

BASIC DESIGN STUDY REPORT
ON
THE PROJECT FOR OMRANIA WEST
WATER SUPPLY AND SEWER UPGRADING, GIZA CITY
IN
THE ARAB REPUBLIC OF EGYPT

AUGUST 1988

Japan International Cooperation Agency

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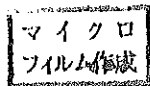


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AUGUST, 1988

Japan International Cooperation Agency



PREFACE

In response to the request of the Government of the Arab Republic of Egypt, the Government of Japan decided to conduct a basic design study on the Project for Omrania West Water Supply and Sewer Upgrading in Giza City, Giza Governorate, and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Egypt a basic design study team, headed by Mr. Takeshi Naruse, First Basic Design Study Division, Grant Aid Planning and Survey Department, JICA, from May 11 to June 19, 1988.

The basic design study team had discussions on the Project with the officials concerned of the Government of Egypt and conducted a field survey in the project area. After the study team returned to Japan, further studies were made, a draft report was prepared and a mission to explain and discuss it, headed by Miss Harumi Kitabayashi, the First Basic Design Study Division, Grant Aid Planning and Survey Department, JICA, was sent to Egypt from August 4 to August 13, 1988. As a result, the present report has been prepared.

I hope that this report will serve for the development of the project and assist in improving the water supply and sewer services of Egypt and contribute to the promotion of friendly relations between two countries.

I wish to express my deep appreciation to the officials concerned of the Government of the Arab Republic of Egypt for their close cooperation extended to the study team.

August, 1988

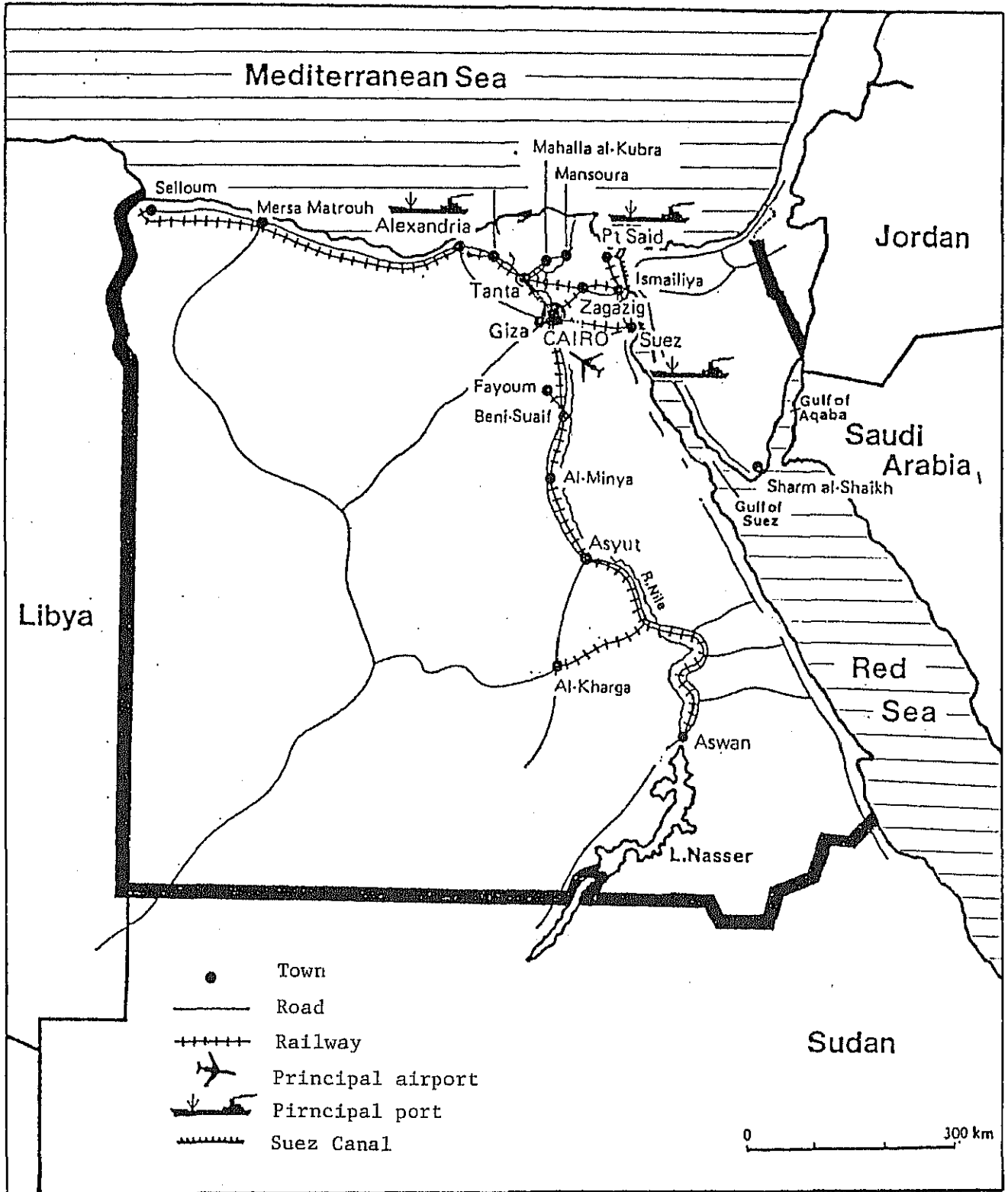


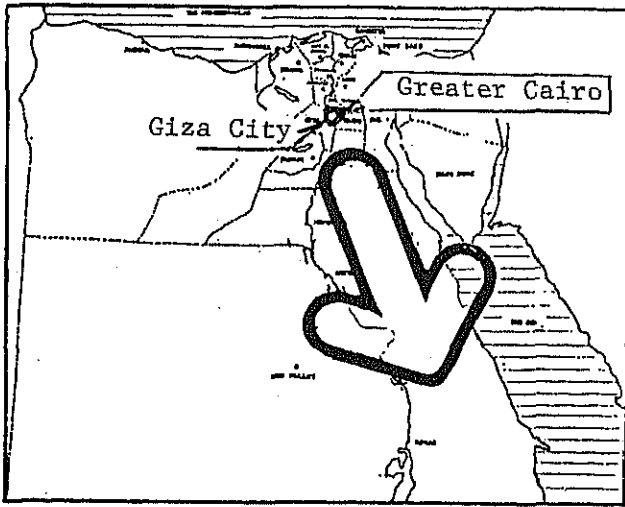
Kensuke YANAGIYA

President

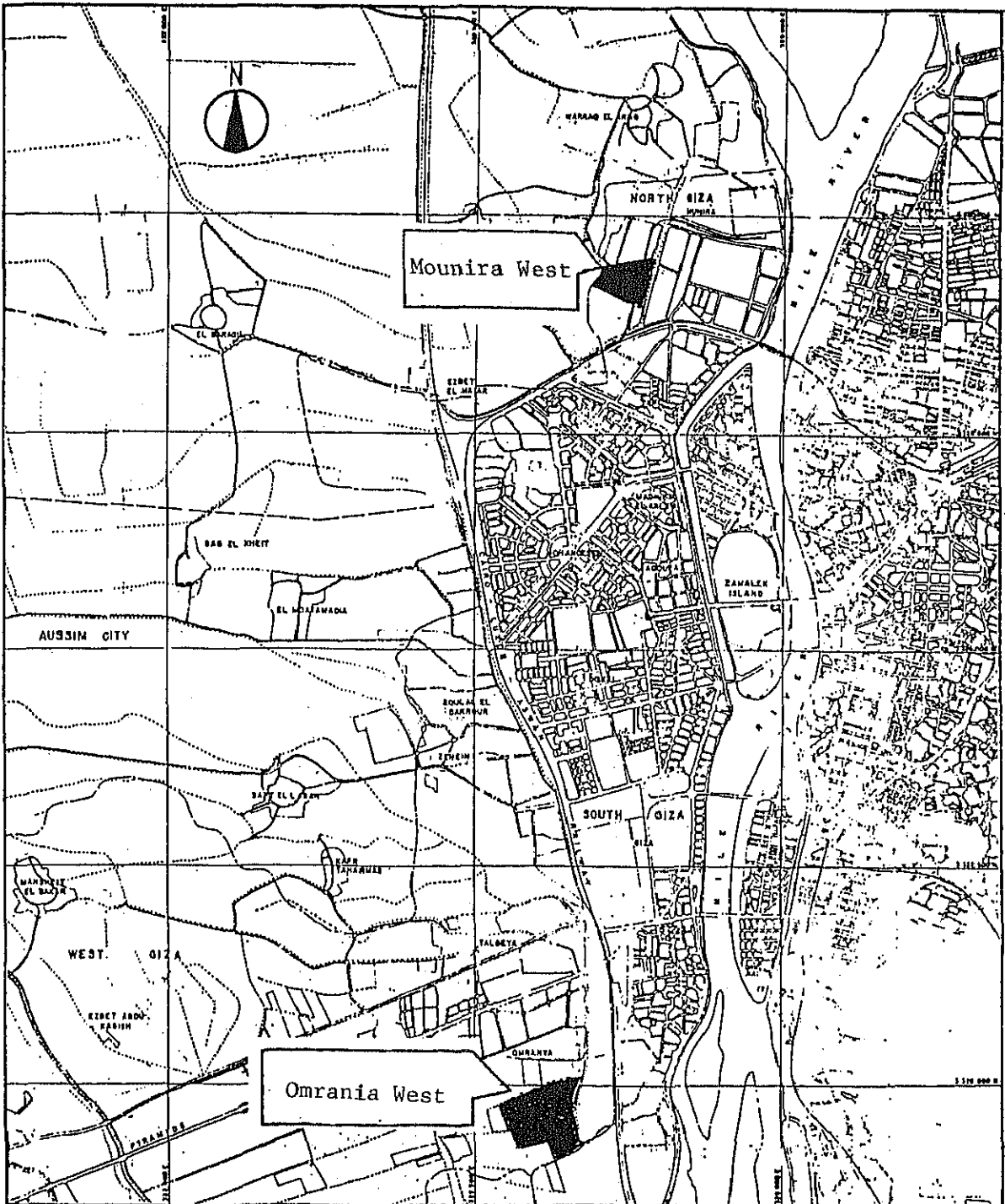
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Map of Egypt





Location Map of Greater Cairo



Location Map of Study Areas

I. OMRANIA WEST



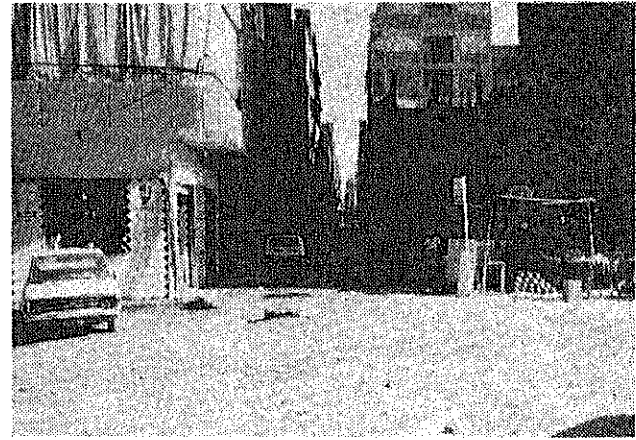
Amina Mohamed Street



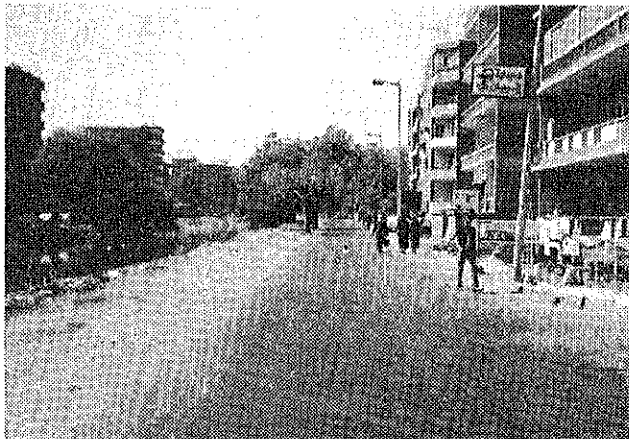
Talatiny Street



Hospital Street



Orouba Street



Zomor Canal Street



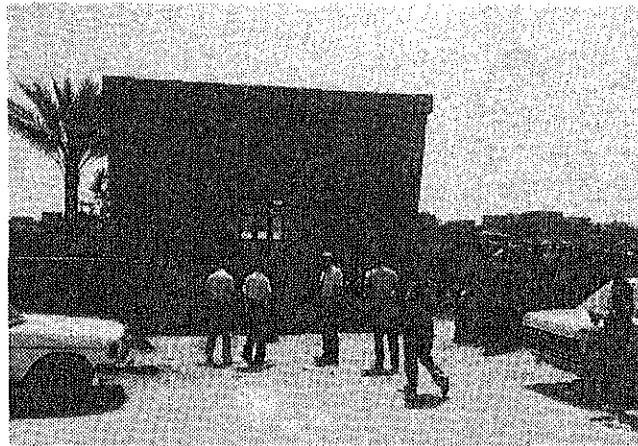
South Side Road of
the Tobacco Factory



Inspection of a Manhole



Longitudinal and Lateral
Profile Surveying



Amina Mohamed Pump Station

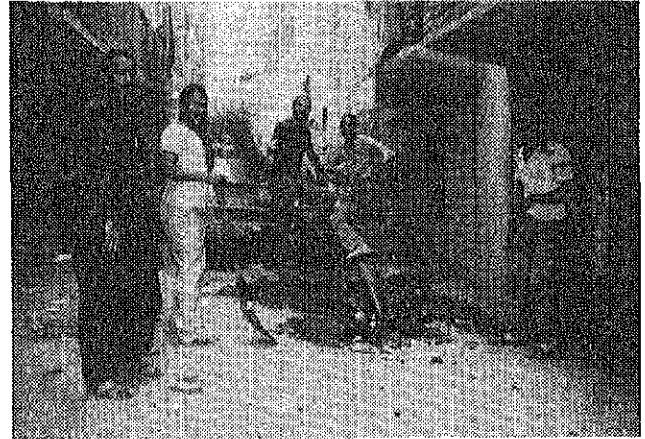
II. MOUNIRA WEST



One of the Streets Running
in the East-West Direction



Water Supply Situation
(at Public Taps)



Sewer Situation
(Septic Tank and Vacuum Vehicle)

SUMMARY

SUMMARY

The National Capital Region of the Arab Republic of Egypt (hereinafter referred to as "Egypt") is composed of the area centered around Cairo City and Giza City, which is generally called by the generic name of "Greater Cairo". Since the early 1960s, the population of the National Capital Region has increased sharply. As of 1986, the Region had become an overcrowded area with a population of about 8,634,000. However, the development of housing, water supply and sewer facilities has lagged behind.

To remedy the situation, the Government of Egypt formulated the first (1982/83 to 1986/87) and the second (1987/88 to 1991/92) five-year socio-economic development plans with emphasis on the improvement of water supply and sewer facilities in the National Capital Region, and are now making efforts to upgrade and strengthen these services.

Giza City in Giza Governorate is greatly behind Cairo City in the development of public infrastructure. This tendency is particularly pronounced in Omrania West and Mounira West, the study areas of this report. Approximately 162,000 people were reported to live in these areas under inferior living conditions as of 1986.

Giza Governorate and Giza City have formulated a master plan and conducted a feasibility study and detail design by obtaining a loan from the International Bank for Reconstruction and Development (World Bank) in order to improve the water supply, sewer facilities and other social infrastructures. As a result of studies, the implementation of the project under a loan was judged to be inappropriate due to the deterioration of Egypt's financial condition and also because of the low return of investment in water supply and sewer facilities improvement.

However, improvement of the living environment in these two areas is an urgent and critical problem for Giza Governorate and Giza City.

Under these circumstances, Giza City, through the Government of Egypt, requested the Government of Japan to provide grant aid for the project for Omrania West and Mounira West Water Supply and Sewer Upgrading, Giza City.

In response to the request of Egypt, the Government of Japan decided to conduct a basic design study, and entrusted the study to the Japan International Cooperation Agency (JICA). JICA sent to Egypt a Basic Design Study Team to prepare the basic design of the project from May 11 to June 19, 1988.

In consultation with Egyptian officials, the study team conducted a field survey which consists of a collection of relevant information on the Development Plan of Egypt, an observation and an evaluation of present water supply and sewer facilities in both areas of Omrania West and Mounira West, a topographical survey along water supply and sewer pipeline routes, a study on existing conditions of the study areas, operation and maintenance of the existing facilities, availability of construction equipment, etc. In Japan, the study team compiled the optimum basic design as the results of this field survey.

On examining the feasibility of the implementation for both areas under the present circumstance, the study team decided the Project Area to be Omrania West. Therefore all mention of "the Project" or "this Project" means the Project for Omrania West Water Supply and Sewer Upgrading.

The construction of water supply and sewer main line and the provision of the necessary materials and equipment are briefly described below.

Scope of the Project

1. Project Area	Omrania West, Giza City, Giza Governorate
2. Water supply main line construction plan	
(1) Planned extension	About 4.7km
(2) Pipe diameter	600mm
(3) Pipe material	Ductile cast iron pipe
3. Sewer main line construction plan	
(1) Planned extension	About 2.2km
(2) Pipe diameter	1,200mm
(3) Pipe material	Centrifugal reinforced concrete pipe
4. Plan for provision of materials for water supply branch pipeline	
(1) Planned extension	11.5km
(2) Pipe diameter	100 to 400mm
(3) Pipe material (Diameter 100 to 300mm)	PVC pipe, PVC fittings and valves, etc.
(4) Pipe material (Diameter 400mm)	Ductile cast iron pipe, ductile cast iron fittings and valves, etc.
5. Plan for provision of materials for sewer branch pipeline	
(1) Planned extension	3.9km
(2) Pipe diameter	175 to 375mm
(3) Pipe material	Vitrified clay pipe
6. Plan for Amina Mohamed Pump Station with grit and trash removing equipment	
(1) Sedimentation basin	2 channels (about 1.8m wide x 11.0m long x 5.5m deep)
(2) Automatic grit removing equipment	1 unit (travelling type sand pump)
(3) Automatic trash removing equipment	2 units (rake type trash remover)
(4) Ancillary equipment	1 set
7. Plan for the provision of sewer pipeline cleaning equipment	
(1) High pressure jet cleaning vehicle	2 units
(2) Vacuum vehicle	2 units

The study team judged that Japan's grant aid project for Mounira West cannot be planned under the present conditions as it must be coordinated with USAID's sewer project which is already scheduled but for which details are unknown. Accordingly, this basic design study will only include the detail technical recommendations for implementing the water supply and sewer facilities improvement in Mounira West.

In this report, the plan for upgrading the water supply and sewer facilities in Omrania West is only presented. This is reinforced with the fact that Giza City has a definite improvement plan for this area and a budget for branch pipeline installation work. It is recognized that the project has an urgency of the implementation. It is also expected that the project will render immediate results as the relevant infrastructures in the vicinity already exist.

Principal undertakings for the Project for which the cost must be borne by the Egyptian side are; securing of sites for construction, temporary office, etc., and laying of branch lines. The roughly estimated cost is 640,000 LE for Phase I and 1,000,000 LE for Phase II.

The Project will consist of following Phases, the contents of which are as follows:

(1) Phase I

- 1) Construction of water supply main line (pipe diameter 600mm x extension about 1.8km), an aqueduct (pipe diameter 600mm x length about 19m) and the connecting work with the existing water supply main line (at 3 connecting points)
- 2) Construction of sewer main line (pipe diameter 1,200mm x extension about 0.8km)
- 3) Construction of 1 sedimentation basin with 2 channels at the Amina Mohamed pump station

- 4) Provision of materials for water supply branch pipelines (pipe diameter 100 to 400mm x extension 4.9km)
- 5) Provision of materials for sewer branch pipelines (pipe diameter 175 to 375mm x extension 1.3km)
- 6) Provision of sewer pipeline cleaning equipment (high pressure jet cleaning vehicle x 2 units, vacuum vehicle x 2 units)

(2) Phase II

- 1) Construction of water supply main line (pipe diameter 600mm x extension about 2.9km)
- 2) Construction of sewer main line (pipe diameter 1,200mm x extension about 1.4km)
- 3) Installation of grit and trash removing equipment at the sedimentation basins for Amina Mohamed pump station
- 4) Provision of materials for water supply branch pipelines (pipe diameter 100 to 400mm x extension 6.6km)
- 5) Provision of materials for sewer branch pipelines (pipe diameter 175 to 375mm x extension 2.6km)

After coming into effect of Exchange of Notes (hereinafter referred to as "E/N"), the construction period including detail design and tendering will be as follows:

Phase I : 14 months

Phase II: 15 months

Total 29 months

Giza City will be responsible for the Project implementation and will undertake the acquisition of all construction sites and

access roads necessary for construction by the date agreed upon, and make all possible efforts to maintain liaison and coordination with Ministries, agencies and other authorities concerned of the Egyptian Government in cooperation with the Japanese side for smooth Project implementation.

It is expected that the implementation of this Project will liberate the inhabitants in Omrania West from the current inferior and unsanitary environment, protect their lives, advance their health, promote the execution of sound city planning and the construction of urban facilities, and thereby contribute greatly to the stabilization and improvement of the inhabitants lives. Therefore, it is quite appropriate to implement this project which comprises the construction of water supply and sewer facilities and the provision of necessary materials and equipment under Japan's grant aid.

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ABBREVIATIONS

AD	DATUM LEVEL AT ALEXANDRIA
AWWA	AMERICAN WATER WORKS ASSOCIATION
DIN	DEUTSCHE NORMEN
E/N	EXCHANGE OF NOTES
FRP	FIBERGLASS REINFORCED PLASTIC
GDP	GROSS DOMESTIC PRODUCT
GNP	GROSS NATIONAL PRODUCT
ha	HECTARE
ISO	INTERNATIONAL ORGANIZATION FOR STANDARDIZATION
JICA	JAPAN INTERNATIONAL COOPERATION AGENCY
JIS	JAPAN INDUSTRIAL STANDARD
LE	EGYPTIAN POUND
OECD	THE OVERSEAS ECONOMIC COOPERATION FUND
PVC	POLY-VINYL CHLORIDE

CHAPTER 1
INTRODUCTION

CHAPTER 1 INTRODUCTION

Omrania West and Mounira West in Giza City are where approximately 162,000 people live as of 1986 under inferior living conditions due to insufficient provision of public infrastructure caused by being excluded from city planning and the rapid increase of population. Giza Governorate and Giza City considered the situation to be serious and formulated a master plan, conducted a feasibility study and detailed design for the areas by obtaining a loan from the World Bank, (hereinafter referred to as "World Bank Loan Project") in order to improve the water supply, sewer facilities and other social infrastructures in both areas. The implementation of the project under the loan was judged to be inappropriate due to the deterioration of Egypt's financial condition and also because of the low return on investment in water supply and sewer facilities improvement.

Upgrading of the living standard and improvement of infrastructure in both areas are critical and urgent problems for Giza Governorate and Giza City.

Under these circumstances, Giza City, through the Government of Egypt, requested the Government of Japan to provide grant aid for the Project for Omrania West and Mounira West Water Supply and Sewer Upgrading, Giza City including the provision of piping materials for branch lines and pipe cleaning equipment.

In response to the request of Egypt, the Government of Japan decided to conduct a basic design study and entrusted the study to the Japan International Cooperation Agency (JICA). JICA sent to Egypt a Basic Design Study Team (refer to Appendix II), headed by Mr. Takeshi Naruse, First Basic Design Study Division, Grant Aid Planning and Survey Department, JICA, from May 11 to June 19, 1988.

The objective of this study was to precisely evaluate the existing condition of the water supply and sewer facilities in both areas i.e., Omrania West and Mounira West, and examine the viability of the proposed project and the effects of Japan's grant aid to these areas.

The study team evaluated the feasibility of the implementation for improving the existing water supply and sewer facilities in both areas, and carried out longitudinal and lateral profile levelling of the planned route for the water supply and sewer facilities project in Omrania West.

The study team had discussions with Egyptian officials regarding the background of the request and the objectives of the Project and carried out the field survey. The results of discussions are shown in Appendix I; Minutes of Discussions and Appendix VIII; Field Report.

On examining the feasibility of the implementation for both areas under the present circumstance the study team decided the Project Area to be Omrania West.

The study team prepared this Basic Design Study Report on the Project for Omrania West Water Supply and Sewer Upgrading, Giza City, Giza Governorate. The Report is based upon full consideration of the actual situation of existing water supply and sewer facilities, topographical and geological features and ground water level, condition of maintenance and management, and the Project contents and scale. For Mounira West detailed technical recommendations for implementing the water supply and sewer facilities are included in this Report.

CHAPTER 2
BACKGROUND OF THE PROJECT

CHAPTER 2 BACKGROUND OF THE PROJECT

2-1 Existing Condition of Water Supply and Sewer Facilities Services

2-1-1 Existing Conditions and their Related Problems

(1) Water Supply Facilities

Fig. 2-1 shows the position of the water supply facilities improvement project for Omrania West and Mounira West in the Giza City Water Supply Improvement Program and the Greater Cairo Water Supply Improvement Program.

1) Omrania West

The existing condition and problems of water supply facilities in Omrania West are as follows:

- a) Major water works and water supply main line networks from which water is supplied to Omrania West area are as shown on Fig. 2-2.
- b) This Project area mostly belongs to the water supply district of South Giza Water Works, whose supply capacity in 1986 was 226,000 m³/day.
- c) The pipe diameter of the existing water supply main line to this area has not been determined on the basis of the planned quantity of water supply. Therefore, the pipe diameter is too small to convey the currently required quantity of water.
- d) The water supply main lines in this Project area are mostly asbestos pipes. Considerable portions of the water supply branch pipes which were laid 10 to 15 years ago are already damaged.
- e) According to the World Bank Loan Project the rate of leakage is as high as 40%.
- f) A considerable number of water supply branch pipes in this area are dead-ended. The pipes do not form a closed circuit network.

- g) According to the Study of Water Supply for City of Giza financed by West Germany (hereinafter referred to as "West German Project Report") about 7.2% of the inhabitants receive only about 20 liters per head per day of water supply from public water taps, and about 28.6% of the inhabitants receive only about 95 liters per capita per day of water supply from domestic outlets.
- h) Water sometimes fails to reach the taps of dwellings on the upper stories during the daytime when the water supply pressure is low.
- i) Fire hydrants have not been installed, which is dangerous.

2) Mounira West

The existing condition and problems of water supply facilities are approximately similar to those in Omrania West. The situations in this area are as follows:

- a) Major water works and water supply main line networks from which water is supplied to Mounira West are as shown on Fig. 2-2.
- b) This area mostly belongs to the water supply district of Embaba Water Works, whose supply capacity in 1986 was 115,000 m³/day.
- c) The pipe diameter of the existing water supply main line to this project area has not been determined on the basis of the planned quantity of water supply. Therefore, the pipe diameter is too small to convey the currently required quantity of water.
- d) The water supply pipes and branch supply pipes are mostly asbestos pipes which were laid many years ago and therefore considerably damaged. Water supply branch pipes for only about 30% to 40% of the required have been laid.
- e) About 60% to 70% of the inhabitants do not receive direct water supply.
- f) According to the World Bank Loan Project the rate of leakage is as high as 40%.

- g) A considerable number of water supply branch pipes are dead-ended. The pipes do not form a closed circuit network.
- h) Water sometimes fails to reach the taps of dwellings on the upper stories during the daytime when the water supply pressure is low.
- i) Fire hydrants have not been installed, which is dangerous.

(2) Sewer Facilities

The position of the sewer facilities improvement project in the Greater Cairo Waste Water Project is shown on Fig. 2-3.

1) Omrania West

Of the sewer facilities in Omrania West, the existing condition and problems of sewer pipes are as follows:

- a) The flow of drainage from existing sewer facilities is as shown on Fig. 2-4.
- b) Approximately 94% of homes in this Project area discharge sanitary sewage to the sewer system.
- c) The sewer pipelines in the Project area were not laid with any systematic planning but laid everytime the urban district was expanded. Some pipes buried underneath narrow streets were laid in 2 rows.
- d) Some of the sewer pipes were officially laid, but others were laid privately by the inhabitants, many of them without regard for technical standards. For instance, at the school, the sewer pipes were laid as far as the public sewer pipeline but sewage cannot drain into it because the invert levels of public sewer pipelines are much higher than the invert levels of the privately laid pipelines, and the sewage has to drain into cesspits.
- e) Sewage is seen overflowing over streets in the upstream zone (particularly in areas south of Hospital Street). Because of this, several dwellings have jointly set up cesspits and have the vacuum vehicle remove the sewage 2 or 3 times a week. The charge for this service is 15 LE to 30

LE per service which is a heavy burden on the inhabitants in this area whose income level is low.

f) Conceivable causes of overflowing are the following.

- Existing flow capacity is about 70% of that required at terminal portions of sewer mains near Amina Mohamed pump station. The pipe diameter is 175 to 500mm which is too small.
- About 50% of the existing sewer pipes are overloaded.
- Sewage is concentrated in certain routes as the pipelines were not laid with any systematic planning
- Some of the privately laid pipes are either inversely graded, the downstream side being higher than the upstream side, or damaged.

The current condition and problems of the existing Amina Mohamed pump station are as follows:

- a) The existing Amina Mohamed pump station does not have a sedimentation basin or any mechanical equipment to remove grit and trash.
- b) When removing grit and trash, the valve on the inflow pipe has to be manually closed and the sewage in the pump well drained by a portable pump to remove the grit and trash manually.
- c) Grit and trash removing work is done about twice a month at night, spending 2 or 3 hours each time with 5 workers. As there is only one pump well, the pump station must stop operating during this work.
- d) Grit and trash removed are piled up and left abandoned in the open vacant lot within the premises of the pump station. They are unsanitary, as they generate offensive odor and are the cause for the occurrence of mosquitoes and flies.

- e) The existing pump well has a rectangular opening and a circular opening but does not have any space for installing new grit and trash removing equipment.

2) Mounira West

The current condition of the sewer facilities in Mounira West is as follows:

- a) Mounira West area is totally lacking in any public sewer facility.
- b) All dwellings use the cesspits, one for each group consisting of several dwellings, which are emptied by vacuum vehicle about twice a week. The charge is 15 LE to 30 LE per service which is a heavy burden on the inhabitants of this project area whose income level is low.
- c) The number of cesspits in this project area is about 2,000 according to the World Bank Loan Project. Cesspits are installed underneath the road but overflow and create an extremely unsanitary situation. As there are so many cesspits, it would be costly and time consuming to remove them in order to lay new water supply and sewer branch pipes.

2-1-2 Water Supply and Sewer Services and Foreign Aid

(1) Water Supply and Sewer Services

Operation and maintenance of water supply facilities in Greater Cairo, including Cairo Governorate and Giza Governorate, are undertaken by the General Organization for Greater Cairo Water Supply. Operation and maintenance of sewer facilities are undertaken by the General Organization for Greater Cairo Sanitary Drainage. Both organizations are under the jurisdiction of the Ministry of Housing and Utilities. Fig. 2-5 and Fig. 2-6 are the respective organizational charts of the aforesaid two organizations.

The existing manpower for operation and maintenance of the water supply service is about 2,390, while for the sanitary drainage service in Giza City, about 250 is assigned to Zenein Waste Water Treatment Plant, about 750 to all pump stations, and about 500 to pipelines. Almost all operation and maintenance works of pipelines are carried out manually.

(2) Foreign Aid

Foreign aid projects for the water supply and sewer facilities improvement programs now in progress on the west bank (on the Giza side) of the Nile River are as follows:

1) Water supply facilities

The development plan for Water Supply for Giza City which aims for the target year of 2000 is now in progress under aid of West Germany. The project is scheduled for completion by 1992.

2) Sewer facilities

The Rehabilitation and Expansion of the Cairo Waste Water System (West Bank Project) which aims for the target year of 2010 is now in progress under USAID (hereinafter referred to as "West Bank Waste Water Projects"). The project is scheduled for completion by 1992.

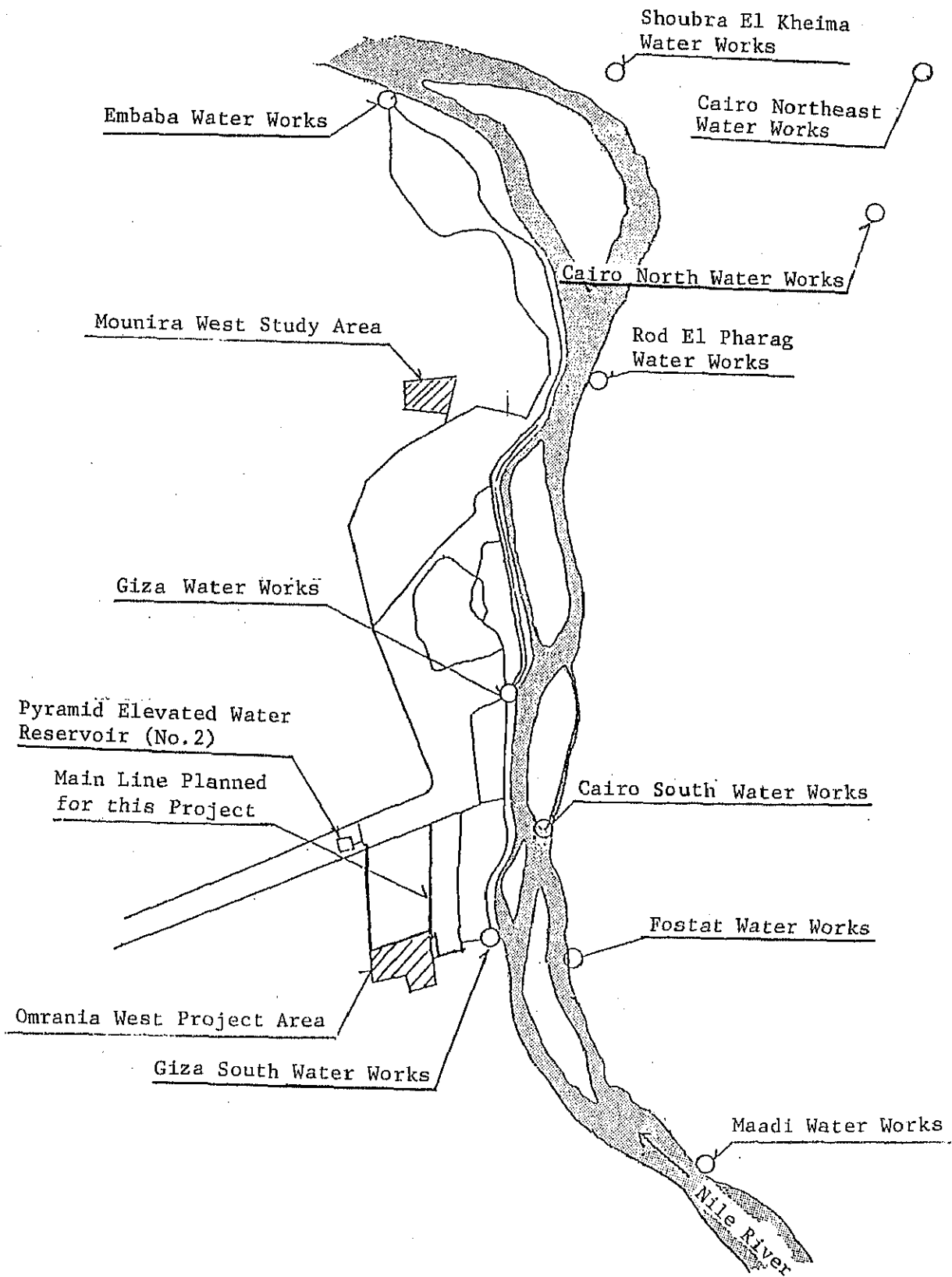


Fig. 2-1 Position of Giza City Water Supply Improvement Program, Greater Cairo Water Supply Improvement Program and the Study Areas

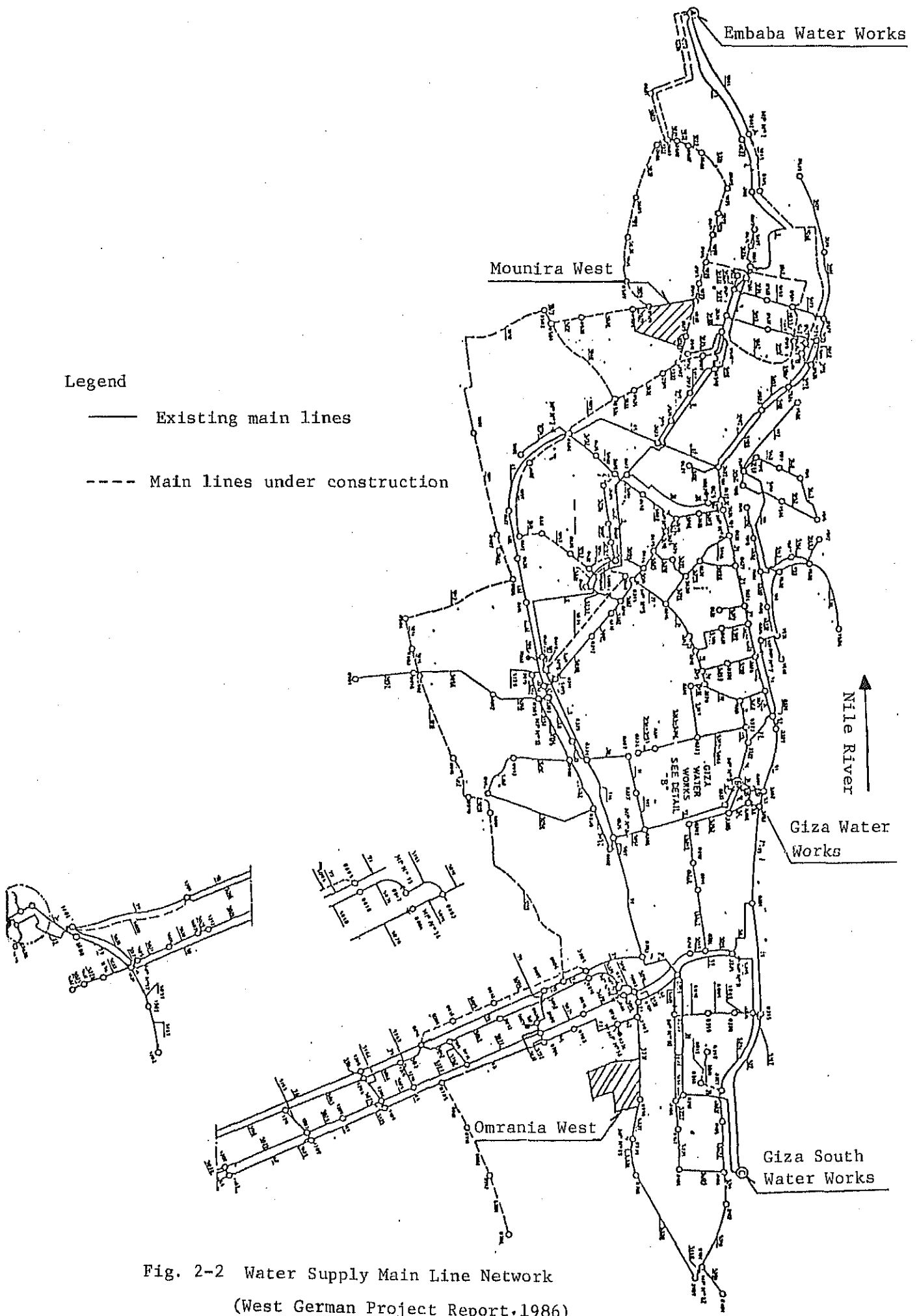


Fig. 2-2 Water Supply Main Line Network
 (West German Project Report, 1986)

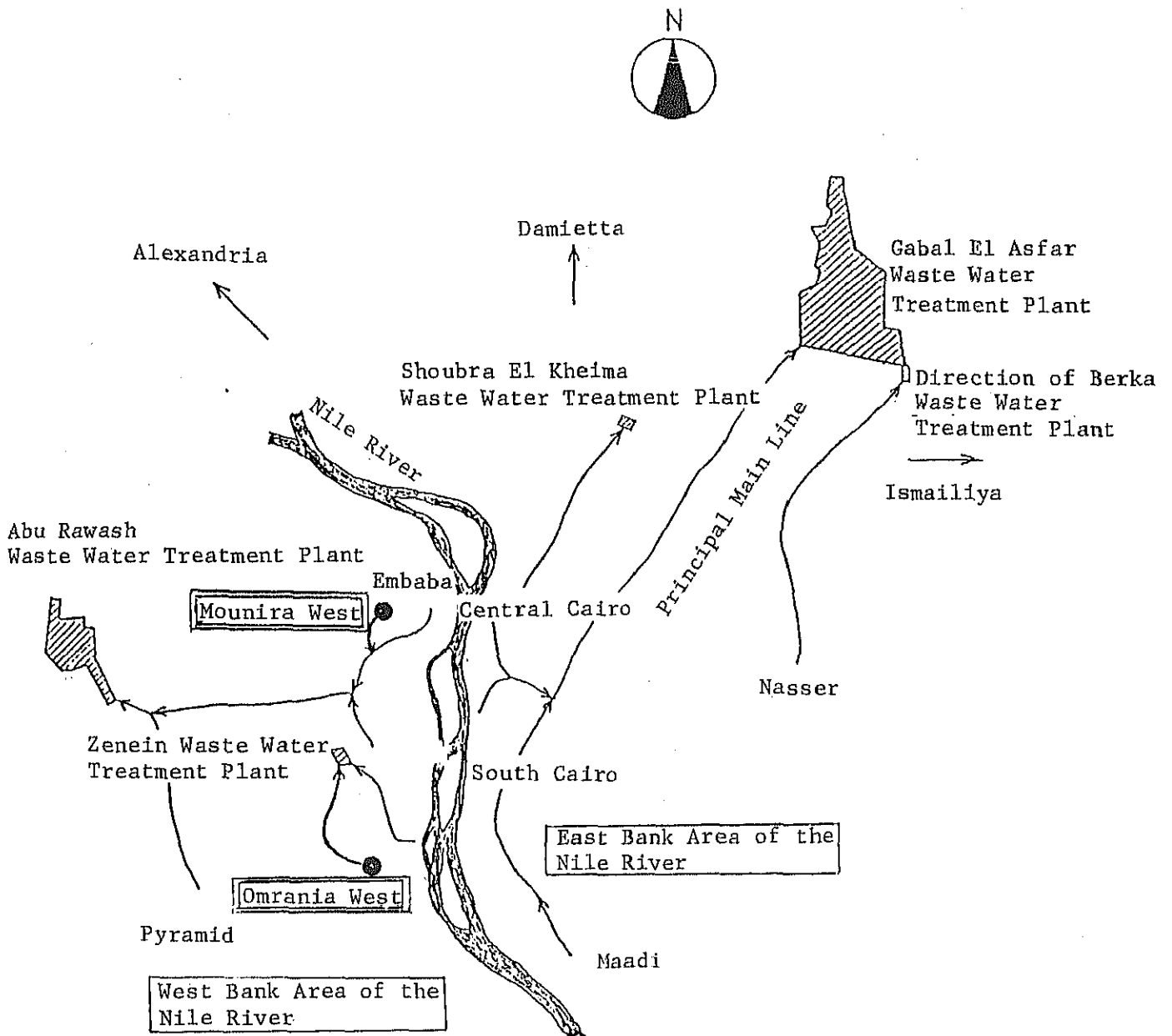


Fig. 2-3 Position of the Greater Cairo Sewer System Program and the Study Areas

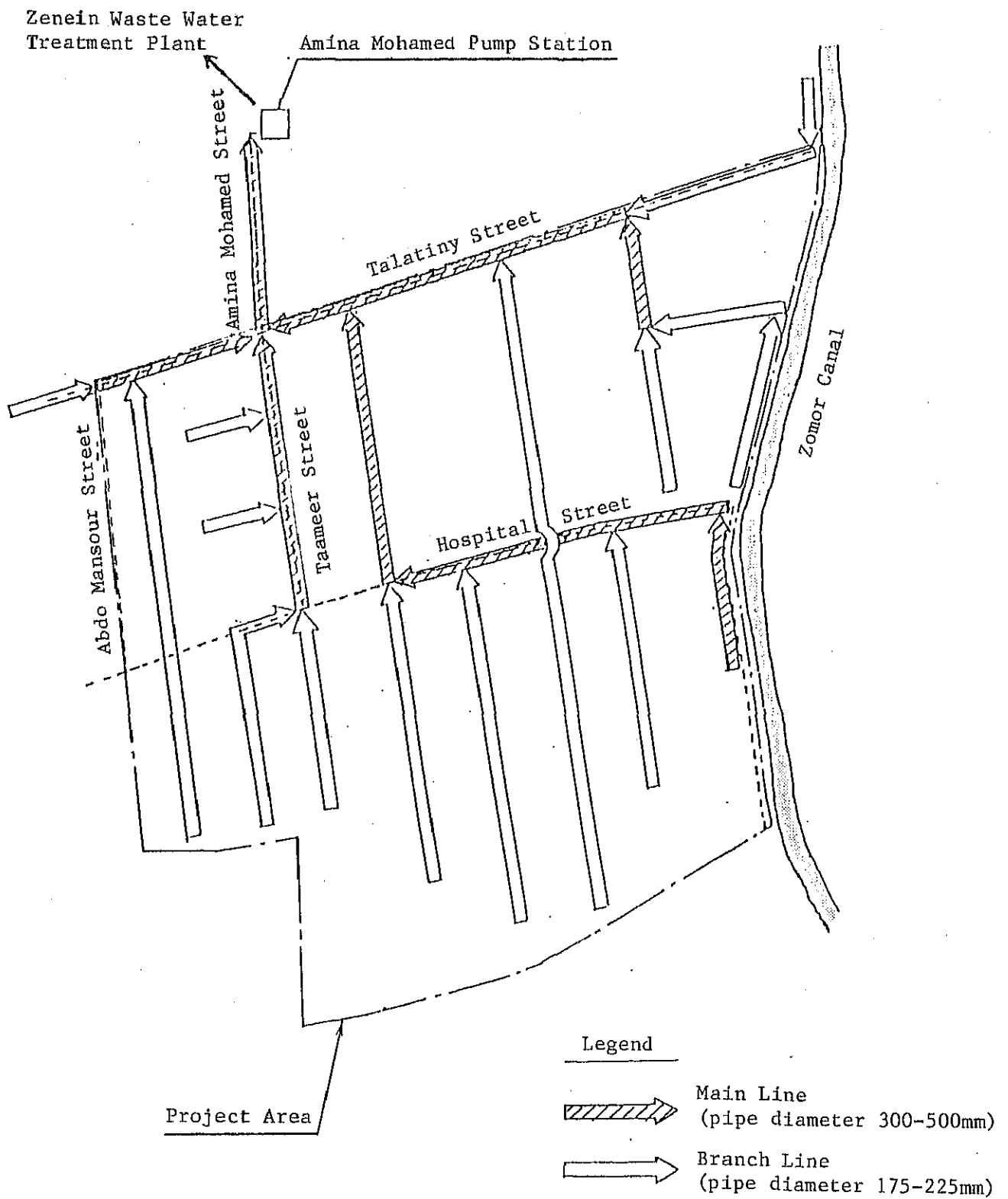


Fig. 2-4 Drainage Route of Existing Sewer Facilities in Omrania West

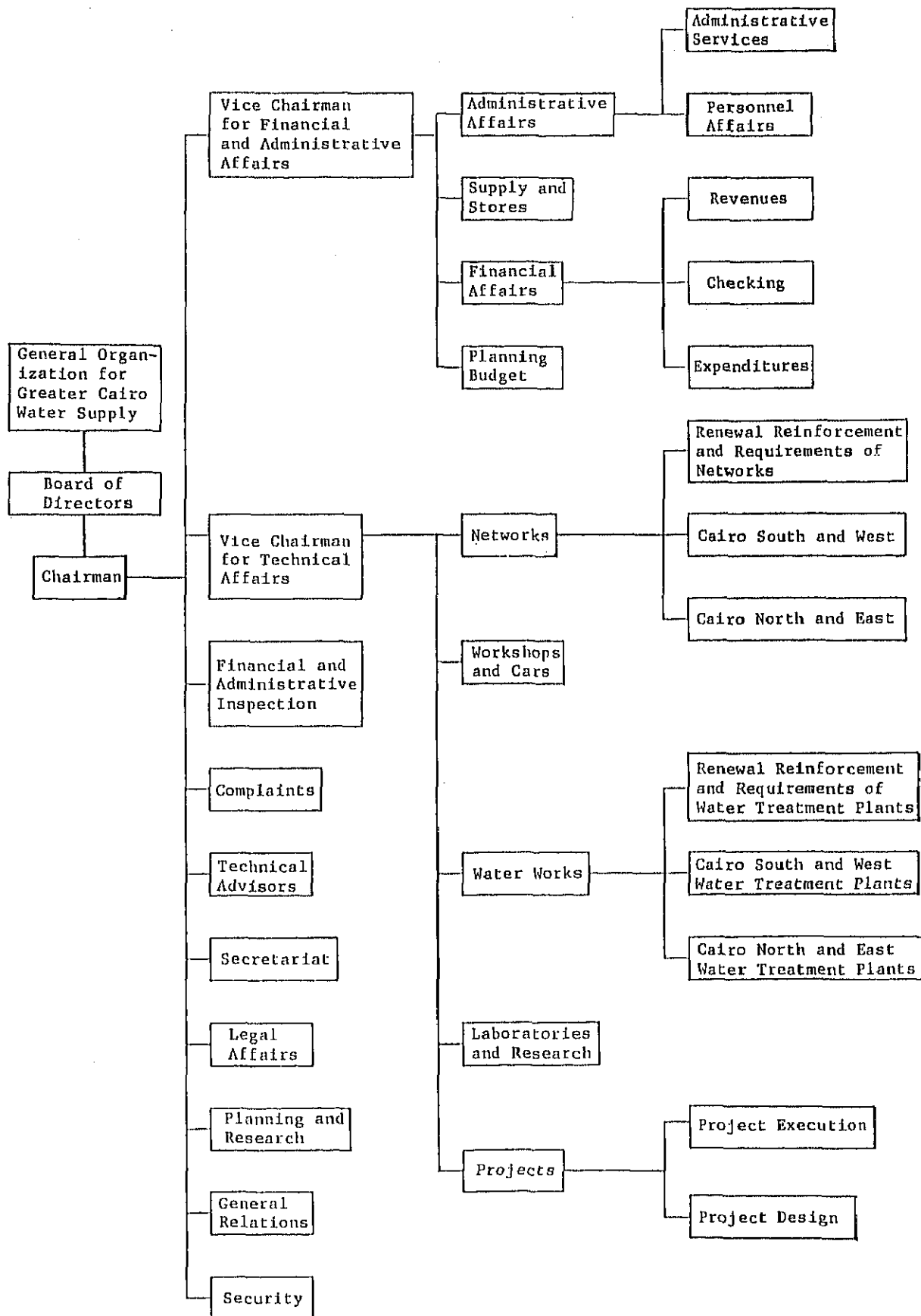


Fig. 2-5 Organization Chart of the General Organization for Greater Cairo Water Supply

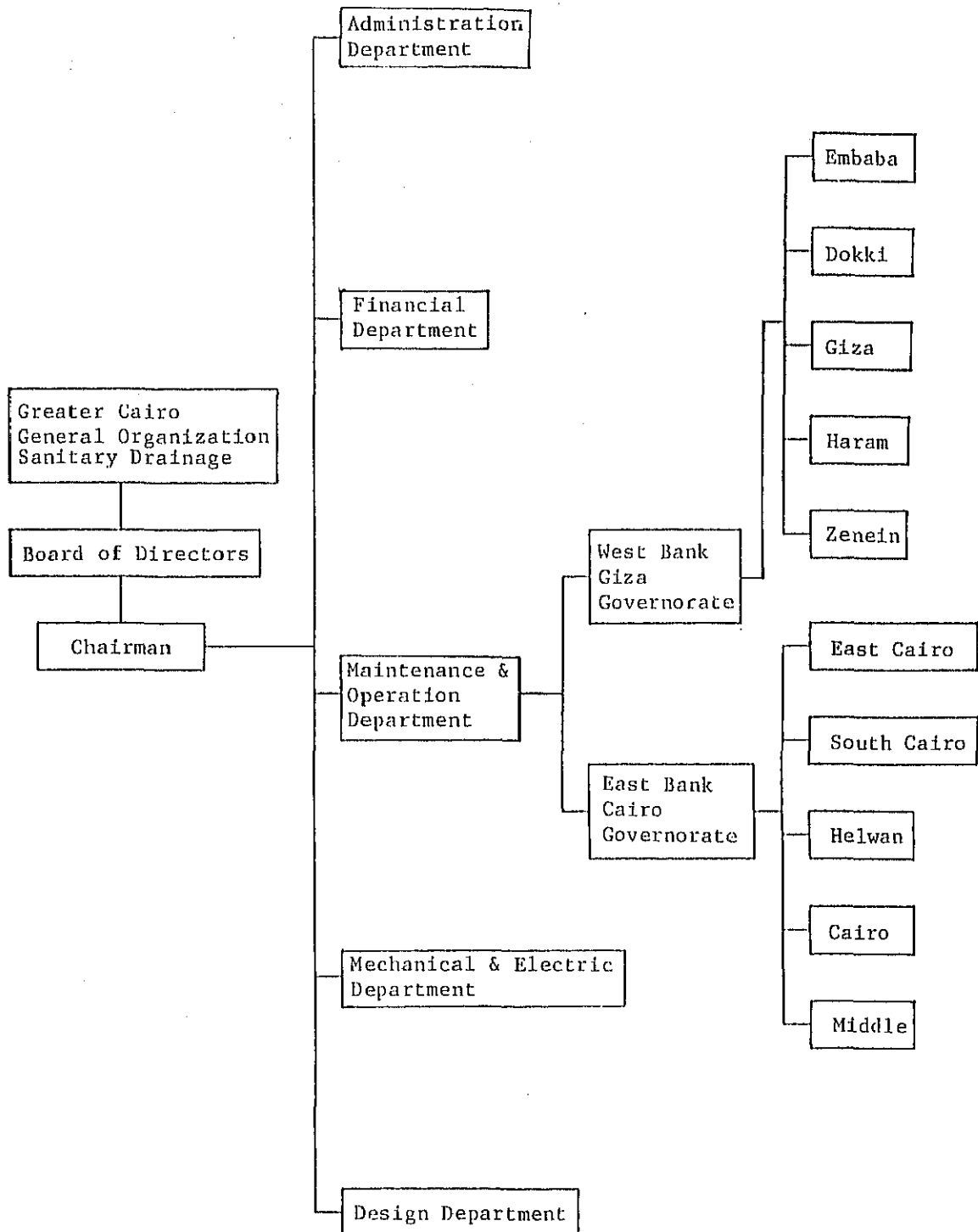


Fig. 2-6 Organization Chart of the General Organization for Greater Cairo Sanitary Drainage

2-2 Outline of Related Development Projects

2-2-1 Development Projects Related to Greater Cairo

(1) Water Supply Facilities

For Greater Cairo, Greater Cairo Water Supply Improvement Project (Phase 3) under Japanese financial cooperation (hereinafter referred to as OECF Loan Project) was scheduled for implementation, but the project is suspended at the moment as the Government of Egypt set forth the policy that low profitability projects shall not be implemented under a loan agreement.

The Water Supply for City of Giza Improvement Project, on the other hand, is in progress under the aid of West Germany.

The following briefly describes the aforesaid two projects.

1) Greater Cairo Water Supply Improvement Project (Phase 3)

a) Construction of water supply main lines

- Fostat main line

Pipe diameter : 1,400mm

Pipeline extension: 12.5km

- Helwan main line

Pipe diameter : 600 to 1,000mm

Pipeline extension: 10.8km

b) Construction of reservoir tanks

- Gabar El Ahmal : 2 units (20,000m³ x 2 units)
reservoir

- Maadi reservoir : 1 unit (15,000m³)

- Hadig Helwan reservoir: 1 unit (10,000m³)

2) Water Supply for City of Giza Improvement Project

This water supply improvement project, which aims for increasing the water supply capacity in Giza City by the target year of 2000, is in progress under the aid of West Germany. The water supply capacity and water pressure in the

target year will be as shown on Fig. 2-7 and 2-8. The contents of this improvement project are as follows.

- a) In order to secure the necessary quantity of water supply in the year 2000, existing water works (Embaba, Giza, South Giza Water Works and Zuri, Ahram well field) will be renovated or improved and expanded by 1992, by which time the current water supply capacity (514,000 m³/day) will be increased to 1,182,500 m³/day.
- b) By renovation and improvement of existing water supply pipes, the rate of leakage which now stands at about 30% will be reduced to 22.5% by 1990 and 15% by year 2000.
- c) In order to enhance the water supply availability, the distributing networks will be extended.

By implementing measures a) and b) above, the water pressure of Pyramid Elevated Water Reservoir (No.2), (AD + 49.09m) in 1986 will be raised to AD + 52.45m above sea level by the year 2000.

(2) Sewer Facilities

One of the sewer improvement projects in Greater Cairo is the Rehabilitation and Expansion of the Cairo Waste Water System which began in 1985. Construction and improvement of sewer facilities on a large scale are under way by USAID on the west bank (West Bank Project), and by the aid of Great Britain on the east bank (East Bank Project) of the Nile River. Brief description of these projects is as follows.

1) West Bank Project

The sewer facilities improvement project on the west bank of the Nile River under USAID mainly consists of the following, and is scheduled for completion by 1992.

- a) Construction of a sewer main in Embaba district
(scheduled for completion by 1991)

This district includes Mounira West, and the sewer main lines in its surroundings are to be constructed. The improvement of branch lines, however, is not included.

- b) Construction of sewer mains between Bourac and Abu Rawash
- c) Construction of Embaba, Bourac, South Muheit, Junction, and Abu Rawash booster pump stations (5 stations)
- d) Construction of sewer main line between South Giza and Zenein and Zenein booster pump station.
- e) Construction of sewer main line between Kom Bakar and Abu Rawash
- f) Construction of Pyramid booster pump station
- g) Construction of Abu Rawash waste water treatment plant
- h) Modification and improvement of Zenein waste water treatment plant

2) East Bank Project

The sewer facilities improvement project on the east bank of the Nile River under aid of Great Britain mainly consists of the following, and is scheduled for completion by 1990.

- a) Construction of principal sewer main line

This sewer main line is designed to have a pipe diameter of 4 to 5m and is to be constructed by the tunnel method. It is to be a main line extending for about 16km between the bank of the Nile River in Cairo City and the new Gabal El Asfar waste water treatment plant scheduled for construction in the northeast.

- b) Construction of sewer main line in Maadi
- c) Construction of sewer main in Nasr City
- d) Construction of Berka waste water treatment plant

- e) Construction of Shoubra El Kheima waste water treatment plant
- f) Construction of Gabal El Asfar waste water treatment plant

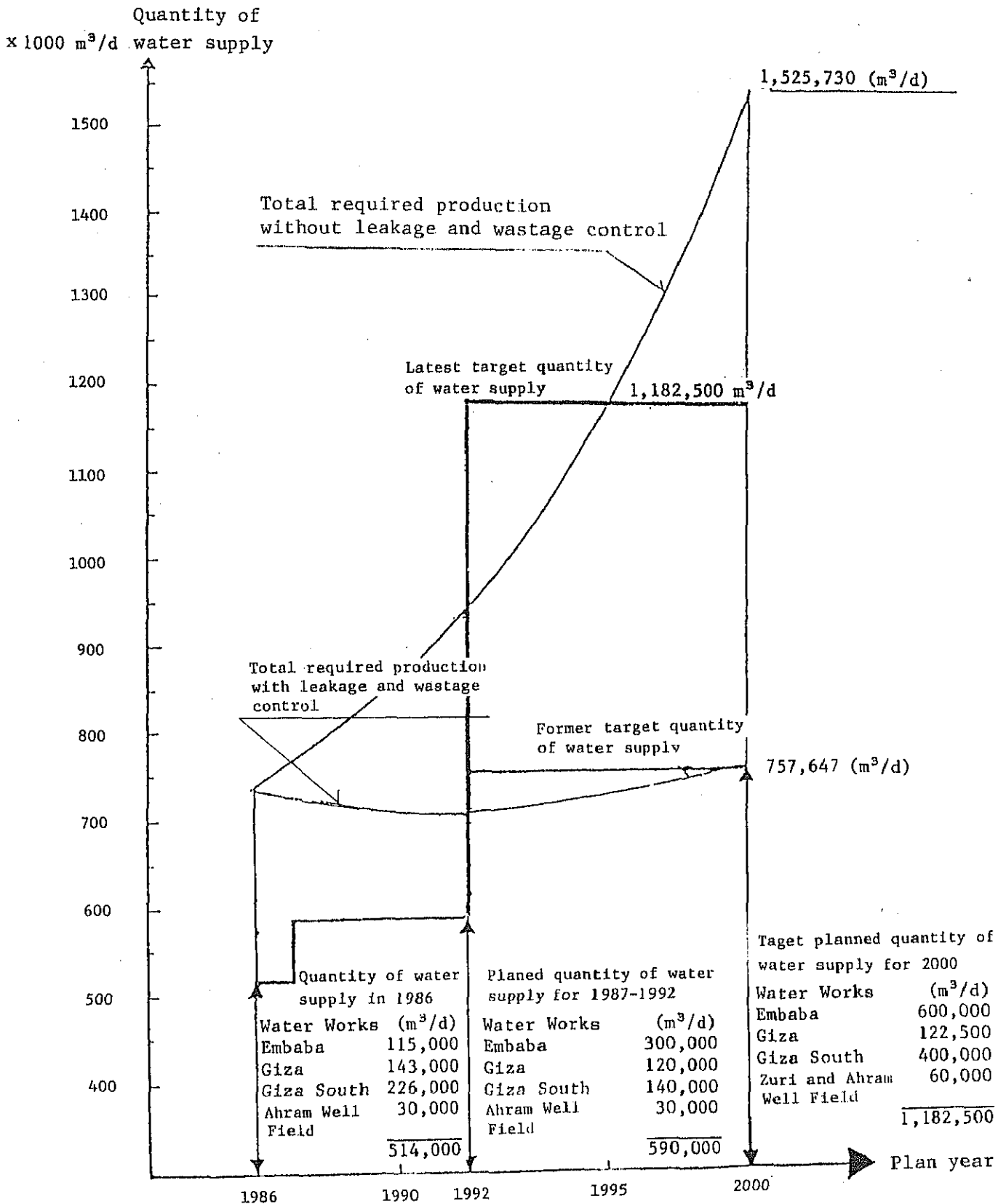
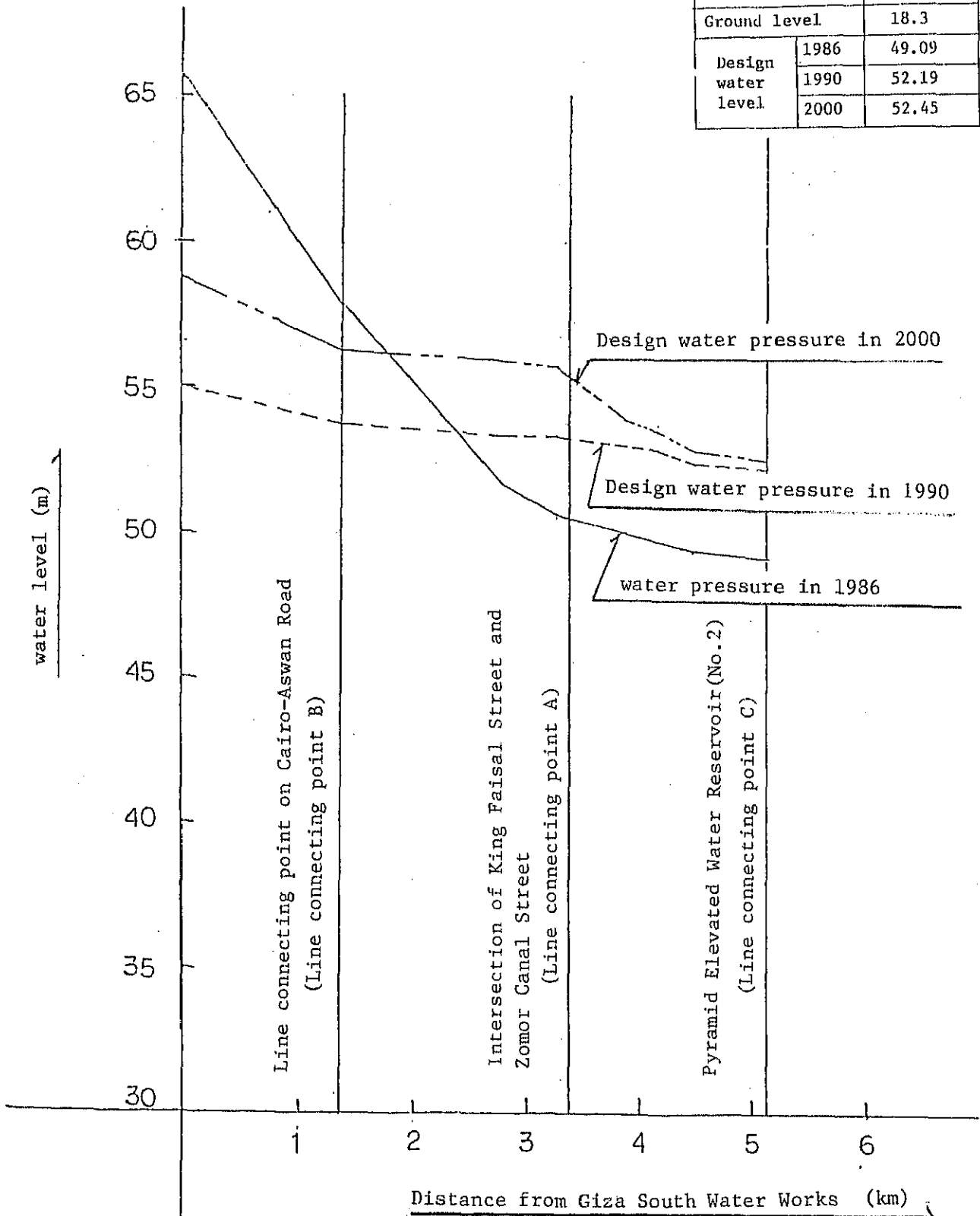


Fig. 2-7 Water Supply Capacity and Water Pressure in the Target Year
(West German Project Report, 1986)

Pyramid elevated water reservoir (No.2)

Description	Altitude(m)	
High-water level	55.0	
Low-water level	50.0	
Ground level	18.3	
Design water level	1986	49.09
	1990	52.19
	2000	52.45



(Note) Water pressure for year 2000 before re-studying the project
(for the quantity of water supply of 757,647 m³/d).

Fig. 2-8 Design Water Pressure in the Project Area
(West German Project Report, 1986)

2-2-2 Outline of Related Projects and Relationship with the Project

Of the development projects assigned to Greater Cairo, the ones related to the proposed project are the following.

(1) Water Supply Facilities

Water Supply for City of Giza Improvement Project under aid of West Germany which emphasizes the expansion of South Giza and Embaba water works is in progress and scheduled for completion by 1992. The Project area belongs to the supply districts of South Giza and Embaba water works, whose expansion will not only increase the quantity of water supply but raise the water pressure which, coupled with the upgrading of water supply main lines under this Project, will improve the quantity of water supply and water pressure to the necessary values.

(2) Sewer Facilities

The West Bank Waste Water Projects related to this Project are shown below.

1) Omrania West

The sewer main line between Abu Horeira pump station in South Giza and Zenein waste water treatment plant is to be constructed as far as about 300m northeast of this Project area, and is scheduled for completion by 1989. As Ahram booster pump station, which is located between Amina Mohamed pump station, and Zenein waste water treatment plant, is overloaded at present, it is possible that the aforesaid sewer main line might be utilized as the route for directly conveying sewage from Amina Mohamed pump station to Zenein waste water treatment plant.

2) Mounira West

The rehabilitation and expansion project in Embaba district which is scheduled for completion in 1991 includes the construction of sewer mains around this area. As development

of branch lines in this project area must be advanced in conformity with USAID project, it is necessary to begin constructing the branch lines only after the said sewer mains are completed in 1991.

2-3 Course of the Progress and Contents of the Request

Although Giza Governorate and Giza City have formulated a master plan and conducted a feasibility study and detail design by obtaining a loan from the World Bank in order to improve the infrastructure with the main objectives of upgrading the living standard of the citizenry and improving the housing situation where about 162,000 persons as of 1986 live under inferior living conditions. The implementation of the project under a loan was judged to be inappropriate due to the deterioration of Egypt's financial condition and also because of the low return of investment in water supply and sewer improvement.

However, improvement of the living environment in these two districts is an urgent and critical problem for Giza Governorate and Giza City. Under these circumstances, Giza City, through the Government of Egypt, requested the Government of Japan to provide grant aid for the project for Omrania West and Mounira West Water Supply and Sewer Upgrading, Giza City.

CHAPTER 3
OUTLINE OF THE PROJECT SITE

CHAPTER 3 OUTLINE OF THE PROJECT SITE

3-1 General Conditions

3-1-1 Location and Topography

Although the territory of Egypt covers a vast area of 1,001,500km², which is about 2.7 times that of Japan, 97% of the land area is desert. Therefore most of the total population (about 48.21 million, 1986 Census) is concentrated in the Nile Delta and on either side of the Nile River which are the cultivated areas. Because of this, the population density is extremely high at 395 persons/ha (1986 Census).

Greater Cairo, which constitutes the metropolitan area, is composed of three districts, which are Cairo, Qalyoubia, and Giza. The total covered area of Greater Cairo is about 410km², excluding the Nile River and deserts, and it is expanding into the low delta of the Nile and the hilly zones on the south, north and east of the Nile.

3-1-2 Population

According to the data of the World Bank Loan Project, the population forecasts for Omrania West and Mounira West are as shown on Figs. 3-1 and 3-2.

The population growth is anticipated to be extreme toward the 21st Century in both Omrania West and Mounira West, increasing almost linearly from now on.

The forecast assumes that the maximum allowable number of residents will be reached by the year 2010 in Omrania West and by the year 2000 in Mounira West.

The growth multiples at this time, compared with the base year of 1987, are forecast to be as follows.

Omrania West (in year 2010) : 1.84 times

Mounira West (in year 2000) : 2.33 times

The estimated populations to be served by the water supply and sewer facilities in both areas are assumed for design purposes to be the estimated maximum allowable number of residents in each area, as shown in Table 3-1.

Table 3-1 Number of Residents Assumed for the Design in Each Area

Area	Forecast Year	Anticipated Population
Omrania West	2010	175,460 persons
Mounira West	2000	155,576 persons

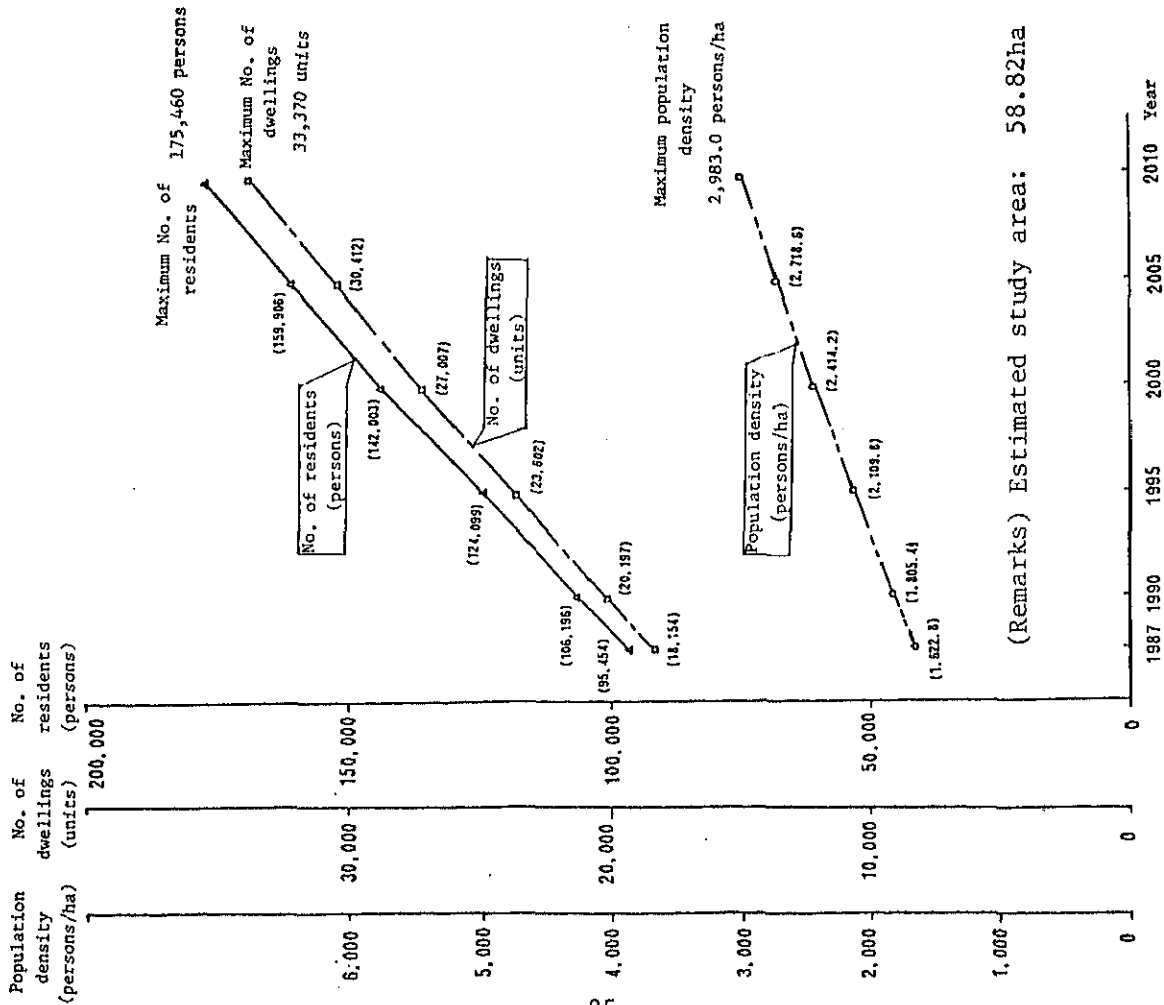


Fig. 3-1 Population Forecast for Omrania West
(Data Source: World Bank Loan Project)

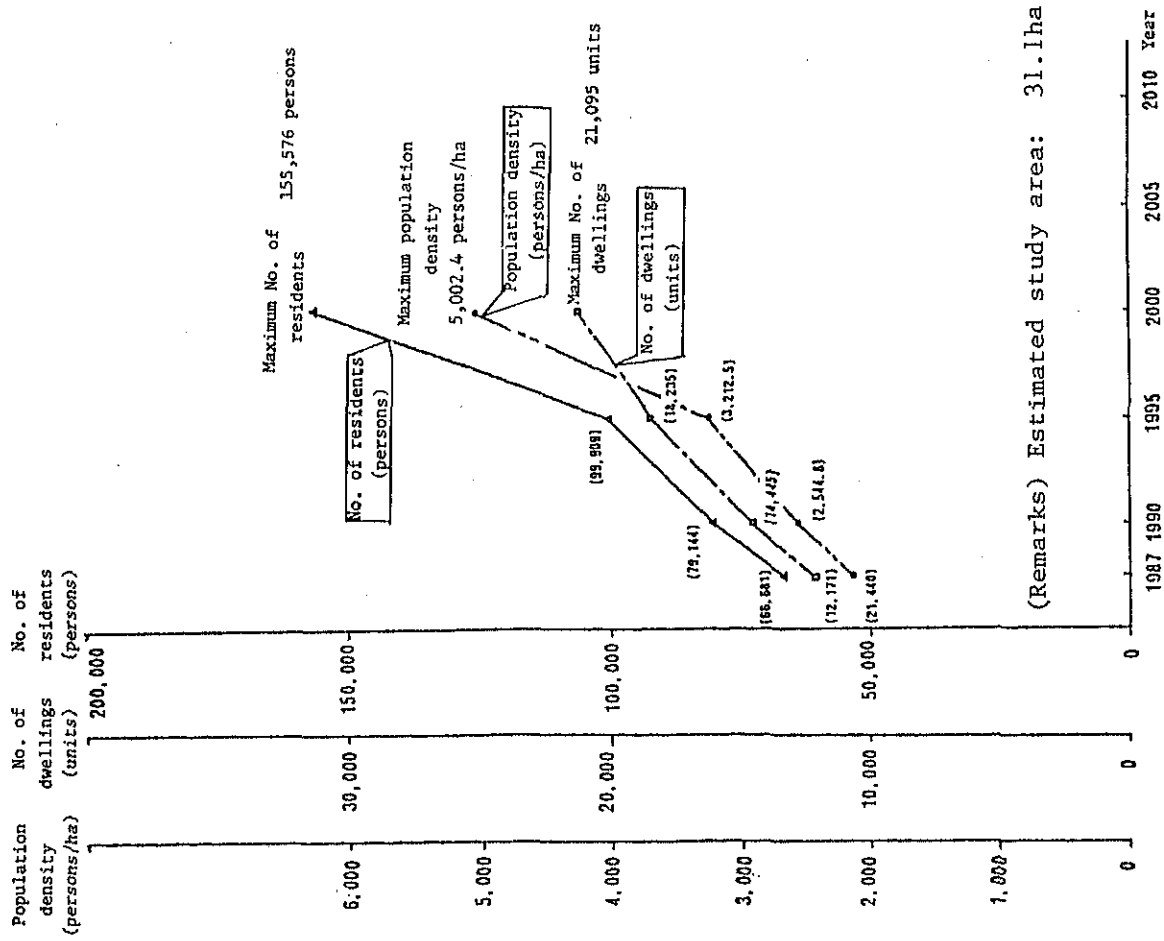


Fig. 3-2 Population Forecast for Mounira West
(Data Source: World Bank Loan Project)

3-1-3 Socio-economic Aspects

The principal sources of Egypt's foreign exchange earnings are the remittances from overseas workers, exports of petroleum, toll fees from the Suez Canal, and tourism revenues.

Actual foreign exchange earnings however have declined lately due to the decrease in employment of Egyptians among the Arab oil producing countries, the decline in the price of oil, the reduction in the number of vessels passing through the Suez Canal, the decreasing number of tourists due to worldwide recession, and other reasons. These factors have pushed the Egyptian economy into a severe situation. Its outstanding foreign debt is estimated to be US\$ 31 billion as of June, 1985.

The real growth rate of GDP has also tapered from 8.0% in 1983/84 to 7.1% in 1984/85 and to 5.9% in 1985/86.

The Government of Egypt has formulated the second five-year socio-economic development plan covering the period between 1987/88 and 1991/92 following the first five-year plan (1982/83 ~ 1986/87) and is now pushing forward various projects aiming for emergence from the oil-dependent system to inducement of private vitality. The principal objective of the plan is to further advance the development accomplished in the first five-year plan.

Table 3-2 shows the Total and Public Works Budget for Fiscal Year 1987/88 of Giza City which is the executing agency of this Project.

Table 3-2 Giza City's Total and Public Works Budget for Fiscal Year 1987/88

1. Total Budget	59,622,909 LE
	(including USAID Budget about 7 Million LE)
2. Budget for Public Works	
2.1 Giza City's Own Budget	
- Street Lighting	1,400,000 LE
- Road Pavement	3,200,000 LE
- Purchase of Vehicles	80,000 LE
- Bridges	200,000 LE
- Light Industries	300,000 LE
- Potable Water	1,000,000 LE
	<hr/>
	Total 6,180,000 LE
2.2 Budget Covered by Foreign and Egyptian Governments in the Form of Loans and Grant Aid	
- Loan from World Bank for upgrading of Mounira East and other areas of Giza	4,400,000 LE
- Various infrastructure projects all financed by USAID	6,782,000 LE
- Infrastructure Maintenance	525,000 LE
Consisting of:	
USAID Budget:	330,000 LE
Egyptian Government Budget:	195,000 LE
	<hr/>
	Total 11,707,000 LE

3-2 Natural Conditions

3-2-1 Topographical and Geological

Greater Cairo is surrounded by hills of about 200m above sea level.

The topography on the whole in both areas of Omrania West and Mounira West is almost flat.

According to the existing soil report, the geological strata of the area is roughly as follows.

- About 1.5m to 2.5m : Clay layer containing lime chips and
below ground level red bricks
- About 2.5m to 7m : Soil stratum intricately deposited with
below ground level silty clay layers and sandy soil.

Large cobble-stones and gravels in both areas are unlikely to exist judging from the fact that the grain size of the soil is 1 to 2mm or less according to the report above and both areas are in the lower reaches of the Nile river and considerably far from the surrounding hilly zones.

The results of the longitudinal and lateral profile levelling conducted at 50m intervals in Omrania West were as follows.

- The topography on the whole is almost flat except where Pyramid Street intersects with Fatma Roshdy Street and Zomor Canal Street. It is only slightly higher on the southern side (on the upstream of Zomor Canal).
- The difference in elevation between Pyramid Street and the access road (Fatma Roshdy Street) is about 2m on either side.
- The difference in elevation between Pyramid Street and the access road (Zomor Canal Street) is about 1m on either side.