
2	Bala'a (m)	5,444	7,066	1,410	928	338,720
3	Anabta (m)	5,462	7,088	3,898	680	248,200
4	Sabastia (m)	2,171	2,817	2,817	270	98,550
5	Talluza (v)	2,003	2,600	2,600	520	189,800
	El Badan area	1,810	2,349	2,349	226	82,490
6	Qusin (v)	1,296	1,682	1,682	161	58,765
7	Qabalan (m)	5,417	7,030	7,030	675	246,375
8	Qalqilia (m)	31,772	41,234	10,310	6,600	2,409,000
9	Azzun (m)	5,871	7,619	4,571	731	266,815
10	Ras Atiya (v)	1,136	1,474	1,474	142	51,830
11	Haris (v)	2,230	2,894	2,894	278	101,470
12	Qibia (v)	3,487	4,525	4,525	434	158,410
13	Kharbatha (v)	2,056	2,669	2,669	256	93,440
	Total	74,598	96,813	53,995		

(3) Design Water Supply and Design Water Pressure

1) General Conditions of Water Supply Facilities

The actual results of the water distribution volume and accounted for water volume in the concerned municipalities and villages are shown in Table 2-3-2. The average water supply volume and maximum water supply volume (including the ineffective water ratio) are 87 L/c/d and 128 L/c/d respectively in these areas. These average volumes exclude Aqqaba Village that currently has no secured water source and Qalqilia, one of the West Bank's major municipalities where the living standard differs from that of the concerned municipalities and villages. Meanwhile, the water supply volume excluding the ineffective water volume (i.e. water consumption) is 53 L/c/d on average and 77 L/c/d maximum.

Table 2-3-2 Water Distribution and Accounted For Water Volumes and Average/Maximum Water Supply Volumes (average for 1997 and 1998)

Name of Concerned Municipality/ Village of Project	Water Distribution Volume (m^3/yr)	Accounted For Water Volume (m^3/yr) (Ineffective Water Ratio: %)	Water Supply Volume (including ineffective water volume) (L/c/d)	
			Average	Maximum
Aqqaba (v)	15,480	8,261 (46.6)	9.4	15.9
Bala'a (m)	136,811	84,576 (38.2)	67.8	104.5
Anabta (m)	162,295	91,912 (43.4)	80.2	162.8
Sabastia (m)	69,918	50,343 (28.0)	86.9	134.5
Talluza (v)	172,052	78,317 (54.5)	121.8	177.4
Qusin (v)	37,415	23,602 (36.9)	77.9	115.5
Qabalan (m)	137,780	92,718 (32.7)	68.7	127.9
Qalqilia (m)	2,352,429	1,661,085 (29.4)	203.6	235.3
Azzun (m)	239,627	140,956 (41.2)	110.2	166.3
Ras Atiya (v)	41,377	27,660 (33.2)	98.3	120.4
Haris (v)	47,830	25,647 (46.4)	57.9	79.1
Qibia (v)	82,345	44,846 (45.5)	63.7	101.5
Kharbatha (v)	52,889	34,009 (35.4)	69.4	117.4

2) Design Water Supply

The design water supply amount can be determined on two separate bases: (i) future water supply target of the administration and (ii) capacity of water sources that can be realistically developed. The water supply target of 50 m^3/c/yr (137 L/c/d) for the year 2000 adopted by the PWA appears difficult to achieve in terms of the feasible water sources. For the Project, it is deemed reasonable to adopt a water supply amount of 35 m^3/c/yr (96 L/c/d). This amount is based on the prospect of a new water supply volume of 28 million m^3/yr for household water supply as set forth in Clause 40 of the Oslo 2 Agreement. And it was adopted as the guiding figure for water supply improvement at the JWC meeting between Israel and the PA. As the annual water supply amount in neighbouring Israel and Jordan is 100 m^3/c and 53 m^3/c respectively, the target water supply amount of 50 m^3/c/yr of the PWA is judged to be appropriate.

If this water supply amount of 35 m^3/c/yr is used as the improvement target for those municipalities and villages currently without a water transmission and distribution network (100 in the northern districts in the West Bank), there will be a water supply source shortage. In the case of the concerned municipalities and villages of the Project where such a network exists, however, water supply at a rate of 35 m^3/c/yr is

almost available as shown in Table 2-3-2. And it is judged that there should be no major difficulties in realizing the Project.

3) Design daily maximum supply per person

As mentioned earlier (2-2-1, (3)), an average daily water supply of 96 L/c/d has been applied for the purposes of the Project. However, concerning the design daily maximum supply per person, which is the basic factor used in setting the scale of facilities, a figure of 1.5 times the average supply per person, which is generally adopted in water supply plans in West Bank districts, will be adopted. In other words, the following expression will be adopted:

Design daily maximum supply per person (L/c/d) = Design daily average supply per person x 1.5

However, concerning the design daily maximum supply per person in Qalqilia, since this city is far bigger than the other municipalities and water consumption is twice as high due to differences in lifestyle, this will be set according to actual figures. Table 2-3-3 shows the design daily maximum supply per person calculated according to the above conditions.

Table 2-3-3 Design Daily Maximum Supply per Person

Municipality and Village	Design Daily Maximum Supply per Person (L/c/d)
12 municipalities and villages excluding Qalqilia	140
Qalqilia	200

The design hourly maximum supply volume, which is necessary to set the diameter of water transmission mains and distribution pipes, is calculated using the following expression. Concerning the time coefficient, 1.3 that is the generally adopted value in the West Bank will be adopted.

Design maximum hourly water supply volume (L/s) =

$$\frac{\text{Design daily maximum supply per person}}{24 \times 60 \times 60} \times \text{Time coefficient (1.3)}$$

Concerning design water pressure, since the northern districts of the West Bank consist of hilly and extremely undulating terrain, water pressure in water wells and the Mekorot service main is set at a high level. Accordingly, water pressure in distribution pipes in each municipality and village will be set at a maximum of 8.0 kg/cm^2 and a minimum of 2.0

kg/cm^2. Moreover, existing water pressure at the starting points of transmission pipes and distribution pipes is set as shown in Table 2-3-4.

Table 2-3-4 Design Water Pressure and Starting Point Water Pressure in Transmission Pipes and Distribution Pipes

No	Municipality and Village	Design Water Pressure (kg/cm^2)		Service Pipe Line Starting Point Water Pressure (kg/cm^2)	Distribution Pipe Starting Point Water Pressure (kg/cm^2)
		Maximum	Minimum		
1	Aqqaba (v)	8,0	2,0	---	Water reservoir water level
2	Bala'a (m)	8,0	2,0	---	Water reservoir water level
3	Anabta (m)	8,0	2,0	---	Zone I: Water reservoir water level
					Zone II: 8.0
4	Sabastia(m)	8,0	2,0	11,5	Water reservoir water level
5	Talluza (v)	8,0	2,0	38,0	Water reservoir water level
	El Badan area	8,0	2,0	---	38,0
6	Qusin (v)	8,0	2,0	---	10,0
7	Qabalan (m)	8,0	2,0	30,0	Water reservoir water level
8	Qalqilia (m)	8,0	2,0	2,0	Water reservoir water level
9	Azzun (m)	8,0	2,0	---	Water reservoir water level
10	Ras Atiya (v)	8,0	2,0	6,0	Water reservoir water level
11	Haris (v)	8,0	2,0	15,0	Water reservoir water level
12	Qibia (v)	8,0	2,0	---	7,0
13	Kharbatha (v)	8,0	2,0	---	7,0

(4) Load Conditions and Allowable Bearing Capacity of Soil

The load conditions and allowable bearing capacity of soil to be applied in the design of water reservoirs will be as indicated in Table 2-3-5 in accordance with criteria that are generally applied on the West Bank. However, Japanese standards will be adopted with respect to seismic load and wind load because no applicable standards exist locally.

Table 2-3-5 Load Conditions and Allowable Bearing Capacity of Soil

Item	Conditions
Live load	100kg/m^2
Wind load	W=q x C (kg/m^2), q=120xh$^{(1/4)}$ C : coefficient of wind force h : height of structure (m)
Seismic load	Kh = 0.05 Kh : horizontal seismic coefficient
Snow load	not considered
Allowable bearing capacity of soil	20 t/m^2

2-3-2-2 Plan of Water Transmission Main and Distribution Main

(1) Plan Outline

The plan of water transmission mains and distribution mains was compiled in accordance with the requested plan of the WBWD based on the field survey results and discussions held with the Palestinian side and officials on the Japanese side. An outline of the plan is given in Table 2-3-6.

Table 2-3-6 Outline of the Plan for Water Distribution Facilities

No.	Municipality and Village	Plan Outline
1	Aqqaba (v)	Increase water distribution capacity through constructing an additional water reservoir (ground type). Also, renew the distribution pipe network.
2	Bala'a (m)	In order to cover the newly developing eastern part (poultry farming district) of the municipality and high area in the north, lay new distribution pipes from the existing water reservoir.
3	Anabta (m)	Carry out renewal of the existing distribution pipe network in those sections where renewal has not yet been carried out. In the old city, an NGO (SCF) is renewing the distribution pipe network as phase 1 works.
4	Sabastia (m)	A transmission pipe is connected from the booster pump station constructed by the UNDP to the existing water reservoir, and this will be extended to the other water reservoir on high ground. Also, the distribution pipe network will be renewed.
5	Talluza (v)	Renew the distribution pipe network in Talluza village and El Badan area. Also, renew the water transmission main from the El Badan well to Talluza village.
6	Qusin (v)	Renew the distribution pipe network.
7	Qabalan (m)	Construct a water reservoir (ground type) on high ground in order to secure water distribution to high areas. Use the existing water reservoir to distribute water to low areas. Also, renew the distribution pipe network.
8	Qalqilia (m)	In order to secure stable water distribution to developing districts, construct a new water reservoir (ground type). Also, lay a transmission main from the existing well to the water reservoir, and a distribution pipe connecting the new water reservoir to the existing distribution pipe network in the project service district.
9.	Azzun (m)	Carry out renewal of the existing distribution pipe network in those areas where renewal has not yet been carried out.
10	Ras Atiya (v)	Lay a water transmission main connecting the booster station (to be constructed by the UNDP) located close to the well to the water reservoir (elevated type). Also, renew the distribution pipe network.
11	Haris (v)	Construct a new water reservoir (elevated type) and lay a water transmission main from the intake point to the new reservoir. Also, renew the distribution pipe network.
12	Qibia (v)	Renew the distribution pipe network.
13	Kharbatha (v)	Renew the distribution pipe network.

Figure 2-3-1 shows a conceptual drawing of the Project water transmission and distribution system intended for the target municipalities and villages.

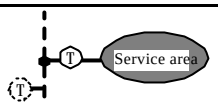
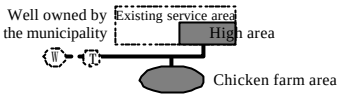
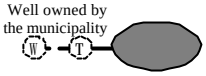
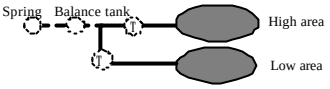
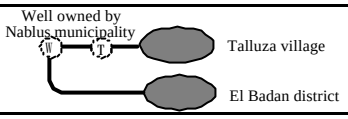
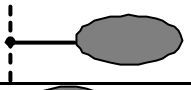
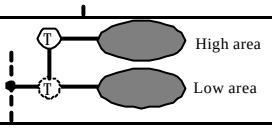
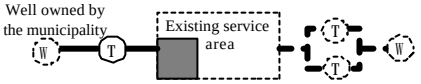
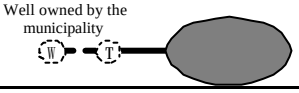
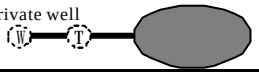
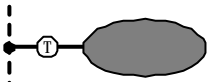
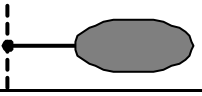
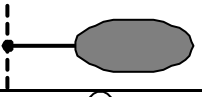
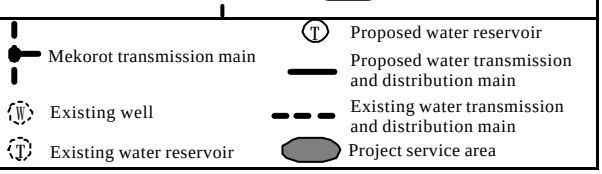
No.	Municipality & Village	Water Transmission and Distribution System
①	Aqqaba (v)	
②	Bala'a (m)	
③	Anabta (m)	
④	Sabastia (m)	
⑤	Talluza (v)	
⑥	Qusin (v)	
⑦	Qabalan (m)	
⑧	Qalqilia (m)	
⑨	Azzun (m)	
⑩	Ras Atiya (v)	
⑪	Haris (v)	
⑫	Qibia (v)	
⑬	Kharbatha (v)	
Legend		

Figure 2-3-1 Conceptual Drawing of the Project Water Transmission and Distribution System

(2) Design Service District

Facility planning under the Project consists of the renewal of deteriorated water transmission mains and distribution pipes and expansion of pipe lines to unserved areas in the target municipalities and villages apart from the municipalities of Anabta, Azzun, Qalqilia, and Bala'a. Accordingly, the design service districts in these municipalities and villages consist of already urbanized districts and areas where people are already living but which are not yet served by the water supply system.

Meanwhile, in the municipalities of Anabta and Azzun, since water supply facilities are being developed in partial districts by other aid agencies, the design service district will consist of the urban area not including these districts. In Qalqilia, southwestern districts where urbanization has been advancing in recent years will be the design service districts.

In Bala'a, construction of the public water supply system was carried out in the urban area in 1991, so the design service district will consist of the high area where water pressure is low and the poultry farming district in the east of the municipality, which is the center of poultry egg and meat production in the whole of Tulkarm. In consideration of this, when it comes to designing distribution pipes in Bala'a, in addition to domestic water supply it is necessary to consider water supply for poultry farming of 250 m^3/day.

As of 1998, the water distribution volume in Bala'a is 406m^3/d (17m^3/hr) and this volume accounts for 23% of the safety pumping volume of the well owned by Bala'a municipality. The design supply volume for the target year of 2005 for Bala'a totals up to 928 m^3/d (39 m^3/hr) with the domestic water supply of 678 m^3/d and the poultry farming water supply of 250 m^3/d. Since this volume accounts for 52% of the safety pumping volume of the well, there will be no difficulty for water distribution.

(3) Design Service Population and Design Supply Volume

Table 2-3-1 shows the design service population in each municipality and village in the Project target year, while Table 2-3-3 shows the design maximum daily water supply per person.

(4) Design Route

The design routes of water transmission mains and distribution pipes will be along public roads in each municipality and village. These routes are shown in Basic Design Drawings WBP-WL-01 through WBP-WL-14.

(5) Coordination with Existing Facilities

Since the Project involves the renewal and expansion of existing facilities, it is necessary to connect the Project facilities with existing water transmission and distribution pipes and water reservoirs. Coordination between the new and existing facilities was examined in detail based on the findings of the field survey. The results of this are shown in Basic Design Drawings WBP-WL-15 through WBP-WL-26.

(6) Examination of Pipe Network

1) Design Criteria

The design criteria needed to calculate the network of water transmission mains and distribution pipes will be the same as was described earlier in 2-3-2-1 (2) and (3).

2) Computation of the Pipe Network

The pipe network computation model and computation results for water transmission mains and distribution pipes in each municipality and village are as indicated in Appendix 5.

3) Pipe Extensions

As a result of calculating the pipe network, the lengths of water transmission main and distribution pipe to be extended according to pipe diameter in each municipality and village are as indicated in Table 2-3-7.

The length in the upper line shows the result of this basic design study and that in the lower line shows the length calculated from the latest planned drawings obtained from WBWD during the field survey.

Table 2-3-7 Water Transmission Main and Distribution Pipe Lengths for Each Diameter

(Unit: m)

Municipality and Village	Water Transmission Main			Distribution Pipe					Total
	100mm	150mm	250mm	50mm	75mm	100mm	150mm	200mm	
Aqqaba (v)	**0**	**0**	**0**	**6,459**	**1,665**	**1,487**	**0**	**0**	**9,701**
	0	0	0	6,210	1,830	1,460	0	0	9,500
Bala'a (m)	**0**	**0**	**0**	**1,173**	**2,734**	**1,023**	**0**	**0**	**4,930**
	0	0	0	1,150	2,660	1,000	0	0	4,810
Anabta (m)	**0**	**0**	**0**	**6,450**	**3,675**	**1,191**	**0**	**0**	**11,316**
	0	0	0	6,070	3,570	1,140	0	0	10,780
Sabastia (m)	**0**	**490**	**0**	**6,947**	**3,478**	**1,294**	**0**	**0**	**12,209**
	0	600	0	4,290	3,910	2,830	600	0	12,230
Talluza (v)	**0**	**2,760**	**0**	**5,503**	**3,130**	**400**	**0**	**0**	**11,793**
	0	2,700	0	3,710	4,310	410	0	0	11,130
El Badan area	**0**	**0**	**0**	**12,737**	**0**	**4,641**	**0**	**0**	**17,378**
	0	0	0	3,950	1,130	2,760	0	0	7,840
Qusin (v)	**0**	**0**	**0**	**4,649**	**881**	**613**	**716**	**0**	**6,859**
	0	0	0	3,680	1,220	1,020	705	0	6,625
Qabalan (m)	**0**	**3,340**	**0**	**6,058**	**1,792**	**772**	**0**	**0**	**11,962**
	0	4,000	0	6,010	2,000	0	0	0	12,010
Qalqilia (m)	**0**	**0**	**1,303**	**0**	**0**	**223**	**0**	**1,371**	**2,897**
	0	0	1,300	0	0	0	0	1,600	2,900
Azzun (m)	**0**	**0**	**0**	**6,880**	**4,194**	**1,253**	**116**	**119**	**12,562**
	0	0	0	6,686	3,836	1,430	160	120	12,232
Ras Atiya (v)	**0**	**710**	**0**	**2,106**	**709**	**210**	**0**	**0**	**3,735**
	0	750	0	1,930	790	400	0	0	3,870
Haris (v)	**1,350**	**0**	**0**	**4,206**	**1,547**	**632**	**0**	**0**	**7,735**
	1,430	0	0	4,170	1,535	465	0	0	7,600
Qibia (v)	**0**	**0**	**0**	**8,936**	**2,673**	**927**	**150**	**0**	**12,686**
	0	0	0	8,910	2,530	940	130	0	12,510
Kharbatha (v)	**0**	**0**	**0**	**3,977**	**1,327**	**793**	**0**	**0**	**6,097**
	0	0	0	4,030	1,070	800	0	0	5,900
Total	**1,350**	**7,300**	**1,303**	**76,171**	**27,805**	**15,459**	**982**	**1,490**	**131,860**
	1,430	8,050	1,300	60,796	30,391	14,655	1,595	1,720	119,937

(7) Consideration of House Connections

Following completion of distribution pipe installation works by the Japanese side, in order to expedite works by the Palestinian side to reconnect service pipes to new distribution pipes, consideration will be given to the installation of secondary distribution pipes as indicated in Figure 2-3-2.

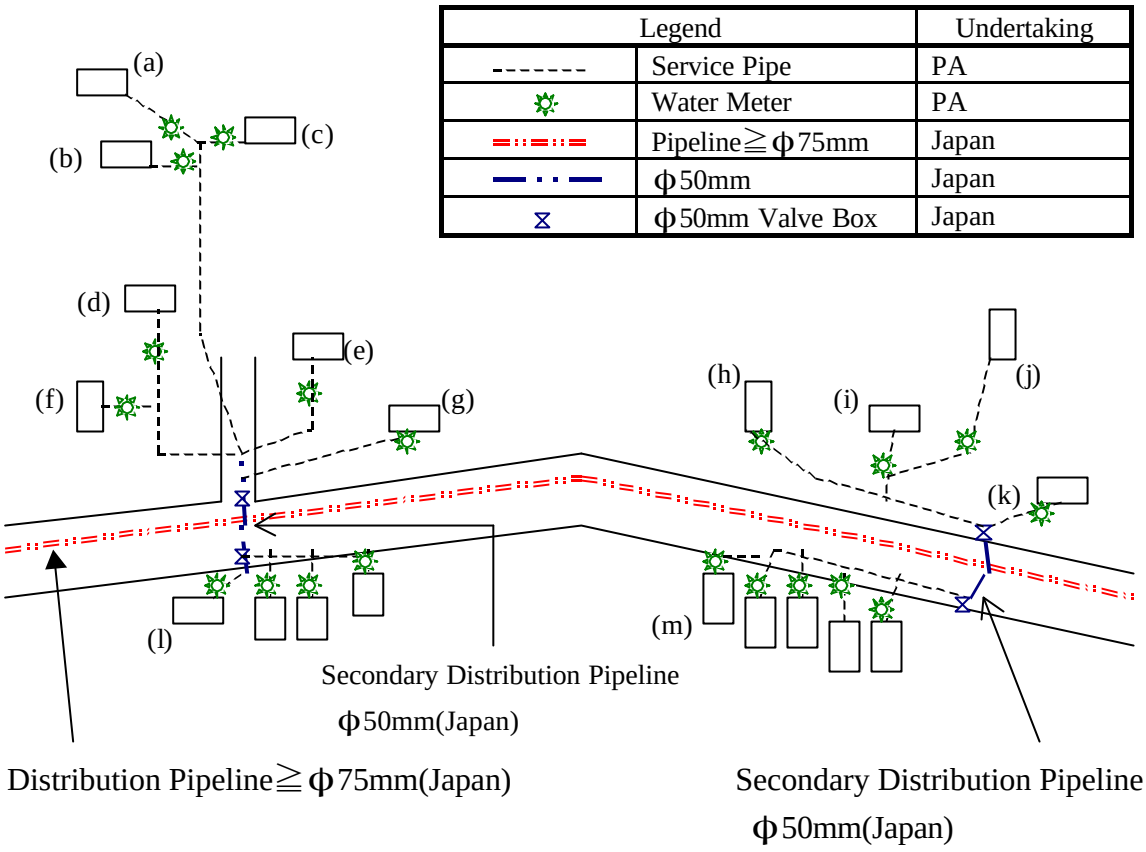


Figure 2-3-2 Installation of Secondary Distribution Pipes for Promotion of Household Connections

1) Secondary Distribution Pipe Branching to Promote Service Pipe Reconnections

Distribution pipes with a diameter of 75 mm or more are installed in residential districts where the level of concentration is high even by urban area standards and, since large numbers of residents are served by such pipes, it is thought that a widespread impact will be expected in cases where water supply is cut off through controlling distribution pipe sluice valves when reconnecting service pipes. In order to avoid this situation, the works to be executed by the Japanese side will include the installation of secondary distribution pipes (branching off from original distribution pipes) and sluice valves installed alongside roads for connecting to service pipes.

See Figure 2-3-3 for a detailed drawing of the secondary distribution pipe branching method.

2) Secondary Distribution Pipe Branch Sites

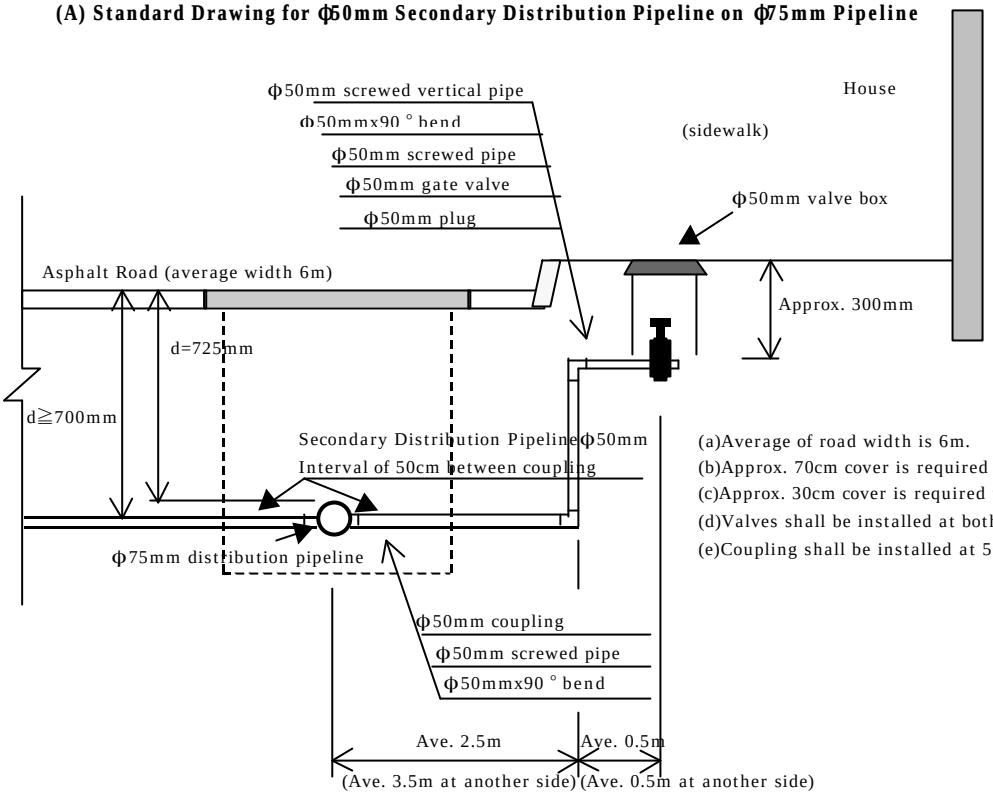
Secondary distribution pipe branch sites and intervals between branches, etc. will be as indicated below. Incidentally, the earth covering of secondary distribution pipes that cross roads will be designed so that the standard earth covering is retained.

① Branches will be placed at each intersection (roughly 50 m on average) or at 50 m intervals covering the central urbanized areas of each municipality and village.

② In areas where houses are sparsely distributed and so on, branches will be placed at intervals of less than 100 m.

The number of such branches amounts to approximately 411 sites (around 30 sites per municipality and village), but it is thought that this work can be implemented during the works period if included in the Japanese scope of work. Moreover, concerning the positioning of branches, this will be determined in the detailed design stage.

(A) Standard Drawing for φ50mm Secondary Distribution Pipeline on φ75mm Pipeline



(B) Standard Drawing for φ50mm Secondary Distribution Pipeline on the Pipeline (≧100mm)

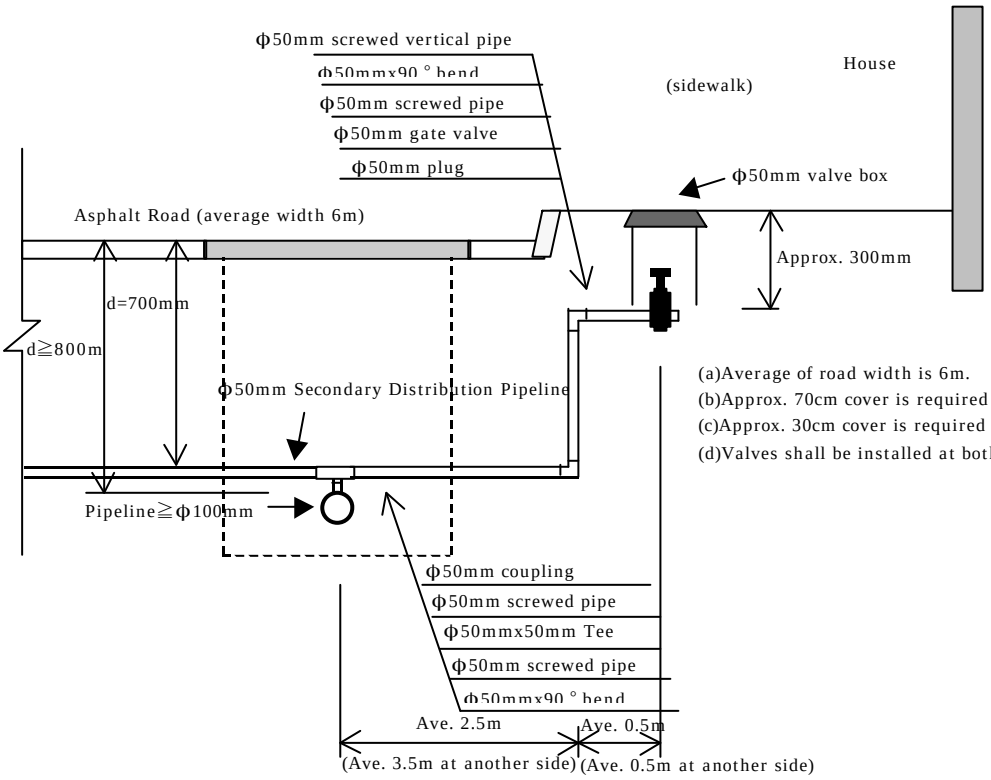


Figure 2-3-3 Secondary Distribution Pipe Branching Method.

(8) Selection of Pipe Type

Water transmission mains and distribution pipes for the Project consist of six pipe diameters, i.e. 50 mm, 75 mm, 100 mm, 150 mm, 200 mm, and 250 mm. In view of past experience on the West Bank, the pipe types indicated in Table 2-3-8 will be considered for use in the Project.

Table 2-3-8 Pipe Types to be Considered for Water Transmission Mains and Distribution Pipes

Pipe Diameter	Pipe Type	Specifications
75 mm or more	Welding steel pipe	Inner cement lining, outer polyethylene coating
	Ductile cast iron pipe	Inner cement lining
50 mm or less	Galvanized steel pipe	Outer galvanized coating
	PVC pipe	

1) Water Transmission Mains and Distribution Pipes of Diameter 75 mm or More (3 inch)

The water transmission mains and distribution pipes of diameter 75 mm or more to be used in the Project will be the same type as those currently used, i.e. welding steel, for the following reasons.

① welding steel pipe is used in all existing water transmission mains and distribution pipes in the 13 target municipalities and villages. The main reason for this is thought to be the fact that all 13 municipalities and villages are located on hilly ground and water pressure at transmission starting points is extremely high. Maximum design pressure is 8.0 kg/cm^2, and pressure-reducing valves are installed in cases where this figure is exceeded. In cases of high water pressure such as these, welding steel pipes offer greater protection against water leaks than ductile cast iron pipes with flexible joints.

② Since new pipes will be connected to existing pipes in each municipality and village, adopting piping that complies with existing inch standards will prove less problematic when carrying out maintenance in the future.

③ Introduction of ductile cast iron pipes has been started in West Bank districts through the activities of other aid agencies, however, local plumbers and welders are more used to conventional pipes, which also happen to be easier to procure.

2) Distribution Pipes of Diameter 50 mm or Less (2 inch)

As for pipes with a diameter of 50 mm or less, it is possible to use either steel pipes or PVC pipes. However, in view of the above mentioned high water pressure and the fact that existing pipes are made from galvanized steel, it is considered appropriate to also use galvanized steel pipes for the purposes of the Project.

(9) Auxiliary Equipment Plan

Auxiliary equipment such as gate valves, air valves, and wash-out valves, etc. will be planned in the manner described below in accordance with conditions of application in existing facilities and waterworks execution standards.

1) Gate Valves

Gate valves will be installed at branches from the intake points of water transmission mains, the branches of distribution pipes, and at the tie-in points of secondary distribution pipes and house connection service pipes.

The main specifications are as given below.

①	Material	: cast iron
②	Joining method	: flange nut and bolt when diameter is 75 mm or more; screw joint when 50 mm or less
③	Valve chamber	: reinforced concrete when diameter is 75 mm or more; valve box when 50 mm or less

2) Pressure-reducing Valves

In cases where there are sections or districts within the pipe network where in-pipe water pressure far exceeds the design water pressure (8.0 kg/cm^2), pressure-reducing valves are installed on distribution pipes in order to reduce and adjust water pressure to below the design value. It is possible to set the range of pressure reduction, however, reduction is always carried out according to the set range regardless of the upstream water pressure level.

The main specifications are as given below.

①	Material	: cast iron
②	Joining method	: flange nut and bolt
③	Valve chamber	: reinforced concrete

3) Pressure Relief Valves

In cases where there are sections or districts within the pipe network where in-pipe water pressure far exceeds the design water pressure (8.0 kg/cm^2), pressure relief valves are installed on distribution pipes in order to automatically release pressure and thus maintain pressure at a set level at times when pressure on the upstream side reaches the set pressure level.

The main specifications are as given below.

① Material : cast iron
② Joining method : flange nut and bolt
③ Valve chamber : reinforced concrete

4) Pressure-sustaining Valve

In Sabastia, water is transmitted from the UNDP pumping station to the existing water reservoir on high ground, however, the water transmission main to this branches off along its route and also conveys water to the existing water reservoir on low ground.

Water is first conveyed to the high water reservoir in this system, however, when this becomes full float valves prevent further inflow and water pressure rises in the water transmission main. The pressure-sensitive valve in the water transmission main to the low water reservoir detects this rise in water pressure and opens, thus allowing water to be conveyed to the low water reservoir.

When the water level in the high water reservoir goes down and water conveyance is started again, water pressure in the water transmission main to the low water reservoir falls and the pressure-sensitive valve closes, thus stopping the conveyance of water to the low water reservoir.

The main specifications are as given below.

① Material : cast iron
② Joining method : flange nut and bolt
③ Valve chamber : reinforced concrete

5) Check Valves

Check valves, which are used to prevent back flows, will be installed at connections between Project water transmission mains and distribution pipes and existing pipes at intake sites. Check valves are installed in tandem with gate valves and float valves, etc.

The main specifications are as given below.

① Material : cast iron
② Joining method : flange nut and bolt
③ Valve chamber : reinforced concrete

6) Float Valves

When a float, which is placed on the surface of a water reservoir and moves up and down in accordance with water level, reaches the set height (maximum water level), the valve installed on the inflow pipe to the reservoir operates to prevent any more water from entering.

The main specifications are as given below.

① Material : cast iron
② Joining method : flange nut and bolt
③ Valve chamber : reinforced concrete

7) Single Air Valves

Air valves are installed on convex sections of water transmission mains and distribution pipes and at relatively high points of water transmission mains on the upstream side of water reservoirs.

The main specifications are as given below.

① Material : cast iron
② Joining method : 25 mm screw joint
③ Valve chamber : reinforced concrete when installed on pipes in the ground

8) Compound Air Valves

Compound air valves are used in water transmission mains and distribution pipes where water pressure is high. Single air valves incorporate 50 mm ventilation openings.

The main specifications are as given below.

①	Material	: cast iron
②	Joining method	: flange nut and bolt
③	Valve chamber	: reinforced concrete when installed on pipes in the ground

9) Wash-out Valves

Wash-out valves, which are installed on concave parts of pipes and on low pipe sections, are composed of sluice valves and short pipes with flanges (screw joints in the case of 50 mm pipes).

The main specifications are as given below.

①	Type	: sluice valve
②	Diameter	: same diameter as pipeline
③	Joining method	: flange nut and bolt when diameter is 75 mm or more; screw joint when 50 mm or less
④	Wash-out method	: Installed on low sections of pipes. Spring cover shall be installed at the short pipe discharge mouth to prevent scouring around the apron by giving protection with wet masonry.

10) Protection of Fittings

Since welded steel pipes and galvanized steel pipes joined by screw use common pipelines and uneven forces resulting from internal pressure are absorbed by the pipe strength, consideration will not be given to protection for fittings.

(10) Execution Method

The municipality and village roads along which water transmission mains and distribution pipes are to be laid range between 3-8 m in width. The width of excavation for pipe installation will vary depending on the pipe diameter but will range between 40-75 cm, while the depth of excavation will range between 85-125 cm.

The first 30 cm from the surface consists of road surface course and subbase course, while ground beneath that consists of limestone. Accordingly, open cutting will be performed when laying pipes and, since the excavated ground will be self-supporting, it will not be necessary to consider sheathing work.

Standard cross sections of pipe installation are given in Basic Design Drawings WBP-WL-22 and WBP-WL-23.

2-3-2-3 Plan of Water Reservoir

(1) Examination of Capacity

Water reservoirs are storage reservoirs designed to receive water from water wells and the Mekorot water transmission main and distribute this water according to demand in the design service districts. In terms of functions, water reservoirs adjust fluctuations in the water demand volume and mitigate effects on water supply at times of abnormal conditions.

Table 2-3-9 indicates the municipalities and villages where water reservoirs are planned and also gives the capacity of each reservoir.

Table 2-3-9 Capacity of Water Reservoirs for the Project

Municipality and Village	Design Reservoir Capacity (m^3)
Aqqaba (v)	300
Qabalan (m)	200
Qalqilia (m)	2,000
Haris (v)	300

The standard capacity of a water reservoir is given as 8-12 hours of the design daily maximum water supply volume, or between 9-20 hours in cases of small water supply systems serving less than 5,000 people.

Since water reservoirs contribute to the overall distribution pipe network, when examining capacity, it is necessary to carry out comprehensive examination that incorporates the capacity of existing water reservoirs in addition to the water reservoirs for the Project.

The storage capacity of the above four water reservoirs for the Project combined with that of existing water reservoirs is as indicated in Table 2-3-10.

Table 2-3-10 Water Reservoir Capacity in Target Municipalities and Villages

(Unit: m^3)

Municipality and Village	Existing Water Reservoir	Water Reservoir for the Project	Overall Water Reservoir Capacity
Aqqaba (v)	100	300	400
Qabalan (m)	200	200	400
Qalqilia (m)	600	2,000	2,600
Haris (v)	0	300	300

The following expression will be used to calculate how many hour's worth of the design daily maximum water supply volume is available in each water reservoir.

Proportion of design daily maximum water supply volume (hr) =

$$\frac{\text{Overall water reservoir capacity}}{\text{Population} \times \text{Design daily maximum water supply volume per person}} \times 24$$

The results of calculating the capacity of each water reservoir according to this expression are as indicated in Table 2-3-11.

Table 2-3-11 Results of Examining Capacity of Water Reservoirs

Municipality and Village	Overall Water Reservoir Capacity (m^3)	Design Daily Maximum Water Supply Volume (m^3)	Proportion of Design Daily Maximum Water Supply Volume (hr)
Aqqaba (v)	400	807	11.9
Qabalan (m)	400	984	9.8
Qalqilia (m)	2,600	8,247	7.6
Haris (v)	300	405	17.8

According to the above, the capacity of the water reservoirs in Aqqaba, Qabalan and Qalqilia is equivalent to between 7.6 and 11.9 hours of the design daily maximum water supply volume and can thus be more or less described as standard.

In Haris Village, on the other hand, the water reservoir capacity is equivalent to 17.8 hours of the design daily maximum water supply volume. However, since the population of this village is small at approximately 2,900 people and hourly fluctuations in the distribution volume may be larger than in the other three municipalities and villages, a large water reservoir capacity is required and the above value is thus considered to be appropriate.

(2) Structural Type and Form

Two types of water reservoir, i.e. ground water reservoirs and elevated water tanks, are available. In the case of Aqqaba, Bala'a and Qalqilia, ground water tanks will be adopted because the reservoirs will be located on high ground where water supply pressure can be secured. In Haris Village, on the other hand, although the reservoir will be placed on high ground, since the water supply pressure at the terminal distribution network will still be insufficient, an elevated water tank will be adopted.

As for type of structure, reinforced concrete structure will be adopted since this is common on the West Bank and local contractors are used to this type.

Regarding shape, round or rectangular reservoirs can be considered. However, since the standard practice in Palestine is to adopt round reservoirs for ground types and rectangular reservoirs for elevated water tanks, this standard will be adhered to. Therefore, the structure and shape of the water reservoirs in each municipality and village will be as indicated in Table 2-3-12.

Table 2-3-12 Type and Shape of Water Reservoirs

Village and Municipality	Type of Water Reservoir	Type of Structure	Shape
Aqqaba (v)	Ground type	Reinforced concrete	Round
Qabalan (m)	Ground type	Reinforced concrete	Round
Qalqilia (m)	Ground type	Reinforced concrete	Round
Haris (v)	Elevated water tank	Reinforced concrete	Rectangular

(3) Foundation Type

All the water reservoirs will be built on hilly ground. Concerning geological conditions in this area, the site survey found that a limestone strata exists from 30-50 cm below the surface and that firm bearing ground can be obtained. According to existing geological data, the allowable bearing capacity of soil in similar districts is 19.2-23.0 t/m^2 and the

ground pressure of water reservoirs is around 10 t/m^2. Accordingly, spread foundations should be sufficient.

Furthermore, in the limestone districts, since it is thought that hollows caused by erosion may exist, mat foundations will be adopted because these allow load to be distributed. Moreover, when excavating foundations, it will be necessary to sufficiently survey the excavation faces to confirm whether or not hollows exist. In cases where hollows are found, it will be necessary to take measures such as filling in with leveling concrete, etc.

(4) Landscaping (in-site roads, etc.)

In order to smoothly operate water reservoir inflow and outflow valves and carry out regular inspections, i.e. carry out operation and maintenance, reservoir sites will be paved with asphalt and paving will be given lateral slant in consideration of stormwater drainage.

(5) Design of Water Reservoirs

Structural computation of the water reservoirs was performed in accordance with the aforementioned design criteria. The design criteria used in the structural computation are as indicated in Table 2-3-13.

Layout drawings and structural drawings of the water reservoirs are shown in Basic Design Drawings WBP-WR-01 through WBP-WR-10

Table 2-3-13 Water Reservoir Design Criteria

Item	Unit	Design Criteria			
		Aqqaba (v)	Qabalan (m)	Qalqilia (m)	Haris (v)
Live load (roof)	kg/m^2	100	100	100	100
Wind load	kg/m^2	82	76	110	241
Dead load	kg/m^2	Concrete dead load			
Load combinations		Case 1 (normal times): dead load + water pressure + live load Case 2 (full reservoir): dead load + water pressure + live load + wind load Case 3 (full reservoir): dead load + water pressure + live load + seismic load Case 4 (empty reservoir):dead load + live load + wind load Case 5 (empty reservoir):dead load + live load + seismic load			
Concrete design criteria strength	kg/m^2	300	300	300	300
Allowable bearing capacity of soil	t/m^2	20	20	20	20

2-3-2-4 Procurement Plan of Piping Materials for Promoting House Connection

(1) Scope of Procurement of Piping Materials for Promoting House Connection

In order to expedite the service pipe reconnection works, it is necessary for service pipe works from the T-pipes (for service pipe branching) attached to distribution pipes up to the sluice valves installed on roadsides to be smoothly implemented as part of the scope of work of the Japanese side.

Distribution pipes of 50 mm diameter account for around 60% of the total piping extension, and the number of sites where T-pipes are installed is massive at approximately 4,200 (approximately 350 per municipality and village). As a result, it is judged that it will be impossible to complete piping between T-pipes and sluice valves if this is included in the scope of works of the Japanese side. Therefore, this will not be included in the Japanese side works, but piping materials for connecting the T-pipes to sluice valves (approximately 6 m) will be procured by the Japanese side. Moreover, the T-pipe installation positions will be decided in the detailed design.

Figure 2-3-4 shows the scope of procurement of piping materials for promoting house connections.

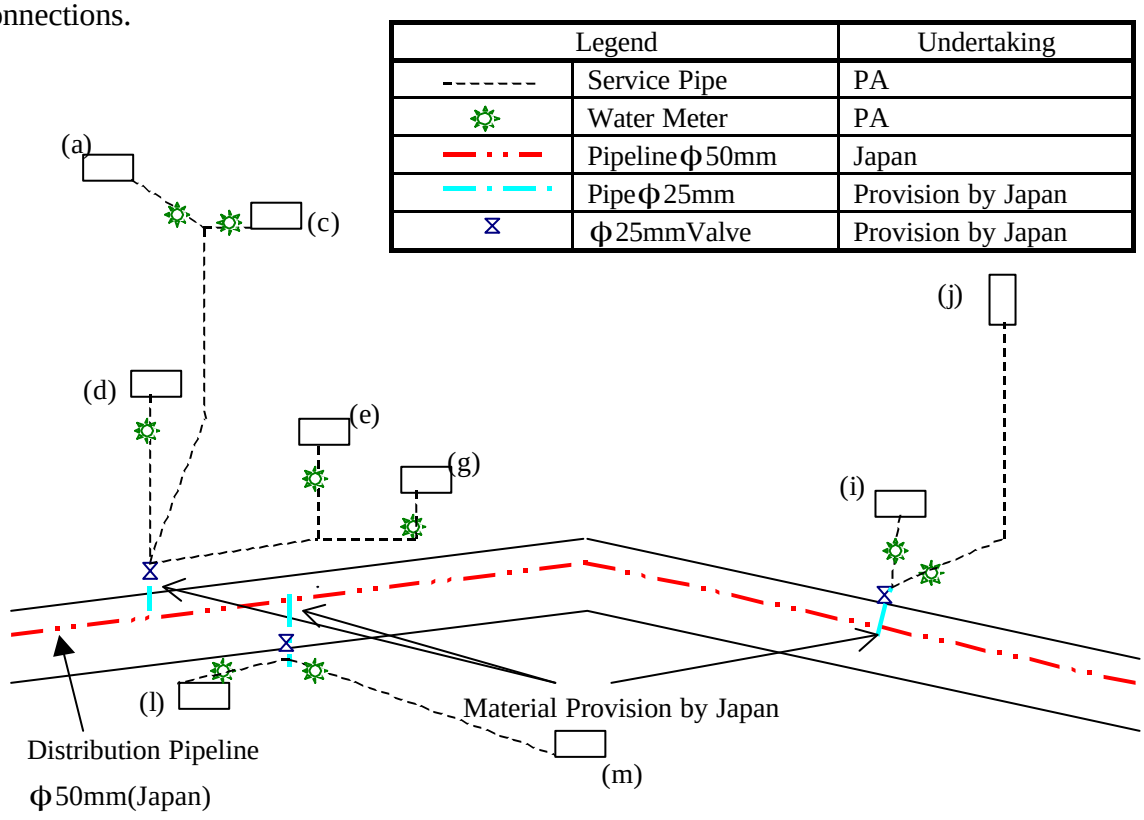


Figure 2-3-4 Scope of Procurement of Piping Materials for Promoting House Connection

(2) T-pipe Installation Sites

The general format of T-pipe installation together with the installation sites and intervals between installations, etc. are as described below.

① The standard installation interval will be 12 m (two pipe's worth). T-pipes of 50 x 25 mm will be placed facing up and will be fixed with plugs.

② In districts where houses are dispersed, T-pipes will be installed at points near houses.

③ In consideration of future urbanization, intervals between T-pipes will be 100 m or less even in districts where houses are thinly scattered.

The amount of piping materials to be supplied per T-pipe is as indicated in Table 2-3-14.

Table 2-3-14 Amount of Piping Materials to be Supplied per T-pipe

Item	Quantity
25 mm curved pipe (90 degree)	1
25 mm galvanized steel pipe (6 m)	1
25 mm socket	1
25 mm sluice valve	1

2-3-2-5 Basic Design Drawings

The basic design drawings for the Project facilities are as indicated in Annex-7 attached.

CHAPTER 3

IMPLEMENTATION PLAN

CHAPTER 3 IMPLEMENTATION PLAN

3-1 Implementation Plan

3-1-1 Implementation Concept

The Project will be implemented in accordance with the framework of the Grant Aid Scheme of the Government of Japan. Accordingly, the Project will only be implemented after approval is given by the Government of Japan for implementation of the Project and the subsequent exchange of notes (E/N) is carried out by the Government of Japan and the PA.

The basic issues and special points to note regarding the implementation of the Project are described below.

(1) Project Implementation Body

The implementation body for the Project on the Palestinian side is the PWA, but the WBWD will give advice on technical points, and the MOLG will be responsible for supervising and instructing each municipality and village.

The notes exchanged between the Government of Japan and the PA will become effective following official ratification. To ensure that the Project is implemented smoothly, it is necessary for the PWA to maintain close communications and hold consultations with the Japanese Consultant and Contractor in cooperation with the WBWD and MOLG.

(2) Consultant

For the construction of facilities and procurement of equipment and materials to be conducted under the Project, a Japanese Consultant will conclude a design and supervision agreement with the Palestinian side to conduct the detailed design and work supervision.

The same Consultant will prepare the tender documents and will also conduct the prequalification and evaluation of bids on behalf of the Project implementation body (PWA).

(3) Contractor

The Japanese Contractor, selected through open tender by the Palestinian side in accordance with the framework of the Grant Aid Scheme of the Government of Japan, will conduct the construction of the facilities and procurement of the equipment and materials planned under the Project.

As the Contractor is expected to provide after-service, including the supply of spare parts and arrangement of repair work, etc., following the completion of the Project, it must carefully consider the post-Project liaison arrangements with the local side.

Given the use of locally procured equipment and materials and the fact that water transmission main and distribution pipe laying works (involving rock excavation) and water reservoir construction works must be implemented in 13 municipalities and villages within a very tight schedule, the Contractor must have a sound understanding of the local natural and socioeconomic conditions, construction market, labor situation, and labor laws, etc.

(4) Necessity to Dispatch Japanese Engineers

As a rule, local specifications and construction methods will be adopted for the purposes of the Project, and works will be executed in accordance with local technical specifications and methods. Having said that, regarding scaffolding and form support works, timber is normally used locally, however, not only does experience show that this is unreliable in terms of safety when carrying out assembly, but it makes it difficult to finely adjust and control height when placing concrete. Accordingly, since it is judged that the local methods for scaffolding and form support works are inappropriate in terms of safety control and quality control, prefabricated and round pipe scaffolding which is commonly used in Japan will be adopted.

Since prefabricated and round pipe scaffolding and form supports are not common in Palestine and difficulty exists in securing skilled workers accustomed to handling these, it will be necessary to dispatch skilled workers to provide guidance and conduct work.

3-1-2 Points to Note Regarding Construction Work

The Project construction works are composed of the laying of water transmission mains and distribution pipes and construction of water reservoirs in 13 municipalities and villages on the West Bank. The following points should be noted in consideration of the facts that the water transmission main and distribution pipe laying work will entail excavation of rock and utilization of existing mains and pipes, and that the work will be implemented with grant aid provided by the Government of Japan.

(1) Local residents should be encouraged to understand the contents of the work in view of obtaining their cooperation, and particular attention should be paid to preventing accidents involving local residents due to the work.

(2) Careful attention should be paid to the selection of the construction methods and construction machinery to minimize/prevent harm to local residents and their homes, etc., including noise, vibration and building damage.

(3) Given the existence of many underground structures (sewer lines, sewage tanks, telephone cables, etc.), careful attention should be paid to preserving their functions and preventing their damage.

(4) Careful attention should be paid to ensuring the safe passage of pedestrians and road traffic through the work sections.

3-1-3 Scope of Works

Table 3-1-1 shows the scope of works to be borne by the Japanese side and the Palestinian side.

Table 3-1-1 Scope of Works

Work Area	Japanese side	Palestinian side	Remarks
1. Laying of water transmission mains and distribution pipes			
• Laying of water transmission mains and distribution pipes	○		
• Laying of secondary distribution pipes (diameter 75 mm or more)	○		Give consideration to reconnection of service pipes
2. Construction of water reservoirs			
• Site acquisition and preparation		○	
• Construction of access roads		○	
• Construction of water reservoirs	○		
• In-site road and paving works	○		
• Perimeter fencing and gates		○	
3. Service pipe reconnection works			
• Partial procurement of piping materials for service pipe connections	○		Piping from T-pipes of 50 mm distribution pipes to roadside sluice valves
• Installation of supplied piping materials		○	
• Home connections		○	Service pipe connections from roadside sluice valves to houses

3-1-4 Work Supervision Plan

In accordance with the Grant Aid Scheme of the Government of Japan and based on the purport of the basic design, the Consultant will organize a project team which will consistently work through the detailed design and work supervision stages of the Project for the smooth implementation of work. At the work supervision stage, the Consultant will dispatch the following on-site supervisors, who possess technical capability suited to the Project work, in accordance with the construction schedule for the purposes of schedule control, quality control, and safety control.

- Pipe laying work supervisor and site manager : one (full-time)
- Pipe laying work and reservoir construction work supervisor : one (full-time)

In addition, experts belonging to the Consultant will be involved in the factory inspection and pre-delivery inspection of the equipment and materials to be manufactured in Japan or third countries, so as to preclude any problems occurring in such equipment and materials following their delivery to Palestine.

(1) Basic Principles of Work Supervision

The Consultant will supervise the work progress to ensure the completion of the facilities construction work envisaged under the Project within the predetermined time limit and will also supervise and guide the Contractor in order to safely and fully achieve the work quality stipulated in the contract documents. The key points of this supervision are described below.

1) Schedule Control

The Consultant will compare the planned work schedule submitted by the Contractor at the time of signing the agreement with the actual progress on a weekly and monthly basis. If the Consultant believes that a delay is likely to occur, he will issue a warning to the Contractor, requesting the submission of improvement measures so that the work in question can be completed on schedule.

1. Confirmation of the completed work
2. Confirmation of the delivery of equipment and materials
3. Confirmation of the actual number of engineers, technicians, and workers, etc. and their proportion vis-à-vis the originally planned manpower level

2) Quality Control

The Consultant will conduct the following actions to check whether or not the Contractor is achieving the quality standards of the facilities and equipment stipulated in the contract documents (technical specifications and detailed design drawings, etc.). If the Consultant believes that the required quality may be compromised, he will ask the Contractor to make corrections, revisions, or modifications.

1. Checking of shop drawings and equipment specifications
2. Checking of equipment and materials factory inspection results or attendance at the factory inspections
3. Checking of equipment installation manuals, on-site trial operation, adjustment and inspection manuals, and working drawings
4. Supervision of site installation work of equipment and attendance at the trial operation, adjustment and inspection
5. Checking of the working drawings for the facilities
6. Checking of the site progress of facilities with working drawings

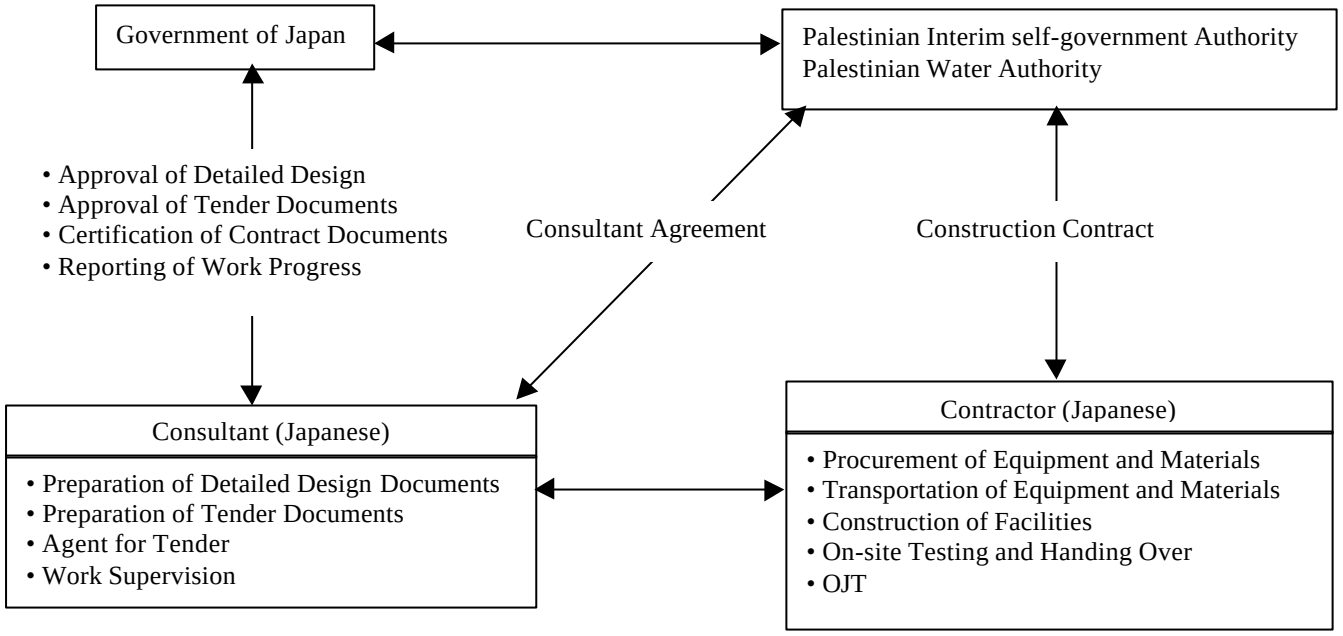
3) Safety Control

The Consultant will consult and cooperate with the project manager of the Contractor with a view to supervising the construction work in order to avoid any accidents or disasters. The key points of on-site safety control are listed below.

1. Establishment of safety control rules and selection of a safety manager
2. Prevention of disasters through regular inspection of construction machinery
3. Compilation of travel routes for work-related vehicles and construction machinery, and the thorough enforcement of slow driving
4. Introduction of worker welfare measures and the strict enforcement of days off

(2) Project Implementation System

The Project implementation system, incorporating all parties of the Project and including the work supervision stage, is shown in Figure 3-1-1.



Note: Both the consultancy agreement and construction agreement must be certified by the Government of Japan.

Figure 3-1-1 Project Implementation System

(3) Work Supervisors

The Contractor will employ local engineers and technicians by means of either direct contract or subcontracting to a local construction company to complete the equipment procurement and construction work within the time limit set forth in the construction agreement. It will be necessary for the Contractor to dispatch engineers with overseas experience of work similar to the expected work under the Project to Palestine to ensure strict schedule control, quality control, and safety control with the local engineers and technicians employed directly or by the subcontractor.

Given the scope and the contents of the Project, the Contractor will be required to dispatch the following numbers and types of work supervisors.

Site representative (full time):	(one) consultation and coordination with Project-related organizations; acquisition of the necessary approval, etc.
Chief administrator (full time):	(one) labor control, equipment and materials procurement
Senior supervisor (full time):	(one) guidance and control of the entire work
Piping work engineer (full time):	(one) guidance and control of the water transmission main and distribution pipe and water reservoir works

3-1-5 Procurement Plan

(1) Procurement Sources and Equipment and Materials

Conditions regarding the procurement of equipment and materials to be used in the Project construction works are as indicated below. Equipment and materials will be procured in Palestine where possible provided that they meet the set specifications, quality, delivery period, and price, etc. Items that cannot be procured in Palestine will be procured in Japan or a third country.

1) General construction materials such as cement, sand, gravel, reinforcing bars, roadbed, and wood form materials, etc. are readily available in Palestine and can be procured through local works contractors and dealers.

2) As the piping materials for the Project, welding steel pipe will be used for piping with a diameter of 75 mm or more, and screw-connected galvanized steel pipe will be used for piping with a diameter of 50 mm or less. Although these piping materials are not produced in Palestine, imported materials mainly from Israel are widely available through local dealers and so on. Accordingly piping materials made in Israel but procured locally in Palestine will be used for the purposes of the Project. However, given that only two companies in Israel make the water piping in question, it is possible that a monopoly exists and sufficient price competition is not practiced and that supply to the West Bank may be cut off in the event of unforeseen situations. Therefore, as procurement sources for piping materials, countries in Europe and so on will also be considered in addition to Israel and Japan.

Based on consideration of the above points, the procurement classifications of main Project equipment and materials are as indicated in Table 3-1-2.

Table 3-1-2 Division of Procurement of Main Equipment and Materials

Equipment/Material	Palestine	Japan/Third Country	remarks
• Concrete aggregate (sand, gravel)	○		
• Ready-mixed concrete	○		
• Cement1	○		
• Reinforcing bars	○		
• Wooden forms	○		
• Roadbed materials	○		Road rehabilitation
• Welding steel pipe (diameter 75 mm or more)	○	△	Water transmission mains and distribution pipes
• Galvanized steel pipe (diameter 50 mm or less)	○	△	Distribution pipes
• Fittings and valves	○	△	Water transmission mains and distribution pipes

Note: ○ takes preference over △ as a procurement source.

(2) Transportation

Items to be transported from Japan to Palestine are temporary installation materials such as prefabricated and round pipe scaffolding, and form supports, etc. Since there are no regular services between Japan and Palestine (and Israel) and it would be uneconomic to charter a special service in view of the small quantities concerned, it will be necessary to transport the materials to a port in Israel (Ashdod) after reloading at a port in a Mediterranean country.

After the materials pass through customs clearance procedures at Ashdod Port, they will be transported overland to the stock yard in Palestine.

3-1-6 Implementation Schedule

After implementation of the Project is approved by the Government of Japan, the E/N will be exchanged between the Government of Japan and the PA and construction will begin. This will largely be divided into three stages: 1) detailed design and preparation of tender documents, 2) tender and signing of the construction agreement, and 3) construction of facilities and procurement of equipment and materials.

The components of the Project are the laying of water transmission mains and distribution pipes, construction of water reservoirs, and provision of house connection piping. Table 3-1-3 shows the Project implementation contents.

Table 3-1-3 Project Implementation Contents

Target Municipality and Village	Project Contents		
	Transmission Main and Distribution Pipe Laying	Water Reservoir Construction	Provision of House Connection Piping (sites)
Aqqaba (v)	Distribution pipe: 50-100 mm x 9,710 m	Ground type 300 m^3 x 1	363
Bala'a (m)	Distribution pipe: 50-100 mm x 4,930 m		65
Anabta (m)	Distribution pipe: 50-100 mm x 11,316 m		358
Sabastia (m)	Transmission main: 150 mm x 490 m Distribution pipe: 50-100 mm x 11,719 m		360
Talluza (v)	Transmission main: 150 mm x 2.760 m Distribution pipe: 50-100 mm x 9,033 m		305
(El Badan area)	Distribution pipe: 50-100 mm x 17,378 m		707
Qusin (v)	Distribution pipe: 50-100 mm x 6,859 m		258
Qabalan (m)		Ground type 200 m^3 x 1	336
Qalqilia (m)	Transmission main: 200-250 mm x 2,674 m Distribution pipe: 100 mm x 223 m	Ground type 2,000 m^3 x 1	
Azzun (m)	Distribution pipe: 50-200 mm x 12,562 m		382
Ras Atiya (v)	Transmission main: 150 mm x 710 m Distribution pipe: 50-100 mm x 3,025 m		117
Haris (v)	Transmission main: 100 mm x 1,350 m Distribution pipe: 50-100 mm x 6,385 m	Elevated tank 300 m^3 x 1	233
Qibia (v)	Distribution pipe: 50-150 mm x 12,686 m		496
Kharbatha (v)	Distribution pipe: 50-100 mm x 6,097 m		220

Incidentally, a breakdown of the piping materials required to promote house connections (one site) is as indicated in Table 2-3-3.

Figure 3-1-2 shows the work implementation schedule of the Project.

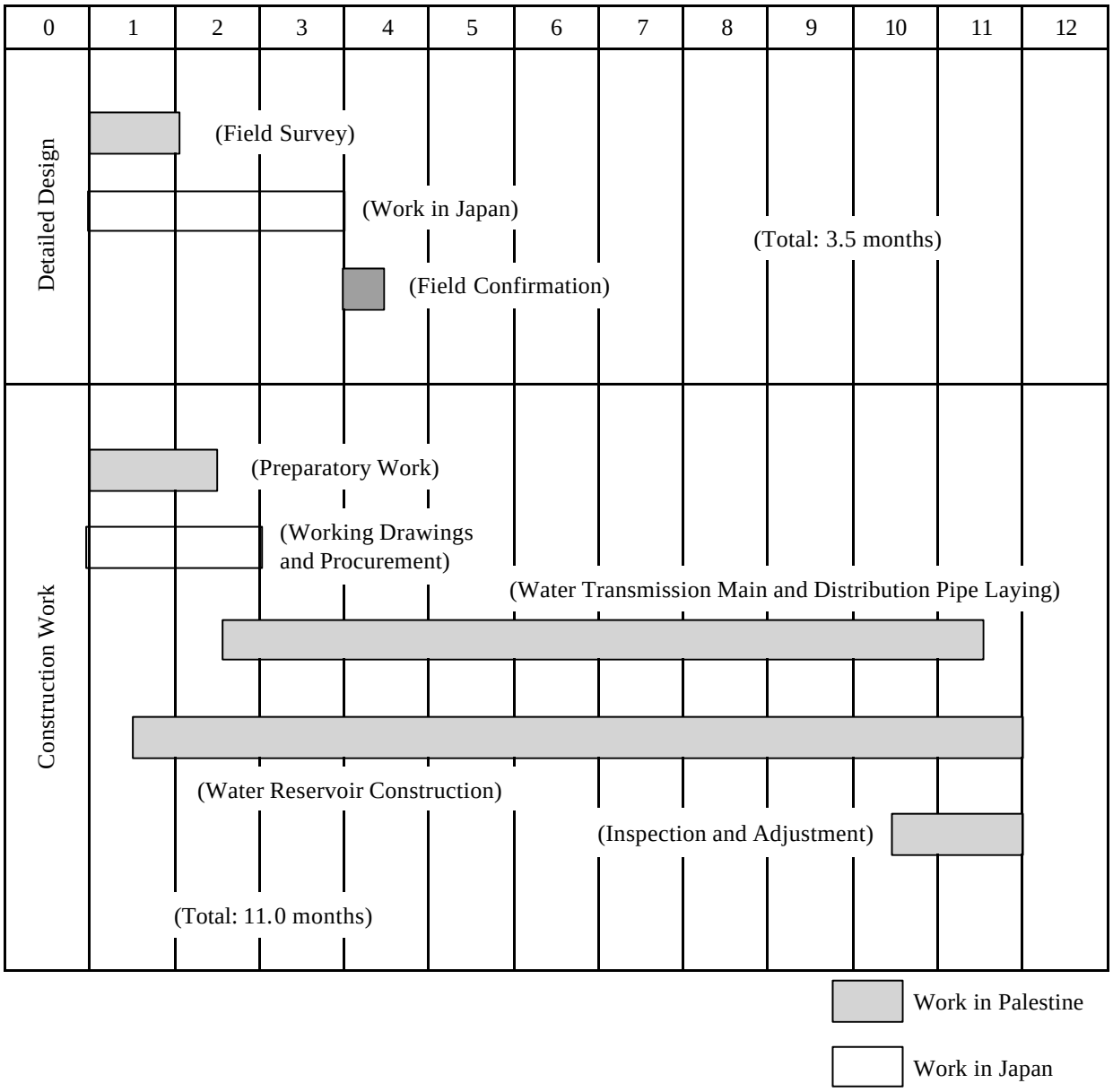


Figure 3-1-2 Work Implementation Schedule of the Project

3-1-7 Work to be Undertaken by the Palestinian Side

The items to be borne and implemented by the Palestinian side in the course of Project implementation are as follows.

(1) Acquisition and leveling of land required for construction of water reservoirs.

(2) Free provision of land to be used for stock yards and temporary structures during the construction period

(3) Provision of information and data required for the detailed design of the Project.

(4) Acquisition of permission for preliminary excavation to confirm the existence of underground structures at the detailed design stage.

(5) Facilitation of the acquisition of permits and approvals required for implementation of the Project.

(6) Acquisition of permits regarding all types of work, including manhole investigation, and surveying work on roads, etc. associated with the Project.

(7) Arrangements for witnessing and confirmation by the competent organizations for preliminary excavation and protective work for underground structures.

(8) Introduction of necessary measures and arrangements for traffic control and obtaining of the cooperation of local residents.

(9) Adoption of necessary measures and arrangements in the case of any ancient remains being found during the construction work.

(10) Provision of disposal sites for surplus soil and waste water during the construction period.

(11) Implementation of service pipe reconnection work in accordance with the Project implementation schedule.

(12) Implementation of auxiliary work, including landscaping, erection of fencing and gates, and installation of outdoor lighting, etc. at the water reservoirs.

(13) Construction of access roads to each water reservoir prior to the commencement of construction work by the Japanese side.

(14) Swift unloading, customs clearance, and tax exemption of the equipment and materials required for the Project at Israeli port of landing.

(15) Concerning the procurement of Project equipment and materials and provision of services required for Project implementation, exemption of tariffs and domestic duties and taxes that would otherwise be placed on Japanese corporations and nationals.

(16) Concerning the procurement of Project equipment and materials and provision of services required for Project implementation, provision of any conveniences required to aid the execution of work by Japanese nationals and their entry to Palestine and stay therein.

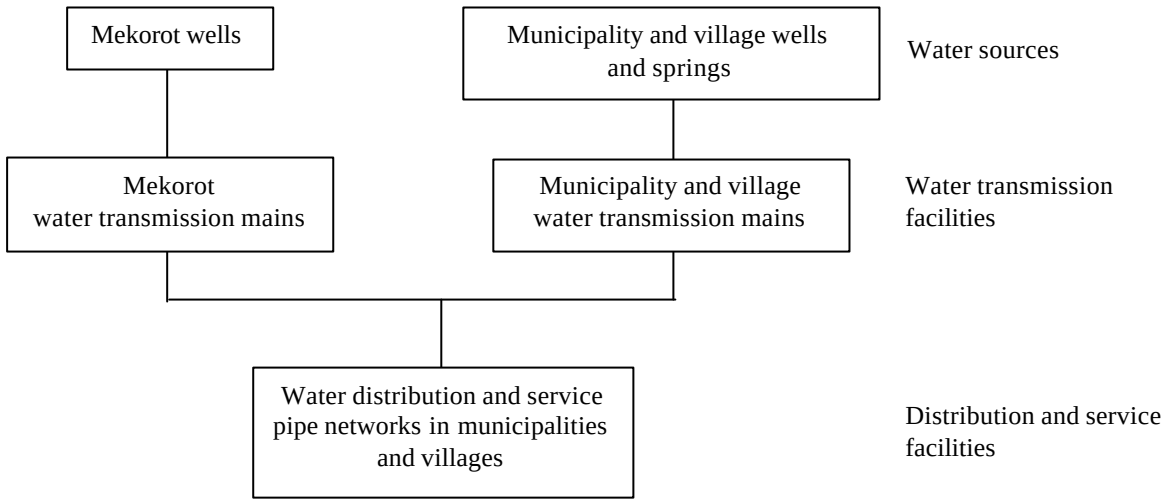
(17) Appropriate use and maintenance of the facilities and equipment which are either constructed or procured under Japanese grant aid.

(18) Payment of all costs necessary for the implementation of the Project which are not included in the scope of the Japanese grant aid.

3-2 Operation and Maintenance Plan

(1) Plan of the Water Supply Facilities Management Organization

As was mentioned previously, the management of water supply facilities in the target districts is divided up and implemented by the organization shown in Figure 3-2-1.



Note: Some of the wells operated by Mekorot are actually owned by the WBWD.

Figure 3-2-1 System of Water Utility Management in the West Bank Districts

Therefore, responsibility for the operation and management of water supply facilities in the target municipalities and villages is divided in the manner shown below according to water source management, water transmission, and water distribution and supply.

- Water source management: Mekorot/WBWD/municipalities and villages/well owners
- Water transmission mains: Mekorot/WBWD/municipalities and villages
- Water distribution pipes and service facilities: municipalities and villages

Moreover, the municipalities and villages carry out tariff collections and meter readings and make bulk payments to the water source managers.

Furthermore, in line with establishment of the executive system of the self-government authority, progress has been made in the establishment of water resources policy and development of organization (starting with the founding of the PWA in 1995) for the implementation of the public water supply utility. In other words, the form of organization currently being planned is as shown in the following diagram. Basically

speaking, this consists of the separation of state policy planning and the utility implementation setup and, on the implementation level, the realization of wide area management through establishment of the Bulk Water Supply Authority and division of the service area in Palestine into four regional water utilities.

This regional water supply organization is an attempt to transfer operation of the utility from the municipalities and villages (including small communes) and replace it with a more efficient form of operation and maintenance. The regional water supply organization may involve partial privatization and has not yet been clearly specified, but basically speaking the covered municipalities and villages will be the owners, executive officers will be elected, and the organization will be non-profit-making (with partial operation being consigned to the private sector within this framework). In view of the highly public nature of the water supply utility, consideration will not be given to full private ownership.

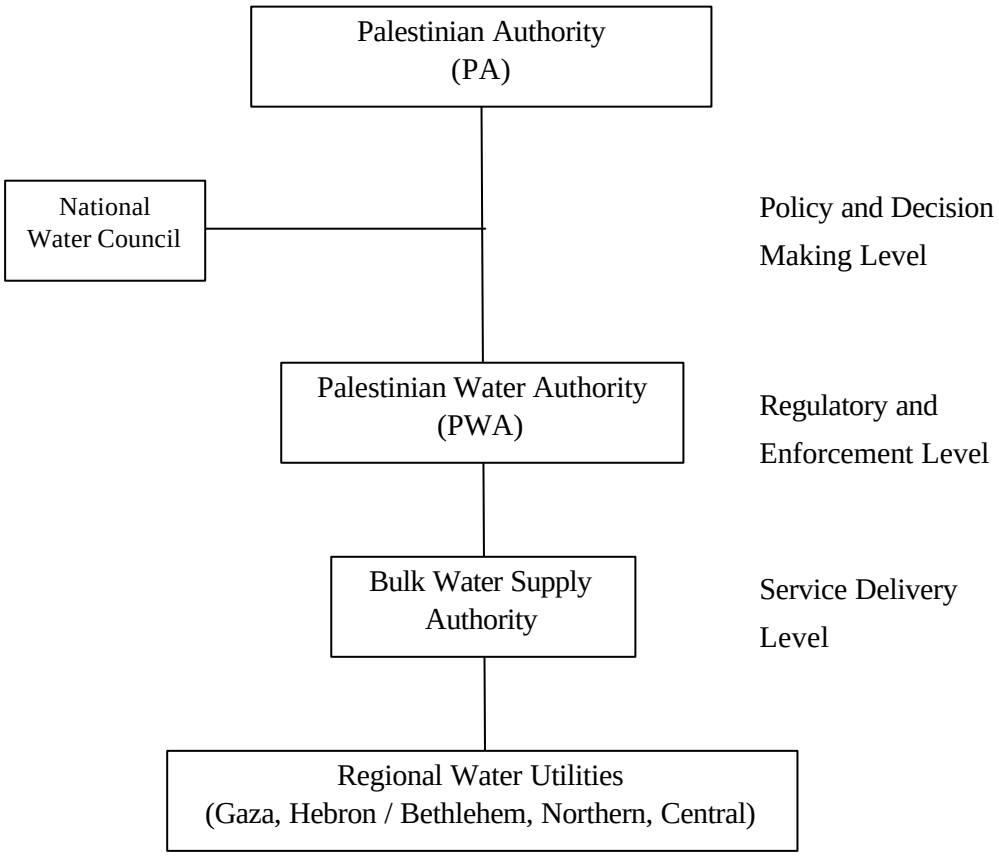


Figure 3-2-2 Implementation Setup of the Water Resource and Water Supply Utility in Palestine

At the time of the survey, in addition to establishment of the PWA, on the utility implementation level consideration was being given to transferring the operating department of the WBWD as the water resources control and supply organization following the agreement of self-rule. Also, of the four regional water utilities, in addition to the Jerusalem Water Undertaking (JWU, in charge of the central districts) which has been active as a model since the 1960s, a foreign company, Lyonnaise des Eau, has been performing operation in a joint effort with the Palestinian company Khatib and Alami. In this way, specific moves towards organizational development are underway.

In the case of JWU, the service population has reached 200,000 and its organization contains a department responsible for carrying out operation and maintenance of water transmission mains and the distribution pipe network. Irrespective of contents, therefore, a maintenance setup does exist. In the PWA/Norconsult survey of organization and tariff systems conducted in 1998, it was estimated that the effect in terms of improved maintenance efficiency brought about by the introduction of a water supply operating organization will be at least 10% of the OM cost. As an example of this, it was demonstrated that the unaccounted-for water (UFW) rates in JWU and the northern districts currently stand at 22% and 39% respectively, thus showing a clear difference.

Meanwhile, on the side of the Self-Government Authority which gives guidance on operation to the municipalities and villages, there are moves to improve efficiency by organizing Joint Service Councils composed of several neighboring municipalities and villages. In this case, separate committees are organized for not only the water supply sector but also the cleansing and sewerage utilities. As an actual case, a joint service council for operating water supply facilities has been formed among 11 villages in the Jenin area. This activity has only just started, but guidance and training are being carried out under the initiative of USAID with respect such areas as the formation of operating organization, establishment of regulations, staff development, and financial planning with a view to renewing facilities in future, etc.

The municipalities and villages targeted by the Project all belong to the Northern Regional Water Utility, where organization happens to be the least well developed. In current conditions, it will be impossible for municipalities composed of a few thousand people to operate water supply facilities, so it will be eventually necessary to promote greater efficiency through wide area operation. Therefore, for the purposes of the operation and maintenance plan of the Project, as a temporary measure until the regional water utility becomes feasible in the future, consideration will be given to individual running by the municipalities and villages. Incidentally, concerning the transmission

mains leading to the municipalities and villages, Mekorot and WBWD are in charge of operation so that no consideration will be given to a plan of maintenance.

(2) Operation and Maintenance Plan

The Project facilities to be operated and maintained by the municipalities and villages are mainly the water transmission main and distribution pipe networks and a small number of pump stations (existing) and water reservoirs. Therefore, the necessary operation and maintenance items will be as shown below.

Preparation of Operation and Maintenance Documents

The area most lacking with respect to operation and maintenance concerns the preparation of relevant documentation. This is understandable to a certain extent in many municipalities and villages because the administrative organization has only just been established, however, the construction of facilities should be used as an opportunity to prepare the following documents. These documents will be common to the municipalities and villages, and the WBWD will cooperate in their preparation.

- Water supply ledgers
- Facilities location drawings/working drawings
- Operation and maintenance checklists
- Planned maintenance schedules
- Operation and maintenance manuals
- Water quality inspection records

Operation and Maintenance of Distribution Pipes and Water Reservoirs

The operation and maintenance of distribution pipe networks is wholly dependent on the extent to which unaccounted-for water is controlled. It is reported from past JWU performance that leakage accounts for 50% of unaccounted-for water and 43% is the result of breakdowns in water meters. These are contrasting issues in terms of operation and maintenance: water leaks require a setup that allows emergency measures to be taken, whereas water meter breakdowns are more a financial issue than a water loss problem and are thus a longer term issue requiring the periodic replacement of water meters.

- Survey and repair of water leaks
- Illegal connections
- Water for public use
- Survey and repair of water meters

Operation and Maintenance of Pump Equipment

The municipalities and villages are able to carry out everyday operation and maintenance, but they do not have the capacity to perform individual motor and pump repairs. It is necessary for the WBWD to provide wide area backup of repairs and to prepare meter testing benches, and for a system to be established that comprises a division of roles, for example, implementation of tests by designated workshops, etc.

- Everyday inspections
- Control and replacement of expendable items and spare parts
- Arranging of motor and pump repair shops

(3) Staff Required for the Operation and Maintenance Plan

Judging from the contents of the Project facilities, the fields and roles of staff required for operation and maintenance are as indicated below, and a standard form of organization is shown in Figure 3-2-3.

Chief Engineers

Chief engineers are indispensable in order for the systematic operation and maintenance of facilities. However, depending on the scale of facilities, since it is financially difficult to secure staff to work solely as engineers, it is necessary for engineers to also serve on other posts on village councils.

Operators

Depending on the facility contents, it is necessary to carry out operation of booster pumps, chlorine disinfection equipment, pressure and flow control valves on water reservoirs and water distribution mains, and hourly water supply, etc. In cases where facilities consist of just small-scale and simple distribution pipes, the same staff can serve as both operators and pipe fitters.

Pipe Fitters

Pipe fitters perform house connections, water meter replacements, simple cleaning and repair of water meters, and inspection and repair of water leaks.

Pump Mechanics

Pump mechanics carry out maintenance such as grease replacement and strainer cleaning, etc. in pumps and peripheral piping, and they are also responsible for the maintenance of chlorine disinfection equipment where it is installed.

Meter Readers and Tariff Collectors

This important post covers a wide range of duties. In addition to the basic duties of reading water meters, preparing and issuing bills, and collecting tariffs every month, everyday work may include the maintenance of water supply ledgers and accounting duties including control of maintenance costs. Other duties include registering applications for new connections and grasping usage conditions of water for public use, etc.

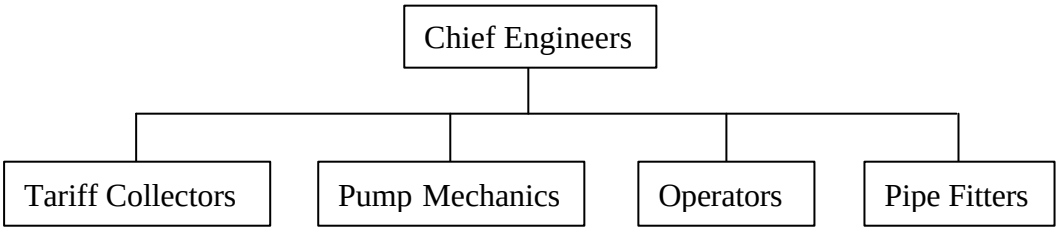


Figure 3-2-3 Standard Maintenance Setup of the Project

Table 3-2-1 shows a plan for bolstering maintenance personnel; this has been formulated based on taking individual operation and maintenance conditions in each municipality and village and the contents of facilities into account.

Table 3-2-1 Current Conditions and Plan for Improvement of Operation and Maintenance in 13 Municipalities and Districts

Municipality and Village/ Contract Customers	Current Water Supply Utility Personnel	Additional Operation and Maintenance Personnel
Aqqaba (v) 820	Personnel: 2 • Pipe fitter: 1 • Tariff collector: 1	Because the service population will double: 1. Appointment of one chief engineer 2. One additional pipe fitter 3. One additional tariff collector
Bala'a (m) 200	Personnel: 4 • Engineer: 1 • Pump operator: 1 • Pipe fitter: 1 • Tariff collector: 1	No additional personnel
Anabta (m) 550	Personnel: 8 • Waterworks and sewerage staff: 6 • Tariff collectors: 2	Reorganization 1. Appointment of an engineer in charge of water supply
Sabastia (m) 400	Personnel: 5 • Maintenance staff: 1 • Hourly supply staff: 3 • Tariff collector: 1	Reorganization 1. Appointment of an engineer in charge of water supply
Talluza (v) Including El Badan area 700	Personnel: 1 • Tariff collector: 1	Reorganization 1. Appointment of an engineer in charge of water supply 2. Two additional maintenance staff 3. Two additional tariff collectors
Qusin (v) 240	Personnel: 1 • Tariff collector: 1	Minimum increase in maintenance and repair staff 1. One additional pipe fitter
Qabalan (m) 1000	Personnel: 5 • Engineer: 1 • Maintenance staff: 3 • Tariff collector: 1	The control setup is in place, but staff should be increased to deal with growth in the service population: 1. One additional operator 2. One additional tariff collector
Qalqilia (m) 1470	Personnel: 19 • Engineer: 1 • Pipe fitters: 15 • Pump operators: 2 • Tariff collectors: 1	Staff will target all municipalities, and the contract customers are those within the target districts. Since the operation and maintenance setup is in place, personnel will not be increased.
Azzun (m) 650	Personnel: 5 • Engineer: 1 • Pipe fitter: 1 • Pump operator: 1 • Tariff collector: 1	Facilities are advancing and operation and maintenance needs are increasing. 1. One additional pipe fitter 2. One additional tariff collector
Ras Atiya (v) 210	Personnel: 2 Tariff collectors: 2	Minimum increase in staff to manage the new water reservoir and booster pump: 1. One additional staff combining operator and pipe fitter duties
Haris (v) 410	Personnel: 2 • Mechanic: 1 • tariff collector: 1	In line with the installation of full-scale water supply facilities, reorganization is required: 1. Appointment of one engineer 2. One additional operator
Qibia (v) 640	Personnel: 1 • Mechanic: 1 (combining tariff collection duties)	Reorganization and tie-up with Kharbatha: 1. Appointment of one engineer 2. One additional maintenance staff 3. Two additional tariff collectors
Kharbatha (v) 380	Personnel: 1 • Tariff collector: 1	Reorganization and tie-up with Qibia: 1. Appointment of one engineer 2. One additional maintenance staff 3. Two additional tariff collectors

(4) Operation and Maintenance Financial Balance Plan

It is planned for the operation and maintenance of water supply facilities constructed under the Project to eventually be carried out by the Northern Regional Water Authority, thus making it possible to improve efficiency and unify the tariff system as a result of implementing centralized operation and maintenance over a wide area. According to the Project report, it is possible to pay for water supply and sewerage facilities operation and maintenance costs and depreciation costs with an average tariff of 3.56 NIS/m^3 (0.89 USD/m^3).

In the Project, too, it is considered that establishment of a regional water utility is an effective means of ensuring the sustained operation and maintenance of facilities. Accordingly, as a stopgap measure until the establishment and start of operation of a regional water utility, a provisional financial balance plan shall be compiled that takes conditions in each individual municipality and village into account.

The current state of water supply utility finances in the target municipalities and villages is compiled into Table 3-2-2. The operating cost is determined by the whereabouts of the water source: municipalities and villages which purchase water from Mekorot or municipalities (for example, Talluza village) pay a high unit price for water, while those municipalities and villages which use self-managed water sources (for example, Qalqilia) bear a low price.

Current Balance of the Water Supply Utility

Concerning the specific financial balance of the water supply utility in the 13 municipalities and villages, the cost and income balance per unit of water supply (a financial indicator) is as shown below. In all the municipalities and villages, the tariff collection system is such that almost all costs required for operation and maintenance can be covered by income. In other words, depreciation cost for facilities renewal is not taken into consideration at all.

- Cost per unit of water distribution 0.82-5.10 NIS/m^3
- Income per unit of water distribution 0.84-5.77 NIS/m^3
- Average water tariff 0.90-6.00 NIS/m^3

Financial Improvement Plan

In line with the construction of facilities under the Project, financial improvement of the water supply utility should entail the establishment of a tariff collection system that takes renewal of facilities into account.

When the following factors are taken into account, that is to say 1) a long depreciation period of around 50 years can be adopted for the distribution pipe network due to the high standard of materials and execution work, 2) increased income can be anticipated through making major improvement to the collection rate, and 3) reduced costs of efficient operation and maintenance and unification of tariffs throughout the region can be anticipated as a result of the regional water utility, ample operation can be carried out using the following kind of tariff settings as indicated in Table 3-2-3.

- Unit water tariff (municipalities and villages with self-managed water sources)
  1.7 NIS/m^3
- Unit water tariff (municipalities and villages which purchase water)
  4.0 NIS/m^3

Table 3-2-2 Current Financial Conditions of the Water Supply Utility in 13 Municipalities and Villages

Municipality/Village		Aqqaba	Balaa	Anabta	Sabastia	Talluza	Qusin	Qabalan	Qalquilia	Azzun	Ras Atia	Haris	Qibia	Kharbatha
Population		4,443	5,444	5,462	2,171	3,813	1,296	5,417	31,772	5,841	1,136	2,230	3,487	2,056
Number of Household		630	770	780	310	540	0	770	4530	830	160	0	0	290
Water Supply	m^3/year	15,500	148,200	162,300	69,900	172,100	37,415	137,800	2,352,000	239,600	41,400	47,830	82,345	52,900
Water metered	m^3/year	9,708	84,576	91,055	50,343	77,835	24,544	95,671	1,661,085	140,956	27,660	26,787	44,846	34,009
OM Cost	NIS/Year	49,492	38,854	271,569	25,616	134,522		318,528	1,363,507	280,770	37,175			122,153
Unit Price of Raw Water	NIS/m^3	2.30	0.00	0.00	0.00	3.50	2.00	2.38	0.00	0.00	0.70	2.38	2.38	2.38
Cost/Water Supplied	NIS/m^3	3.19	0.26	1.67	0.37	0.78		2.31	0.58	1.17	0.90			2.31
Cost/Water Sale	NIS/m^3	5.10	0.46	2.98	0.51	1.73		3.33	0.82	1.99	1.34			3.59
	USD/m^3	1.27	0.11	0.75	0.13	0.43		0.83	0.21	0.50	0.34			0.90
Revenue from Water	NIS/Year	55,991	159,000	241,500	106,179	97,797	61,360	308,414	1,398,500	410,495	41,995	80,361	147,225	102,429
Revenue/Water Supplied	NIS/m^3	3.61	0.26	1.49	1.52	0.57		2.24	0.59	1.71	1.01			
Revenue/Water Sale	NIS/m^3	5.77	0.46	2.65	2.11	1.26		3.22	0.84	2.91	1.52			
	USD/m^3	1.44	0.11	0.66	0.53	0.31		0.81	0.21	0.73	0.38			
Average-tariff/household	NIS/h/month	7.4	17.2	25.8	28.5	15.1	28.4	33.4	25.7	41.2	21.9	21.6	25.0	29.4
Average-tariff/m^3	NIS/m^3	5.8	1.9	2.7	2.1	1.3	2.5	3.2	0.9	2.9	1.5	3.0	3.3	3.0
Average consumption	m^3/h/month	1.3	9.2	9.7	13.5	12.0	11.4	10.4	30.6	14.2	14.4	7.2	7.6	9.8

Table 3-2-3 Financial Conditions of the Water Supply Utility in 13 Municipalities and Villages in the Target Year

Item	Unit	Aqqaba	Bala'a	Anabta	Sabastia	Talluza	Qusin	Qabalan	Qalqilia	Azzun	Ras Atiya	Haris	Qibia	Kharbatha
Population		5,776	7,066	7,088	2,817	4,949	1,682	7,030	41,234	7,619	1,474	2,894	4,525	2,669
Number of Household		820	1000	1010	400	700	240	1000	5890	1080	210	410	640	380
Project Cost	NIS	2,310,400	4,239,600	4,252,800	1,690,200	2,969,400	672,800	2,812,000	16,493,600	3,047,600	589,600	1,157,600	1,810,000	1,067,600
Water Supply	m^3/year	202,390	247,590	248,360	98,700	173,410	58,930	246,330	1,444,830	266,960	51,640	101,400	158,550	93,520
Water Saled	m^3/year	161,910	198,070	198,680	78,960	138,720	47,140	197,060	1,155,860	213,560	41,310	81,120	126,840	74,810
OM Cost	NIS/year	582,883	247,590	248,360	98,700	499,421	169,718	709,430	1,444,830	266,960	61,968	292,032	456,624	269,338
Unit Price of Water	NIS/m^3	2.38	0.50	0.50	0.50	2.38	2.38	2.38	0.50	0.50	0.70	2.38	2.38	2.38
Water Supply Cost	NIS/m^3	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Depreciation	NIS/year	46,208	84,792	85,056	33,804	59,388	13,456	56,240	329,872	60,952	11,792	23,152	36,200	21,352
OM Cost + Depreciation	NIS	629,091	332,382	333,416	132,504	558,809	183,174	765,670	1,774,702	327,912	73,760	315,184	492,824	290,690
Revenue	NIS/year	647,640	336,719	337,756	134,232	554,880	188,560	788,240	1,964,962	363,052	74,358	324,480	507,360	299,240
Averaged Water Tariff	NIS/m^3	4.00	1.70	1.70	1.70	4.00	4.00	4.00	1.70	1.70	1.80	4.00	4.00	4.00

Note OM Cost : Operation and maintenance cost

Table 3-2-4 Financial Plan Criteria

Project target year	2005
Water supply grade	Level 3 (house connection)
Water supply ratio	100%
Design average daily water supply per person	96 liters/c/day
Tariff collection rate	80%
Construction cost	800 NIS/person (200 US $/person)
Depreciation period	50 years
Distribution network operation and maintenance cost	0.50 NIS/m^3 per unit of water supply
Water supply cost (water purchase)	2.38 NIS/m^3 per unit of water supply (including operation and maintenance cost and depreciation cost of water supply facilities)
Water supply cost (self-managed wells)	0.50 NIS/m^3 per unit of water supply (including operation and maintenance cost and depreciation cost of water supply facilities)

(5) Examination of Potential for Autonomous Development

Table 3-2-5 shows the results of examining the ability of residents to pay the water tariff which was set in the above financial improvement plan. This shows that the water tariff accounts for 1.9% of monthly income when water is obtained from self-managed wells and 4.5% when water is purchased from Mekorot, etc. In view of the fact that both figures are within the burden of 5.0% prescribed by the World Bank as appropriate for developing countries, and the fact that the tariff is no different from what it is now, it is judged that this tariff can be comfortably afforded. Accordingly, there is thought to be ample potential for autonomous development following implementation of the Project.

Table 3-2-5 Examination of the Ability to Pay of Residents

Item		Unit	
Average income per household		NIS/month	1,500
Water consumption per household (96 L/c/d x 7 persons/household x 30 days x 0.8)		m^3/month	17
Water tariff	Municipalities and villages with self-managed water sources	NIS/month	29
	Municipalities and villages which purchase water	NIS/month	68
Tariff as ratio of income	Municipalities and villages with self-managed water sources	%	1.9
	Municipalities and villages which purchase water	%	4.5

CHAPTER 4

PROJECT EVALUATION AND RECOMMENDATION

CHAPTER 4 PROJECT EVALUATION AND RECOMMENDATIONS

4-1 Project Effects

Following the progress of the peace negotiations, there has been growing political stability as well as economic activities in the 13 municipalities and villages (population of 74,600 as of 1997) in northern districts of the West Bank of Palestine. While the local standard of living is improving, however, the development of social infrastructure has been comparatively slow. In particular, water supply facilities suffer from many leaks due to aging as most of them were constructed and expanded in the late 1970's or earlier without proper planning, resulting in an estimated ineffective water ratio of as high as some 40%. Except for Qalqilia, a major municipality in the districts, the average water supply amount is 87 L/c/d and the consumption rate is approximately 50 L/c/d which is much lower than the WHO standard of 100 - 150 L/c/d. As a result, people in the Project Area are experiencing poor conditions from the viewpoints of the living standard and public hygiene and are even forced to buy expensive water from water vendors during the dry period. Meanwhile, as northern districts of the West Bank do not enjoy the luxury of plentiful water sources and as the development of groundwater has almost reached its limit, the securing of a satisfactory water supply volume through the development of new sources is difficult.

In order to improve the situation, the PWA and the WBWD formulated the Rural Water Supply Facilities Improvement Plan for Northern Districts of the West Bank. The present Project intends to reduce the ineffective water ratio, to secure water sources, to supply water in a stable manner and to expand the water supply area by means of the renewal and extension of the water transmission and distribution network and the construction of water reservoirs, all of which are priority issues in the said Plan.

With the implementation of the Project, the ineffective water ratio is expected to drop from some 40% at present to approximately 20% while the average water consumption is expected to increase from some 50 L/c/d to 77 L/c/d. In addition, the water supply coverage should improve from the some 90% at present to almost 100%. Moreover, the use of such highly durable pipes as steel pipes with a concrete lining and externally zinc plated pipes and the employment of proper construction methods, including reduction of the external stress on pipes by means of laying them deep in the ground, will make the new network serviceable for 50 or more years. This long life will not only make it possible to adopt a long depreciation period but also promises increased income through a substantial improvement of the accounted for water.

The municipalities and villages in question will initially be responsible for the operation and maintenance of the water transmission and distribution facilities following the completion of the Project while assistance will be made available by the WBWD for technical matters and by the MOLG for management matters. Considering the planned establishment of the Northern Regional Water Utility in the next few years to be responsible for operation and maintenance in a wide area which should achieve cost reduction as well as the introduction of fair water charges throughout the region, sound financial management based on the following water charge levels should be possible to pay for the maintenance and depreciation costs.

- Unit water charge (municipality or village with its own water source) : 1.7 NIS/m^3
- Unit water charge (municipality or village which buys water from others) : 4.0 NIS/m^3

Current Situation and Problems	Improvement Measure(s) Under the Project	Project Effects and Degree of Improvement
1. Aging of water supply facilities High ineffective water ratio and growing number of cases requiring maintenance work	Renewal of facilities using highly durable materials	Reduction of the ineffective water ratio from some 40% to less than 20% and long life of the new facilities of 50 years or more
2. Insufficient water supply volume Small pipe diameter and low water pressure	Selection of pipe diameter and water pressure based on transmission and distribution network calculation, taking the housing density into consideration	Systematic and reliable water supply with a minimum terminal pressure of two bars
3. Facility development without proper planning Insufficient water supply capacity due to failure to install additional distribution mains in line with housing development	Formulation of a facility plan, taking the existing households and future housing development plan into consideration	Proper layout of distribution mains and installation of branch pipes for house connection within a 50 m distance of each household; achievement of water supply coverage of 100%
4. Inadequate construction Constant occurrence of ruptures or cracks of pipes due to their shallow depth	Adoption of a sufficient burying depth, use of high quality refilling materials and employment of compacting work as well as protection work at road crossing sections	Continuation of leakage prevention effect over a long period of time
5. Inadequate maintenance system Inadequate maintenance system, including the use of outsiders after the occurrence of a problem	Increase of maintenance staff at municipalities and villages; joint ownership of repair shops and repair equipment/tools under the WBWD	Establishment of an adequate maintenance system by enabling a quick response
6. Worsening of financial scope for maintenance Low income due to low water supply amount and rapid increase of maintenance cost	Introduction of appropriate technologies to renew facilities, to secure water supply volume and to reduce the necessary repair work	Increased steady income as a result of increased water consumption, in turn due to improved accounted for water; reduction of the water supply cost

The development of water supply facilities using groundwater necessitates environmental consideration in regard to (i) possible lowering of the groundwater table due to excessive development and (ii) necessity to develop a sewerage system in response to increased water consumption. Both of these potential problems, however, should not pose major obstacles in view of the facts that the development of new water sources is not, in principle, planned under the Project in relation to the former and that the absolute amount of planned water supply under the Project is relatively small, that the environmental load of waste water is believed to be below the permissible level given the population density of the Project Area and that the PWA is currently simultaneously developing water supply and sewerage services in relation to the latter.

Moreover, the progress of water supply facility development in northern districts of the West Bank is coordinated with other international aid organizations and NGOs. The comprehensive improvement of water supply facilities is intended under the Project in collaboration with other projects in the area in wide-ranging fields. For example, development work at Azzun, Ras Atiya and Anabta is divided between the Project and projects of the UNDP and SCF. Ongoing projects in other areas include the development of water source facilities by the USAID, the development of a water supply network, including assistance for improvement of the operation and maintenance system, by the NEARA and assistance for a survey on and the implementation of the reorganization and improvement of the entire water utility by Norway.

Based on the above observations, the implementation of the Project under the grant aid scheme is judged to be highly feasible if the Palestinian side fulfills its obligations described later and is highly appropriate given the significance of the Project for the Project Area.

4-2 Recommendations

Further improvement and development is necessary in regard to the following issues for the successful implementation of the Project and for the sustainable operation and maintenance of the new facilities following the completion of the Project.

(1) House Connection Work

The envisaged development of water supply facilities under the Project consists of not only the construction of water transmission and distribution facilities by the Japanese side but also the replacement of and new house connection by the Palestinian side. The municipalities and villages concerned should introduce budgetary measures to enable house connection with the cooperation and guidance of the MOLG and should also prepare (i) a work implementation schedule in line with the transmission and distribution

mains construction schedule and (ii) a replacement and connection programme, including a plan to effectively use the connection equipment and materials of which the supply is planned under the Project.

(2) Establishment of Maintenance System

As already discussed in the section of this report on the maintenance plan, the municipalities and villages concerned will be responsible for the operation and maintenance of the new facilities. Except for some municipalities, these municipalities and villages currently have only a minimum maintenance system, making an increase of the maintenance personnel and the introduction of maintenance and repair facilities necessary. Here, the deployment of personnel and the implementation of maintenance work must be conducted with the eventual establishment of the Northern Regional Water Utility (NRWU) in mind. To be more precise, the development of a centralized maintenance facility responsible for a wide area and appropriate staff deployment must be conducted by the WBWD and the MOLG.

(3) Introduction of Appropriate Water Charges and Establishment of Reliable Water Charge Collection System

The expected improvement of the accounted for water ratio and increase of the water supply volume with the implementation of the Project should greatly improve the financial health of the municipal/village water utility once an appropriate water charge collection system has been established. As in the case of the maintenance plan, the financial plan that will act as the basis for water utility operation must envisage the establishment of a common water charge system throughout the district with the establishment of the NRWU in mind. To realize such a system, the WBWD and the MOLG must establish an appropriate water charge for the district, establish a reliable water charge collection system and prepare guidelines for the planning of a feasible budget.

(4) Strengthening of Water Quality Control System

At present, the WBWD regularly conducts water quality analysis at the water source wells under its control but it does not conduct the quality control of water that reaches the end users via the transmission and distribution mains. In the case of water from wells, as deep groundwater is pumped for all of the municipalities and villages concerned, there is less likelihood of the contamination of the groundwater itself. Contamination, if any, is likely to occur with subsequent water supply through the transmission and distribution mains. In view of such an eventuality, the WBWD should establish a system whereby

each municipality or village is requested to conduct regular sampling and analysis in order to strengthen the water quality control.

(5) Early Transition to Regional Water Utilities

The overall plan for water utilities and facility management in Palestine is reorganization to the PWA and four regional water supply facilities. In the Project Area, the establishment of the NRWU is planned but its preparatory work is lagging behind that in other areas. The positive effects of operating a wide area water utility have already been demonstrated and the early transition to the new set-up is highly desirable through the active coordination of the municipalities and villages involved.

(6) Development of Sewerage Facilities

The completion of the new facilities planned under the Project and the expected population increase suggest a substantial increase of water consumption. As a result, the amount of wastewater produced in the area will proportionally increase, indicating the possible occurrence of environmental contamination. Because of the relatively small absolute water supply volume under the Project except for some municipalities and the low population density in the district, however, the environmental load of wastewater is believed to be below the permissible level. Even so, careful consideration is required to prevent localized high level contamination and to develop sewerage facilities from a long-term perspective.

Appendices

Appendix-1　Member List of the Survey Team

1. Basic Design Study

Name	Work Assignment	Current Position
Mr. Katsuo SHOJI	Leader	Deputy Director, First Project Management Division, Grant Aid Management Department, JICA
Mr. Hiroshi TSUJIHARA	Technical Advisor	Deputy Director for International Cooperation, International Affairs Division, Ministry of Health and Welfare
Mr. Noboru SAEKI	Chief Consultant / Water Supply Planner	Yachiyo Engineering Co., Ltd.
Mr. Masatoshi SENO	Water Supply Facility Planner/ Operation and Maintenance Planner	Yachiyo Engineering Co., Ltd.
Mr. Masahiro TAKEUCHI	Distribution Network Planner 1	Yachiyo Engineering Co., Ltd.
Mr. Minoru AIKI	Distribution Network Planner 2	Yachiyo Engineering Co., Ltd.
Mr. Katsumi FUJII	Procurement Specialist	Yachiyo Engineering Co., Ltd.

2. Draft Report Explanation

Name	Work Assignment	Current Position
Mr. Katsuo SHOJI	Leader	Deputy Director, First Project Management Division, Grant Aid Management Department, JICA
Mr. Hiroshi TSUJIHARA	Technical Advisor	Deputy Director for International Cooperation, International Affairs Division, Ministry of Health and Welfare
Mr. Noboru SAEKI	Chief Consultant / Water Supply Planner	Yachiyo Engineering Co., Ltd.
Mr. Masahiro TAKEUCHI	Distribution Network Planner 1	Yachiyo Engineering Co., Ltd.

Appendix-2　Survey Schedule

1. Field Survey Schedule of the Study Team

No.	Date		Activities Officials: Mr. Shoji (Team Leader) and Mr. Tsujihara Consultants: Messrs. Saeki, Seno, Takeuchi, Aiki and Fujii	Overnight
1	7th July	(Wed.)	- Both officials and Messrs. Saeki, Sono and Takeuchi depart Narita (12:00) for Paris on AF275, arriving in Paris at 17:10	Paris
2	8th July	(Thurs.)	- All travelling members depart Paris (10:00) for Tel Aviv on AF1992, arriving in Tel Aviv at 15:35 - Courtesy visit to Embassy of Japan and JICA Palestine Office	Tel Aviv
3	9th July	(Fri.)	- Transfer to Gaza - Team meeting at JICA Palestine Office	Gaza
4	10th July	(Sat.)	- Courtesy visit to MOPIC and discussion on Inception Report (IC/R) - Courtesy visit to PWA (Gaza) and discussion on IC/R - Courtesy visit to PWA (West Bank) and discussion on IC/R and questionnaire - Preparations for local subcontracting of natural conditions survey (surveying and water quality analysis)	Ramallah
5	11th July	(Sun.)	- Field survey at project sites (Kharbatha, Qibia, Qabalan, Talluza and Aqqaba) - Preparations for local subcontracting of natural conditions survey (surveying and water quality analysis)	Ramallah
6	12th July	(Mon.)	- Field survey at project sites (Anabta, Bala'a, Sabastia and Qusin) - Courtesy visit to USAID office and information gathering - Courtesy visit to MOLG and discussion on IC/R - Preparations for local subcontracting of natural conditions survey (surveying and water quality analysis)	Ramallah
7	13th July	(Tues.)	- Field survey at project sites (Haris, Azzun, Qalquilia and Ras Atiya) - Preparations for local subcontracting of natural conditions survey (surveying and water quality analysis)	Ramallah
8	14th July	(Wed.)	- Discussions with PWA (on contents of the request and questionnaire) - Courtesy visit to UNDP and information gathering - Preparations for local subcontracting of natural conditions survey (surveying and water quality analysis) [Aiki arrives in Tel Aviv]	Ramallah
9	15th July	(Thurs.)	- Discussion on Minutes of Discussions (M/D) with PWA - Technical consultation with NBWD - Preparations for local subcontracting of natural conditions survey (surveying and water quality analysis)	Ramallah
10	16th July	(Fri.)	- Reporting of progress to Embassy of Japan and JICA Palestine Office - Team meeting on M/D - Commencement of locally subcontracted natural conditions survey (surveying and water quality analysis) [Tsujihara departs Tel Aviv on AF1193 for Paris; 07:00 - 11:20]	Ramallah
11	17th July	(Sat.)	- Signing of M/D (at PWA West Bank Office; 21:30) - Technical consultation with WBWD - Natural conditions survey (surveying and water quality analysis)	Ramallah
12	18th July	(Sun.)	- Field survey of project sites (Kharbatha and Qibia) (gathering of reference materials and data on conditions of existing facilities, water supply volume, accounted for water, organization, state of operation and maintenance and budget, etc.) - Natural conditions survey (surveying and water quality analysis) [Shoji, the team leader, departs Tel Aviv on AF1193 for Paris; 07:00 - 11:20]	Ramallah
13	19th July	(Mon.)	- Field survey of project sites (Qabalan and Aqqaba) (gathering of reference materials and data on conditions of existing facilities, water supply volume, accounted for water, organization, state of operation and maintenance and budget, etc.) - Natural conditions survey (surveying and water quality analysis)	Ramallah

No.	Date		Activities	Overnight
14	20th July	(Tues.)	- Field survey of project sites (Sabastia, Qusin, Talluza and Ras Atiya) (gathering of reference materials and data on conditions of existing facilities, water supply volume, accounted for water, organization, state of operation and maintenance and budget, etc.) - Natural conditions survey (surveying and water quality analysis)	Ramallah
15	21st July	(Wed.)	- Field survey of project sites (Anabta, Bala'a, Azzun and Haris)) (gathering of reference materials and data on conditions of existing facilities, water supply volume, accounted for water, organization, state of operation and maintenance and budget, etc.) - Natural conditions survey (surveying and water quality analysis)	Ramallah
16	22nd July	(Thurs.)	- Technical consultation with WBWD - Sorting and analysis of gathered information - Natural conditions survey (surveying and water quality analysis)	Ramallah
17	23rd July	(Fri.)	- Team meeting - Sorting and analysis of gathered information [Fuji arrives in Tel Aviv]	Ramallah
18	24th July	(Sat.)	- Technical consultation with WBWD - Sorting and analysis of gathered information - Natural conditions survey (surveying and water quality analysis)	Ramallah
19	25th July	(Sun.)	- Additional field survey of project sites (Qalqilia and Haris) - Preparation of Field Report (FL/R) - Natural conditions survey (surveying and water quality analysis)	Ramallah
20	26th July	(Mon.)	- Additional field survey of project sites (Qabalan, Sabastia and Qusin) - Preparation of FL/R - Natural conditions survey (surveying and water quality analysis	Ramallah
21	27th July	(Tues.)	- Additional field survey of project sites (Bala'a, Anabta, Talluza and Ras Atiya) - Technical consultation with WBWD - Preparation of FL/R - Natural conditions survey (surveying and water quality analysis)	Ramallah
22	28th July	(Wed.)	- Technical consultation with WBWD - Natural conditions survey (surveying and water quality analysis)	Ramallah
23	29th July	(Thurs.)	- Technical consultation with WBWD - Natural conditions survey (surveying and water quality analysis)	Ramallah
24	30th July	(Fri.)	- Sorting of gathered information	Ramallah
25	31st July	(Sat.)	- Survey on municipalities and villages similar to those subject to the Project - Natural conditions survey (surveying and water quality analysis)	Ramallah
26	1st Aug.	(Sun.)	- Final discussion on and signing of FL/R with PWA and WBWD - Natural conditions survey (surveying and water quality analysis)	Ramallah
27	2nd Aug.	(Mon.)	- Reporting to Embassy of Japan and JICA Palestine Office - Reporting to MOPIC - Natural conditions survey (surveying and water quality analysis)	Ramallah
28	3rd Aug.	(Tues.)	- Visit to ANERA; interview survey - Natural conditions survey (surveying and water quality analysis)	Ramallah
29	4th Aug.	(Wed.)	- Messrs. Saeki, Seno, Takeuchi, Aiki and Fujii depart Tel Aviv on AF1193 for Paris (07:00 - 11:20) and then AF276 for Narita (13:20)	
30	5th Aug.	(Thurs.)	- Arrival at Narita (08:15)	

Abbreviations

MOPIC : Ministry of Planning and International Cooperation
PWA : Palestinian Water Authority
MOLG : Ministry of Local Government
WBWD : West Bank Water Department

2. Schedule of Visit to Explain the Draft Basic Design

No.	Date		Activities Officials: Mr. Shoji and Mr. Tsujihara Consultants: Mr. Saeki and Mr. Takeuchi	Overnight
1	22nd Oct.	(Fri.)	- All members depart Narita for Paris on AF289 (13:00 - 18:10)	Paris
2	23rd Oct.	(Sat.)	- All travelling members depart Paris for Tel Aviv on AF1992 (10:00 - 14:35)	Tel Aviv
3	24th Oct.	(Sun.)	- Team meeting at JICA Palestine Office - Courtesy visit to MOPIC; explanation of Draft Basic Design (D-B/D) - Courtesy visit to PWA (West Bank); explanation and discussion of D-B/D	Tel Aviv
4	25th Oct.	(Mon.)	- Courtesy visit to Embassy of Japan; explanation and discussion of D-B/D - All members move to West Bank - Visit to WBWD to explain and discuss D-B/D	Ramallah
5	26th Oct.	(Tues.)	- Visit to WBWD to explain and discuss D-B/D - Survey at Qabalan Municipality - Survey on municipalities and villages similar to those subject to the Project	Ramallah
6	27th Oct.	(Wed.)	- Visit to WBWD to explain and discuss D-B/D - Courtesy visit to MOLG; explanation and discussion of D-B/D - Discussion with PWA/WBWD on Minutes of Discussions (M/D)	Ramallah
7	28th Oct.	(Thurs.)	- Signing of M/D	Ramallah
8	29th Oct.	(Fri.)	- Travelling day; Messrs. Saeki and Takeuchi depart Tel Aviv for Paris on AF1193 (06:20 - 11:20)	Paris
9	30th Oct.	(Sat.)	- Travelling day; Messrs. Saeki and Takeuchi depart Paris for Narita on AF276 (13:20)	
10	31st Oct.	(Sun.)	- Messrs. Saeki and Takeuchi arrive at Narita (08:15)	

Abbreviations

MOPIC : Ministry of Planning and International Cooperation
PWA : Palestinian Water Authority
MOLG : Ministry of Local Government
WBWD : West Bank Water Department

Appendix-3　List of Party Concerned in the PA

List of Party Concerned in the PA

Authority and Position	Name
Ministry of Planning and International Cooperation (MOPIC)	
Director General of International cooperation	Mr. Waleed A. Siam
Palestinian Water Authority (PWA)	
PWA office in Gaza	
Head of PWA	Mr. Nabil El-Sherif
Director of Technical Department	Mr. Rebhy El-Sheikh
Director of Planning Department	Dr. Nahed Ghaben
PWA office in West Bank	
Deputy Head of PWA	Mr. Fadel Kawash
Economic Advisor	Dr. Ihab Isam Barghouthi
Mechanical Engineer	Mr. Mahmoud S. Ibrahim
West Bank Water Department (WBWD)	
General Director	Mr. Taher N. Nassereddin
Director of Planning Division	Mr. Mohammad Jaas
Manager of Planning Division	Mr. Ali Odeh
Civil Engineer	Mr. Amjad A. Quraish
Water Analysis Laboratory Staff	Mr. Subhi Sauhun
Water Analysis Laboratory Staff	Mr. Zaidoun Salah
Accountant	Mr. Mohammad Ramadan
Ministry of Local Government (MOLG)	
Deputy Minister	Mr. Hussein El A'raj
Deputy Assistant	Mr. Ahmed Ghnaim
Director of Water & Environment Department	Mr. Nizar Mustafa Zyoud
Head of Project Management Department of MOLG, Tulkarm	Mrs. Abeer Younis
General Manager of MOLG, Jenin	Mr. Fatehy Ragheb
Manager of MOLG, Jenin	Mr. Naser Adam
United Nations Development Programe (UNDP)	
Projects Manager	Mr. Musa El Khatib
Chief of Engineering Unit	Mr. Walid Hasna
Head of Water, Environment & Employment Generation Unit	Ms. Lana Abu Hijleh
U. S. Agency for International Development (USAID), West Bank and Gaza Mission	
Water Resources Engineer	Mr. Alvin P. Newman
Save The Children Federation	
Program Manager, Nablus Office	Dr. Naim A. Ismail

Authority and Position	Name
American Near East Refugee Aid (ANERA)	
Deputy Representative	Mr. Jamal El-Aref
Irrigation Projects Coodinator	Mr. Mohammad Yousef Sbeih
Aqqaba Village Council	
Mayor	Mr. Ezat Ghanam
Council Member	Mr. Mohamed Abu Nedal
Accountant	Mr. Yousef Ghanam
Bala'a Municipality	
Mayor	Mr. Talal Aref
Deputy Mayor	Mr. Raek Amer
Engineer	Mrs. Wedad Madak
Anabta Municipality	
Mayor	Mr. Hamdallah El Hamedallah
Council Member	Mr. Khawla Awad
Senior Engineer	Mr. Ghasan Karsh
Manager of Water Section	Mr. Fawzy Abu Asaad
Accountant	Mr. Amer Barakat
Sabastia Municipality	
Mayor	Mr. Mahmoud Ghazal
Talluza Village Council	
Council Member	Mr. Mohamed Salehat
Council Member	Mr. Radi Faris
Council Secretary	Mr. Mohamed Janajra
Qusin Village Council	
Mayor	Mr. Mohamed El Salman
Council Member	Mr. Nadar Bedak
Qabalan Municipality	
Mayor	Mr. Riad Ali
Council Member	Mr. Jaser Ibrahim
Engineer	Mr. Farid Ziada
Qalqilia Municipality	
Mayor	Mr. Marouf Zahran
Senior Engineer	Mr. Tarek Awad
Engineer of Water Section	Mr. Abd El Momen Affana
Azzun Municipality	
Mayor	Mr. Ehsan Abd El latif
Engineer	Mr. Raeed Radwan

Authority and Position	Name
Ras Atiya Village Council	
Mayor	Mr. Samara Mara'abh
Council Member	Mr. Saeed Mara'abh
Accountant	Mr. Ahmed Mara'abh
Haris Village Council	
Mayor	Mr. Hosam Abd El Halim
Council Member	Mr. Hassan Yousef
Council Member	Mr. Bashir Sultan
Qibia Village Council	
Mayor	Mr. Hassan Ahmed Ragheb
Counsil Member	Mr. Hamed Attia
Kharbatha Bani Harith Village Council	
Mayor	Mr. Tawfik Enjas
Deputy Mayor	Mr. Adel Enjas
Embassy of Japan in Israel	
Minister	Mr. Toshio Kunikata
Second Secretary	Mr. Kohei Sato
JICA office in Gaza	
Resident Representative	Mr. Shigeru Okamoto
Assistant Resident Representative	Mr. Toshiya Abe
Program Officer	Mr. Iyas Salim

Appendix-4　Minutes of Discussion

MINUTES OF DISCUSSIONS
BASIC DESIGN STUDY
ON
THE PROJECT
FOR
IMPROVEMENT OF WATER DISTRIBUTION FACILITIES
IN
THE NORTHERN DISTRICTS OF THE WEST BANK

In response to a request from the Palestinian Interim Self-Government Authority (hereinafter referred to as "PA"), the Government of Japan decided to conduct a basic design study on the Project for Improvement of Water Distribution Facilities in the Northern Districts of the West Bank (hereinafter referred to as "the Project") and entrusted the study to Japan International Cooperation Agency (JICA).

JICA has sent to PA a study team, headed by Mr. Katsuo SHOJI, Deputy Director, First Project Management Division, Grant Aid Management Department, JICA, and scheduled to stay in PA from July 8 to August 3, 1999.

The Team held discussions with the officials concerned of PA, and conducted field surveys at the study areas.

In the course of the discussions and field surveys, both parties have confirmed the main items described on the attached sheets. The Team will proceed to further works and prepare the Basic Design Study report.

Ramallah-El Bireh, July 17, 1999

Mr. Katsuo SHOJI
Leader
Basic Design Study Team
JICA

Mr. Fadel Kawash
Deputy Head
The Palestinian Water Authority

Mr. Hussein El A'raj
Deputy Minister
Ministry of Local Government

(Witness)

Mr. Waleed A. Siam
Director General of International Cooperation
Ministry of Planning and International Cooperation

ATTACHMENT

1. Objective

The objective of the Project is to improve the water supply condition of the northern districts of the West Bank by the rehabilitation and expansion of the existing water distribution facilities.

2. Project sites

The Project sites are the municipalities and villages in the northern districts of the West Bank as shown in Annex-I.

3. Responsible and Implementing Agencies

(1) Coordinating organization : Ministry of Planning and International Cooperation
(2) Responsible organization : The Palestinian Water Authority
(3) Implementing organization : The Palestinian Water Authority with coordination of Ministry of Local Government

4. Items requested by the Palestinian Authority

After a series of discussions with the Team, PA requested the items shown in Annex-II. However, final items to be executed under Japan's Grant Aid will be decided after further studies in Japan.

5. Japan's Grant Aid System

(1) PA side has understood Japan's Grant Aid system explained by the Team, as described in Annex-III.

(2) PA side will take necessary measures, as described in Annex-IV, for smooth implementation of the Project, on condition that the Grant Aid Assistance by the Government of Japan is extended to the Project.

6. Schedule of the Study

(1) The consultant of the Team will proceed to further studies in PA until August 3, 1999.

(2) Based on the Minutes of Discussions and technical examination of the study results, JICA will prepare a draft report in English and dispatch a mission to PA in order to explain its contents around the end of October, 1999.

(3) In case that the contents of the draft report are accepted in principal by PA, JICA will complete the final report and send it to PA by the end of January, 2000.

7. Major Points of Discussion

The following points have been discussed and confirmed by both parties.

(1) Approval of the requested projects by JWC

PA side explained to the Team that all the requested projects have already been approved by Joint Water Committee (JWC) and submitted documentary evidence thereof to the Team.

(2) Procedures for re-approval from JWC for the modification of the project contents

PA side agreed that in case the contents of the Project are modified as a result of the Basic Design Study and thereby re-approval from JWC is required, PA side will secure the re-approval from JWC by the time when the draft report explanation team arrives in PA around the end of October, 1999. The Team will inform the contents of the modification, if any, to PA side around the middle of September, 1999.

(3) Necessary preparatory procedures for the execution of construction work

The Team confirmed that PA takes necessary preparatory procedures including construction permission to be required for the execution of the construction work by the end of October, 1999 and provides the Team with documentary evidence, if necessary.

(4) Ownership of the existing water supply facilities

PA side agreed that in case some parts of the existing water supply facilities in the Project Site are found to be the property which is not owned by PA or not owned by any authority under PA, the rehabilitation of those parts shall be excluded from the components of the Project.

(5) Ownership of the water distribution facilities constructed in the Project

The Team confirmed that the ownership of the water distribution facilities constructed in the Project shall belong to the concerned municipalities and villages. The Palestinian Water Authority and Ministry of Local Government shall be responsible for implementing the undertakings of PA side, and supervising the proper and continuous operation and maintenance of the facilities by the concerned municipalities and villages.

(6) Securing the water extraction and bulk water supply volume for the Project

Regarding the required water supply volume for the Project, PA side could not submit the documentary evidence for securing the volume by the signing date of this Minutes of Discussions. However, PA side confirmed to prepare the information related to the water source for the Project and/or the water supply records of the municipalities and villages concerned for the past few years by August 3, 1999.

(7) Planning Framework

The Team confirmed to conduct the Study based on the data regarding the water supply source obtained in item (6) above. In addition, the Team proposed and PA side agreed that the Study shall be done in accordance with the planning framework as follows, on condition that the required water supply volume is secured.

- Target year of the plan : the year 2005
- Population growth rate : 3 % per year
- Basic water supply volume per capita : 35 m^3/year (agreed figure in JWC)

(8) Water quality

PA side agreed to take necessary measures for the improvement of potable water quality in the Project sites, if required.

(9) Construction cost estimation for the Project

The Team confirmed that PWA will support the Team by providing necessary information to conduct construction cost estimation for the Project appropriately.

(10) House connection

The Team confirmed that the material supply and construction for new connections to each household shall be the undertaking of PA side. PA side requested the Japanese side to include the re-connection work for the service pipe to each household in the Project. The Team agreed to convey the request from PA side to the Japanese authorities concerned. Other undertakings of PA side shall be determined after the further study.

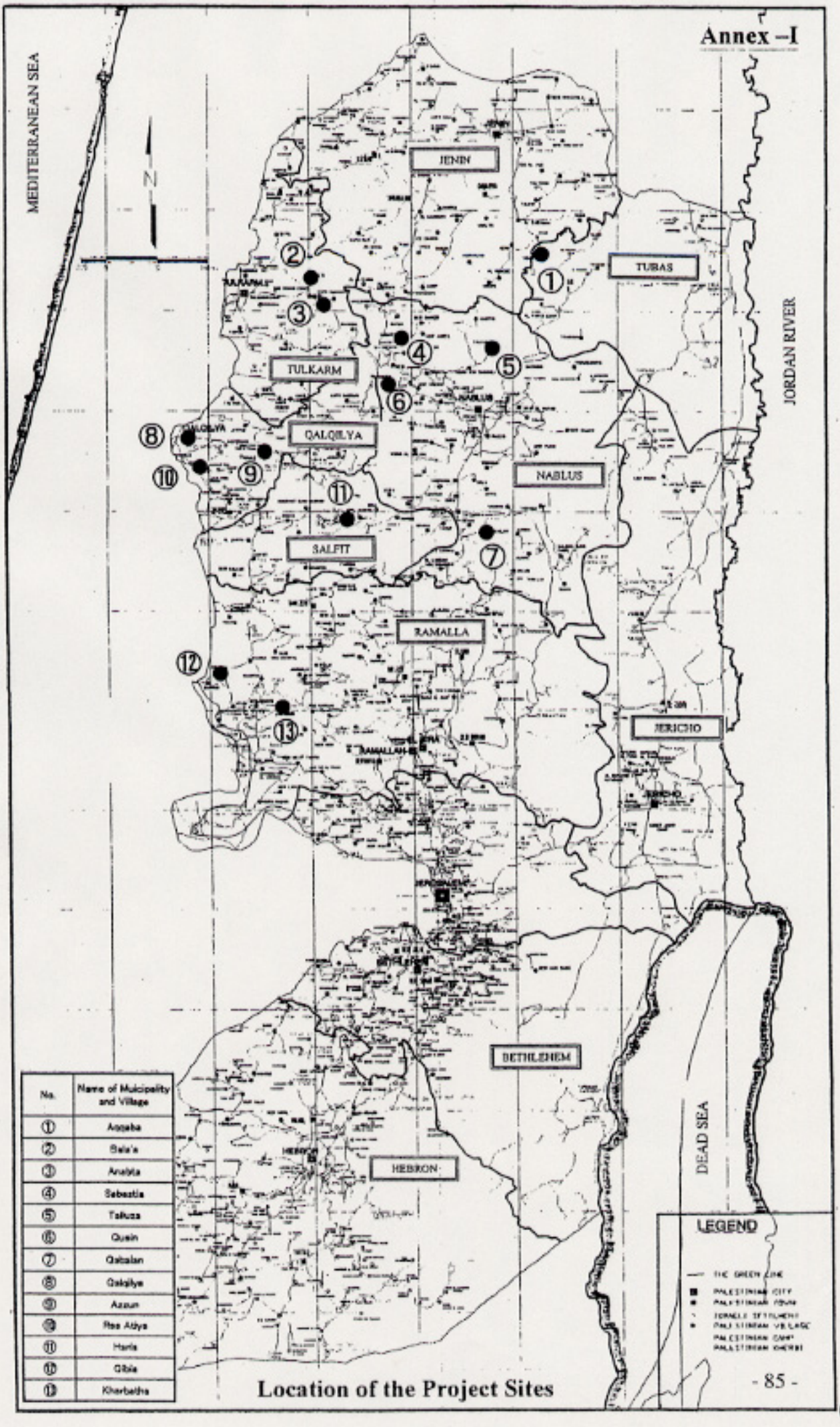
(11) Particular problems of each site

1) Aqqaba Village
The Team pointed out the problem of water source for the project of Aqqaba as shown in Annex-V and explained that, unless otherwise the problem is solved in due time, the project will not be implemented. PA requested the modification of the plan according to Annex-V and confirmed to apply the modification of the plan to JWC. Both parties agreed that if the approval by JWC is not obtained by the end of September 1999, Aqqba Village site will be excluded from the Study.

2) Talluza Village
As a result of the site survey, it was found that Talluza Village council consists of two areas of Talluza and El Badan although the request by PA includes only the rehabilitation plan for the Talluza area. However, PA side confirmed that the rehabilitation plan for the El Badan area has already been approved by JWC and the plan is ready to be implemented. Therefore, PA side requested the Japanese side to include the El Badan area in the Study. The Team agreed to convey the request from PA to the Japanese authorities concerned.

PA side confirmed that 2 km of the network in the El Badan area is included in Area-C and will take necessary action to obtain the construction permits immediately. Both parties agreed that if above permits are not obtained by the end of September 1999, the part of the El Badan area will be excluded from the Study.

3) Qabalan Municipality
The Team pointed out that there are some water distribution pipelines planned in higher elevation than the water reservoir. PA side requested the Team to consider new water reservoir beside the existing reservoir for those houses. The Team agreed to convey the request from PA to the Japanese authorities concerned.



No.	Name of Mukipality and Village
①	Aqqaba
②	Bala'a
③	Anabta
④	Sebastia
⑤	Talluza
⑥	Qusin
⑦	Qabalan
⑧	Qaqilya
⑨	Azzun
⑩	Ras Atiya
⑪	Haris
⑫	Qibia
⑬	Kharbatha

Location of the Project Sites

Annex – II

Items requested by PA

No.	Municipality and Village	District	Requested Items		
			Construction of Water Transmission and Distribution Pipes		Construction of Water Reservoir
			Diameter (mm)	Length (m)	
1	Aqqaba (v)	Tubas	50～100	9,800	Ground type 300m³
2	Bala'a (m)	Tulkarm	50～100	4,900	—
3	Anabta (m)		50～100	12,610	—
4	Sabastia (m)	Nablus	50～150	9,600	—
5	Talluza (v)		50～100	15,270	—
6	Qusin (v)		50～150	6,930	—
7	Qabalan (m)		50～150	12,100	Ground type 200m³
8	Qalqilia (m)	Qalqilia	200～250	2,300	Ground type 2,000m³
9	Azzun (m)		50～150	13,300	—
10	Ras Atiya (v)		50～150	3,950	—
11	Haris (v)	Salfit	50～100	7,980	Elevated type 300m³
12	Qibia (v)	Ramallah	50～150	12,750	—
13	Kharbatha (v)		50～100	6,350	—

Note : (v) = village, (m) = municipality

Annex-III

Japan's Grant Aid Scheme

1. Grant Aid Procedures

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

Application	(Request made by a recipient country)
Study	(Basic Design Study conducted by JICA)
Appraisal & Approval	(Appraisal by the Government of Japan and Approval by Cabinet)
Determination of Implementation	(The Notes exchanged between the Governments of Japan and the recipient country)

(2) Firstly, the application or request for a Grant Aid project submitted by a recipient country is examined by the Government of Japan (the Ministry of Foreign Affairs) to determine whether or not it is eligible for Grant Aid. If the request is deemed appropriate, the Government of Japan assigns JICA (Japan International Cooperation Agency) to conduct a study on the request.
Secondly, JICA conducts the study (Basic Design Study), using (a) Japanese consulting firm(s).
Thirdly, the Government of Japan appraises the project to see whether or not it is suitable for Japan's Grant Aid Program, based on the Basic Design Study report prepared by JICA, and the results are then submitted to the Cabinet for approval.
Fourthly, the project, once approved by the Cabinet, becomes official with the Exchange of Notes signed by the Governments of Japan and the recipient country.
Finally, for the implementation of the project, JICA assists the recipient country in such matters as preparing tenders, contracts and so on.

2. Basic Design Study

(1) Contents of the Study
The aim of the Basic Design Study (hereinafter referred to as "the Study"), conducted by JICA on a requested project (hereinafter referred to as "the Project") is to provide a basic document necessary for the appraisal of the Project by the Japanese Government. The contents of the Study are as follows:

a) Confirmation of the background, objectives, and benefits of the requested project and also institutional capacity of agencies concerned of the recipient country necessary for the Project's implementation.
b) Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, social and economic point of view.
c) Confirmation of items agreed on by both parties concerning the basic concept of the Project.
d) Preparation of a basic design of the Project
e) Estimation of costs of the Project

The contents of the original request are not necessarily approved in their initial form as the contents of the Grant Aid project. The Basic Design of the Project is confirmed considering the guidelines of Japan's Grant Aid Scheme.
The Government of Japan requests the Government of the recipient country to take whatever measures are necessary to ensure its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization in the recipient country actually implementing the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country through the Minutes of Discussions.

(2) Selection of Consultants

For smooth implementation of the Study, JICA uses (a) registered consultant firm(s). JICA selects (a) firms(s) based on proposals submitted by interested firms. The firm(s) selected carry(ies) out a Basic Design Study and write(s) a report, based upon terms of reference set by JICA.
The consulting firm(s) used for the Study is(are) recommended by JICA to the recipient country to also work on the Project's implementation after the Exchange of Notes, in order to maintain technical consistency.

3. Japan's Grant Aid Scheme

(1) What is Grant Aid?
The Grant Aid Program provides a recipient country with non-reimbursable funds to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for economic and social development of the country under principles in accordance with the relevant laws and regulations of Japan. Grant Aid is not supplied through the donation of materials as such.

(2) Exchange of Notes (E/N)
Japan's Grant Aid is extended in accordance with the Notes exchanged by the two Governments concerned, in which the objectives of the Project, period of execution, conditions and amount of the Grant Aid, etc., are confirmed.

(3) "The period of the Grant Aid" means the one fiscal year which the Cabinet approves the Project for. Within the fiscal year, all procedures such as exchanging of the Notes, concluding contracts with (a) consultant firm(s) and (a) contractor(s) and final payment to them must be completed.
However in case of delays in delivery, installation or construction due to unforeseen factors such as weather, the period of the Grant Aid can be further extended for a maximum of one fiscal year at most by mutual agreement between the two Governments.

(4) Under the Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased.
When the two Governments deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country.
However the prime contractors, namely, consulting, contracting and procurement firms, are limited to "Japanese nationals". (The term "Japanese nationals" means persons of Japanese nationality or Japanese corporations controlled by persons of Japanese nationality.)

(5) Necessity of "Verification"
The Government of recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by the Government of Japan. This "Verification" is deemed necessary to secure accountability to Japanese taxpayers.

(6) Undertakings required of the Government of the Recipient Country
In the implementation of the Grant Aid project, the recipient country is required to undertake such necessary measures as the following:
1) To secure land necessary for the sites of the Project and to clear, level and reclaim the land prior to commencement of the construction.
2) To provide facilities for the distribution of electricity, water supply and drainage and other incidental facilities in and around the sites.
3) To secure buildings prior to the procurement in case the installation of the 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 the facilities constructed and 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 Grant Aid.

(8) "Re-export"

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

(9) Banking Arrangements (B/A)

1) The Government of the recipient country or its designated authority should open an account in the name of the Government of the recipient country in a 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 the Government of the recipient country or its designated authority under the Verified Contracts.

2) 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 Palestinian Interim Self-Government Authority on condition that Japan's Grant Aid is extended.

1. To secure and provide cleared, embanked and leveled land as well as access road for the new water reservoirs, prior to the commencement of the construction for the Project.

2. To support prompt execution for customs clearance of the construction materials and equipment imported to PA under the Grant Aid.

3. To accord Japanese nationals whose services may be required in connection with the supply of products and services under the verified contracts such facilities as may be necessary for their entry into PA and stay therein for the execution of their work.

4. To exempt Japanese nationals from custom duties, internal taxes and other fiscal levies which may be imposed in PA with respect to the supply of the products and services under the verified contracts.

5. To maintain and use the facilities constructed under the Grant Aid properly and effectively and to assign the staff necessary for operation and maintenance for the facilities.

6. To bear all the expenses other than those to be borne by the Grant Aid necessary for the execution of the Project.

7. To bear advising commissions for Authorization to Pay and payment commission to a Japanese bank for the banking services based upon the banking arrangement.

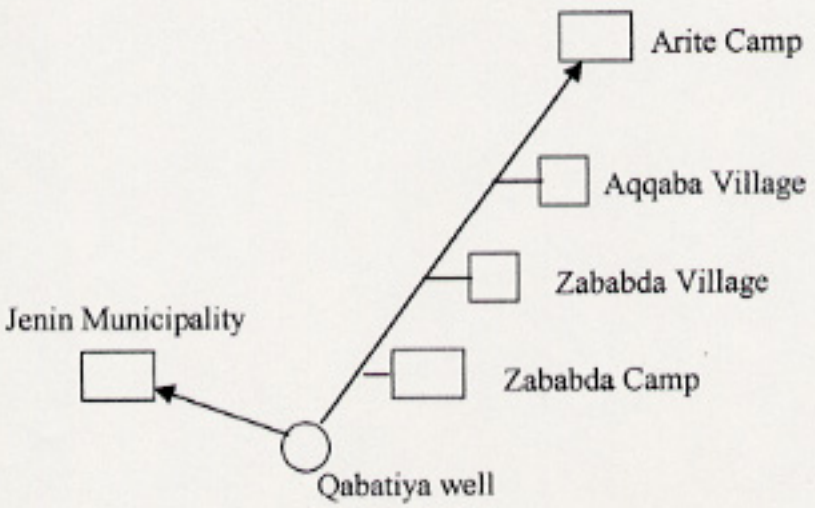
Annex-V

Modification Plan for the Project in Aqqaba Village

1. Present situation of water supply in the village

   Results of site survey conducted on July 12, 1999 with the engineer of PWA are as follows;

   - Head of the Village Council received the Team: Mr. Ezat Ghainam
   - Population: 5,500
   - Water source: Qabatiya Well locating 7 km from the village, ownership of WBWD and operation by Mekorot
   - Water supply by present system: 1,000 m^3 to 1,500 m^3 per month (actual records of consumption 1,160 m^3 in March and 1,890 m^3 in May1999)
   - Reservoir at Aqqaba: 100 m^3 reinforced concrete ground tank and supposed to be used as a surge tank of the line
   - Present water supply line:



2. Problems

   Source of water for Aqqaba Village is Qabatiya well operated by Mekorot. The well is supplying water to Jenin Municipality and Arite Israeri Camp through Aqqaba and other villages and camp. Problem to Aqqaba Village is that the line to Arite camp is operated intermittently, i.e. when the reservoir in Arite camp is filled up, water supply of the line is stopped and resumed when emptied. Since the capacity of the camp reservoir is big (figure is not known), time of water supply is limited but the network in Aqqaba has no storage capacity for 5,000 people except the 100 m^3 surge tank. Consequently the village can receive 1000 m^3 to 1500 m^3 per month that is 6 to 10 litter per capita per day. Therefore unless the water source problem is solved, the rehabilitation of the network has no meaning.

3. Possible measure to be taken

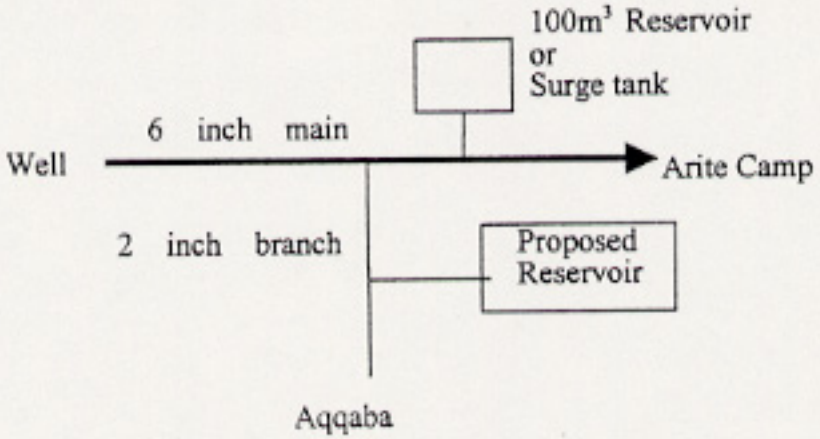
   Qabatyia well is one of the high yield wells in the region with the production of 568,800 m^3

in 1996 and increase of water supply to the line to Aqqaba Village can be considered possible. On this basis there are following two alternative measures considered to solve the problem.

Alternative-A: Changing the operation mode of the line from intermittent operation to continuous operation

Alternative-B: Constructing a reservoir with a capacity of about 300 m^3 (tentative capacity subject to determination by the Study) for Aqqaba Village to secure water source to supply to the network.

Basic concept of the modification of Alternative-B is addition of one reservoir and location of the reservoir in the line is as shown below. The new reservoir shall be connected to the 2-inch branch line to the village. The land for the new reservoir is available just beside the existing tank at the highest part of the village and ground type reservoir can be considered.



Detail design, land acquisition certificate and other necessary documents for the JWC application shall be prepared by PWA and MOLG.