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DEPARTMENT OF STATE  
AGENCY FOR INTERNATIONAL DEVELOPMENT  
Washington, D.C. 20523

PROJECT PAPER

Proposal and Recommendations  
For the Review of the  
Development Loan Committee

EGYPT: CAIRO WATER

AID-DLC/P- 2264

UNCLASSIFIED

DEPARTMENT OF STATE  
AGENCY FOR INTERNATIONAL DEVELOPMENT  
WASHINGTON, D.C. 20523

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AID-DLC/P-2264

September 19, 1977

MEMORANDUM FOR THE DEVELOPMENT LOAN COMMITTEE

SUBJECT: EGYPT - Cairo Water

Attached for your review is the recommendation for authorization of a loan to the Arab Republic of Egypt ("Cooperating Country") of not to exceed Thirty Million United States Dollars (\$30,000,000) ("Authorized Amount") to help in financing certain foreign exchange costs of goods and services required for the Project.

No meeting is scheduled for this loan proposal. However, please advise us of your concurrence or objections as early as possible, but in no event later than close of business on Monday, September 26, 1977. If you are a voting member, a poll sheet has been enclosed for your response.

Development Loan Committee  
Office of Development Program  
Review and Evaluation

Attachments:

Summary and Recommendations  
Project Analysis  
Annexes A - X

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PROJECT PAPER FACESHEET

TRANSACTION CODE

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DOCUMENT CODE  
3

1 COUNTRY ENTITY

ARAB REPUBLIC OF EGYPT

4 DOCUMENT REVISION NUMBER

5. PROJECT NUMBER (7 digits)

6. BUREAU OFFICE

7 PROJECT TITLE (Maximum 40 characters)

A SYMBOL

B CODE

NE

3

CAIRO WATER

8 ESTIMATED FY OF PROJECT COMPLETION

fy 81

9 ESTIMATED DATE OF OBSERVATION

A INITIAL FY 77

B QUARTER 4

C FINAL FY 77

(Enter 1, 2, 3 or 4)

10 ESTIMATED COSTS \$000 OR EQUIVALENT \$1 - .70LE

A FUNDING SOURCE	FIRST FY			LIFE OF PROJECT		
	B FX	C - C	D TOTAL	E FX	F - C	G TOTAL
AID APPROPRIATED TOTAL						
(GRANT)						
(LOAN)	30,000		30,000	30,000		30,000
OTHER						
U.S.						
HOST COUNTRY		70	70		15016	15,016
OTHER DONOR(S)						
TOTALS			30,070			

11 PROPOSED BUDGET APPROPRIATED FUNDS \$000

APPROPRIATION	B PRIMARY PURPOSE CODE	PRIMARY TECH. CODE		E 1ST FY 77		H 2ND FY		K 3RD FY	
		C GRANT	D LOAN	F GRANT	G LOAN	I GRANT	J LOAN	L GRANT	M LOAN
(1) SA	729	545		30,000					
(2)									
(3)									
(4)									
TOTALS				30,000					

A APPROPRIATION	N. 4TH FY		O. 5TH FY		LIFE OF PROJECT		12. IN-DEPTH EVALUATION SCHEDULED
	P GRANT	Q LOAN	R GRANT	S LOAN	T GRANT	U LOAN	
(1) SA						30,000	
(2)							
(3)							
(4)							
TOTALS						30,000	

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14 ORIGINATING OFFICE CLEARANCE

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Donald S. Brown, Director, USAID, Cairo

DATE SIGNED

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## ABBREVIATIONS

### ORGANIZATIONS

GOGCWS	General Organization Greater Cairo Water Supply ("Organization" is also used to identify the GOGCWS)
GOSSD	General Organization for Sewerage and Sanitary Drainage
MOHR	Ministry of Housing and Reconstruction
USAID	United States Agency for International Development/Cairo
AID	United States Agency for International Development

### TECHNICAL

mm	millimetre	mg/l	milligrams per litre
m	metre	g/cu m	grams per cubic metre
km	kilometre	l/c.d	litres per capita per day
sq m	square metre	cu m/sq m.d	cubic metres per square metre per day
ha	hectare	BOD	5-day, biochemical oxygen demand
sq km	square kilometre	COD	Chemical oxygen demand
l	litre	SS	Suspended solids
cu m	cubic metre	TDS	Total dissolved solids
s	second	EC	Electrical conductivity
min	minute	TU	Turbidity Units
h	hour	DO	Dissolved oxygen
d	day	TDE	Total dynamic head
y	year	LS	Lump Sum
m/s	metres per second	ea	each
l/min	litres per minute	na	not available or not know
cu m/s	cubic metres per second	LE	Egyptian pound (= SUS 1.43)
ug	microgram	mill	millieme (1000 mills = LE 1.000)
mg	milligram		
g	gram		
kg	kilogram		
t	tonne (metric)		

### METRIC-ENGLISH UNIT EQUIVALENT

1 metre	=	3.28 feet
1 kilometre	=	0.621
1 square metre	=	10.76 square feet
1 hectare	=	2.47 acres
1 cubic metre	=	264.2 US gallons
	=	220.1 Imp. gallons
	=	35.32 cubic feet
1 cubic metre/second	=	22.8 million gallons (US) per day
1 000 cubic metres/day	=	0.264 million gallons (US) per day
1 cubic metre/square metre day	=	24.5 gallons (US) per square foot per day
1 cubic metre/metre.day	=	80.5 gallons (US) per foot per day

PROJECT PAPER

EGYPT: CAIRO WATER

SUMMARY AND RECOMMENDATIONS

1. Borrower: Government of the Arab Republic of Egypt (GOE).
2. Beneficiary: General Organization Greater Cairo Water Supply (GOGCWS).
3. Loan Amount: U.S. \$30.0 Million.
4. Terms: To GOE - Repayment within forty (40) years including ten (10) years of grace. Two percent (2%) annual interest during the grace period and three percent (3%) annual interest thereafter.  
  
To the General Organization Greater Cairo Water Supply - To be relet on terms subject to AID approval.
5. Project Description:
  - A. Rehabilitation of the Rod El Farag Water Treatment Plant to ensure construction of current production capacity;
  - B. Expansion of the Plant by 200,000 cu m/d;
  - C. Laying of five km of transmission line; and
  - D. Installation of 40,000 individual metered house service connections.
6. Purpose: To increase the quantity and quality of potable water for Cairo and to increase the distribution of such water to the urban poor. The expansion proposed by this project would increase the filtered water production of the Greater Cairo Water System by 200,000 cm/d and improve water service for an estimated 600,000 people.

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7. Total Project Cost: Total cost of the project, both foreign exchange and local, is estimated at \$45.016 million. The foreign exchange component is estimated at \$30.0 million. The GOE will provide the \$15.016 million equivalent balance in local currency.
8. Environmental Considerations: Have been addressed.
9. Loan Application: The GOE has requested AID to provide the foreign exchange costs of this project. The application is attached as Annex A.
10. Recommendation: Authorize a \$30.0 million loan to the GOE on terms and conditions set forth in the draft Loan Authorization in Annex B.

USAID PROJECT COMMITTEE:

M.B. Briggs, Capital Development Officer  
J. Snead, Sanitary Engineer  
J. Norris, Economist  
G. Laudato, Program Officer  
J. Phippard, Attorney

## I. INTRODUCTION

1.01 The Government of the Arab Republic of Egypt (GOE) is presently engaged in a program to improve and expand water and wastewater utilities in five major cities. To assist the GOE, AID is financing the foreign exchange cost of feasibility studies and masterplanning of water and wastewater facilities in the cities of Cairo, Alexandria, Port Said, Ismailia and Suez. Additionally, AID is financing a study of Egypt's water and wastewater management and tariff structure.

1.02 For the study of Cairo's water system the GOE, through the Ministry of Housing and Reconstruction (MOHR), entered into a contract with Engineering Science, Inc., and Ralph M. Parsons Corporation (ESP), a joint venture of two U.S. consulting engineering firms. The contract was signed on April 27, 1977. Work commenced on May 2, 1977. ESP's tasks are divided into two sectors: (1) an immediate program to satisfy Cairo water demands through the year 1982; and (2) the staged development of waterworks to satisfy projected potable and non-potable water needs in the period 1982 through year 2000. The total study will be completed by December 1978. In August 1977, ESP completed part of its first task which identified immediate investment needs. After review of the ESP report, the GOE formally requested AID assistance in financing the foreign exchange cost of (1) rehabilitation and expansion of the Rod El Farag water treatment plant and (2) placement of water connections in approximately 40,000 individual houses not now served by water. The GOE's letter requesting assistance is included as Annex A.

## II. BACKGROUND

### A. Cairo Water Supply and Demand

2.01 Annex E provides an overview of Egypt's water and wastewater sector. As explained in that section, the General Organization Greater Cairo Water System (GOGCWS) is responsible for Cairo's water supply and distribution. GOGCWS presently serves approximately 6.7 million consumers (84 percent of the population). Two-thirds of Cairo's water is supplied by the Nile River with all of the water treatment plants being operated at near or above capacity. However, production still fails to meet current demands. This has been caused by (1) a lack of replacement equipment and the seriously deteriorated condition of most treatment facilities and (2) the change in water quality created by the construction of the Aswan Dam.

2.02 Previously, the Nile River waters had high turbidities (silt) and low plankton (algae) counts. With water impoundment in Lake Nasser the river water quality has been reversed - i.e., low turbidities and high algae counts. This has meant that water treatment facilities originally designed to handle high turbidity waters which clarify easily must now be operated at approximately 70 percent of design capacity to treat adequately the slower settling algae-laden waters. Simply put, Cairo lost approximately 30 percent of most of its treatment plant facilities on completion of the Aswan High Dam. Design capacities of the filtration plants and actual production of treated and well-water are indicated in Table 1. Annex F shows the locations of these plants.

TABLE 1  
DESIGN AND PRODUCTION OF POTABLE WATER (GMD)

Filtration Plant	Treated Water		Groundwater Production	Total Production
	Design	Production*		
Tura	7,000	5,000	-	5,000
Maadi	29,000	20,000	10,000	30,000
North Helwan	76,000	53,000	-	53,000
Kafr El Elw	74,000	52,000	-	52,000
South Giza	134,000	94,000	-	94,000
South Cairo	126,000	88,000	-	88,000
Giza/Gezira	146,000	102,000	-	102,000
North Cairo	355,000	250,000	195,000	445,000
Rod El Farag	432,000	302,000	60,000	362,000
Cairo NE	245,000	172,000	195,000	367,000
5 Well Stations	-	-	150,000	150,000
TOTAL	<u>1,551,000</u>	<u>1,138,000</u>	<u>610,000</u>	<u>1,748,000</u>

\* Actual capacity when treating low-turbidity high-algae waters.

2.03 A good deal of the difference between the metered consumption and the water produced at the plants and well stations can be attributed to inadequate metering. However, almost certainly there are significant real water losses. This includes the following: (1) illegal or unmetered connections; (2) water losses in distribution system; (3) inaccuracy of meters; and (4) losses through fire hydrants, public fountains, etc. GOGCWS's unaccounted for water is estimated to be approximately 26.7 percent. A good water system with accurate metering and accounting in the U.S. varies between 10 percent and 15 percent.

2.04 The 1976 water consumption was estimated at 160 liters (42.3 gallons) per capita per day (lcd) (see Annex X). The per capita usage ranged from a low of 27 lcd (7.1 gpcd) to a high of 1,439 lcd (380 gpcd). After allowing for government, industrial, social and military, a per capita figure of 200 lcd (51.6 gpcd) was developed as water requirements with the Greater Cairo Area for 1976. This usage is comparable with other major cities in developing countries. The adopted per capita figure is also consistent with the design standards established in the "Guidelines and Criteria for Community Water Supplies in Developing Countries," U.S. Department of State, Agency for International Development, 1969.

2.05 Based on the above, Cairo has a need for the following water quantities:

$$6,710,817 \times 0.200 \text{ lpc} = 1,342,163 \text{ cm/d.}$$

In addition, there is an unserved population in the Metropolitan Area of 1,289,183 people who are obtaining water indirectly from the system. Their water usage is estimated at 50 lpc (includes wastage) or 64,500 cm/d. Added to the total quantities of water needed must be an allowance of 26.7 percent for water losses or 375,500 cm/d. Therefore, the present total water demand for the Greater Cairo Area is conservatively estimated at 1,782,000 cm/d.

2.06 However, data from cities the size of Cairo indicate that maximum day demands are at least 25 percent higher than the average daily demand. This has not been the case in Cairo where the maximum day has been only 14 percent higher than average. However, at the present time the maximum demand is constrained by less than adequate production capacity. Thus, the 1976 estimated average daily production of 1,782,000 cm/d should be increased by at least 25 percent to arrive at a demand under improved supply conditions of 2,230,000 cm/d. This shows a present deficit in water production of almost 500,000 cm/d.

B. Distribution

2.07 In 1976, the Central Agency for Public Mobilization and Statistics, an independent agency reporting directly to the President's Office, reported that within the Governorate of Cairo and the urban areas of Kalubia and Giza some 276,000 households were not connected to the water system and obtained all their water from public fountains, shallow wells or tank-cart vendors. This represents some 19 percent of the total households within the area or about 1,234,200 people.

2.08 Currently, GOGCWS is installing approximately 11,000 water connections per year, mainly for new buildings at the expense of the building owner. Installation costs and fees are reported to range from LE76 to over LE600 depending on length and size of service connection. This cost must be paid in full before work is started.

2.09 The proposed metered water connection program is designed to concentrate on providing service to existing families who cannot afford the present GOGCWS connection fee. It will supplement the existing program now in progress by the GOGCWS. The supplemental program will impact on the large segment of the population that is receiving only minimal water supplies mainly from public hydrants. Buildings are of one, two and three-story configuration, built of brick, mud block or any available material with little or no facilities and upon any available site. These are occupied generally by unskilled laborers, house servants, agricultural workers, etc., and are situated in various parts of Cairo. While some streets have water distribution mains, many are too small to deliver water to a substantial number of customers. Each area to receive metered connections would be reviewed with the agencies involved to coordinate land use planning, sewers, and other utility locations. No water connections will be put in areas without providing for proper drainage of the wastewaters.

### III. THE PROJECT

3.01 The Project consists of two elements: (1) design and construction of a rehabilitation and expansion of the Rod El Farag Water Treatment Plant with the interconnecting transmission lines; and (2) the installation of approximately 40,000 house-service connections with means of disposing of the generated wastewater. The proposed AID assistance will finance the foreign exchange costs estimated at \$20 million for the plant expansion and lines and \$10 million for the house connections. The GOE will assure that the General Organization Greater Cairo Water Supply has sufficient funds to finance the Egyptian currency costs of both projects.

3.02 The Rod El Farag project more specifically consists of new raw water intake facilities, new mixing basins, modification of the existing clarifiers and sedimentation basins, a new electric motor-driven filtered water pumping station, a new chemical mixing facility, 2.4 KM of 1200 MM plus 2.6 KM of 1000 MM diameter ductile iron, cement-lined transmission lines with necessary valves and fittings.

3.03 The house connections project more specifically consists of installing water connections in approximately 40,000 residences not presently serviced. A typical installation will be a half-inch connection pipeline, a buried corporation cock, a lockable corporation cock, a meter and hose bibb. Installation will include a floor sink and drain line to collect and transfer waste and spilled water to existing disposal points. In selecting the residences in which to install water connections, the GOGCWS will give priority to the Khalifa, Shoubra, Matareya, Masr El-Kadima, Sahel and Rod El Farag districts of the city.

#### IV. TECHNICAL ANALYSIS

##### A. Introduction

4.01 The GOGCWS maintains a list of 33 capital improvement projects which it systematically updates on an annual basis. The projects all include substantial foreign exchange purchase of equipment and materials. The projects encompass new water treatment plants, additions to existing water treatment plants, substantial modifications of existing water plants to increase water production and/or quality; new pumping stations or modifications; new transmission lines and reservoirs for pressure regulation and flow stabilization.

4.02 Review of these projects indicates that all would improve the existing waterworks system, although definitive evaluation of these projects cannot be made until the current water plan study is further advanced.

##### B. Screening of Proposed Projects

###### 1. Criteria

4.03 Criteria for USAID screening of the GOGCWS list of projects were established to ensure that all projects were evaluated on the same basis and to provide a baseline for decision-making. The criteria are identified in the following paragraphs.

###### a. Financing Status:

4.04 Any projects for which financing was negotiated or for which there was reason to believe that financing negotiations currently underway would be successfully completed were eliminated from further consideration. Also, projects were eliminated which appeared by their size and nature to have a strong probability of being financed out of the Organization's meager capital improvements budget.

b. Local/Foreign Cost Ratio:

4.05 Projects with a high local to foreign cost ratio were also eliminated. USAID concluded that such projects should not be included since they would obligate large sums of limited local currency for a small number of projects. On the other hand, projects with a low local to foreign cost ratio were considered since they would provide the maximum development with minimum expenditure of local funds.

c. Scheduling:

4.06 Any projects requiring more than a four-year schedule for completion were eliminated from further consideration. Projects requiring a completion period of more than four years would probably overlap projects to be implemented under master planning and would need more detailed evaluation and analysis for compatibility with the current master planning effort.

d. Social Aspects:

4.07 Projects which did not have a high potential of directly relieving some of the problems of the poor as outlined by the Congressional Mandate, no matter how technically or economically feasible, were awarded a low priority or eliminated.

2. Evaluation of Projects

4.08 The criteria above were applied to the projects on the GOGCWS list. A substantial number were immediately eliminated while other projects required more investigation with respect to the time required for completion or concerning the local to foreign cost ratio. In those instances where the application of criteria did not immediately eliminate a project, field investigations were made to verify project elements and completion schedules. Field investigations included on-site observations of the construction practices and procedures employed throughout the Metropolitan Cairo area and in particular at on-going water-works and sewerage projects, as well as review of local social conditions. As a result of this evaluation the following two projects were selected:

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3. Rod El Farag Filtration Plant Expansion and Transmission Mains

4.09 This project includes construction of new raw water intake facilities, new mixing basins, modification of the existing clarifiers and sedimentation basins, a new electric motor-driven filtered water pumping station, a new chemical mixing facility, and 2.4 km of 1200 mm diameter and 2.6 km of 1000 mm diameter ductile iron, cement-lined transmission lines and associated valves and fittings. The expansion under this project would increase the filtered water production of the Rod El Farag Treatment Plant by 200,000 cu m/d.

4. Metered Water Connections

4.10 The metered water connections project is designed to provide 40,000 house connections to the lower income population making available to them a reliable and safe public water supply inside the house building and a means of safely disposing of the generated wastewaters.

C. Rod El Farag Filtration Plant and Transmission Lines

1. Basis of Design and Description of Improvements

4.11 Rod El Farag is the oldest filtration plant in the Cairo water system, and its location at the hub of the system makes it the most important. Since its original construction in 1903, it has been expanded and modified several times.

4.12 Analysis of the plant and its operation showed that its capacity could be doubled with a relatively small amount of construction. The reason for this is that the sedimentation basins and filters potentially can produce more water than is obtained presently.

4.13 At the time this analysis was made, GOGCWS already had a 100,000 cu m/d expansion underway at Rod El Farag. Review of the planned improvements showed that they were based on old technology, they would not improve the quality of the filtered water, and they did not include transmission mains to deliver the added water to the system. Discussions with GOGCWS led them to suspend their construction work pending a decision by AID regarding assistance in implementing a more effective expansion program.

4.14 The additions and modifications recommended to achieve an increase of 200,000 cu m/d in capacity are summarized in Annex H.

4.15 The construction of an intake farther from the shore (where slower velocities result in less turbid waters) will provide the additional capacity required as well as provide a better quality raw water.

4.16 Construction of additional raw water pumping capacity coordinated with modernization of the existing raw water pumping station will provide the capacity required for plant operation as well as replace a badly deteriorating superstructure. The newer equipment presently proposed for the existing structure will be incorporated into the modernization program. Expansion of the existing raw water pumping station will be to the south. The superstructure of the existing building will be raised and a superstructure and facing compatible with the additions will be constructed incorporating the old and new construction into one unit. The existing diesel oil tanks will be replaced with a new, relocated day tank.

4.17 The new flash mixing and mechanical flocculation basins constructed adjacent to the existing Dorr-Oliver clarifiers will improve the capacity and quality of water passing through the units. Once completed, the Dorr-Oliver units can be modified to improve the overflow rate by increasing the weir length. The existing sedimentation tanks will also be modified to improve flow characteristics and overflow rates.

4.18 If modification of the filters presently under construction is made one of the first items of construction, unnecessary expenditures such as paralleling piping and changing filter media and nozzles can be avoided. At the present time, only the foundations are being placed. Piping is not scheduled until next year. In addition to changing the filter media to dual media, new back-wash pumps and piping will be required.

4.19 Construction of a new filtered water (electric motor-driven) pump station will consolidate one existing and one proposed pump station. The existing diesel-driven, filtered water pumping unit adjacent to the filter building will be relocated into the diesel engine filtered water pump house. Thus, it will provide additional area for further expansion and modification at this site. Further consolidation of the remaining pump stations in the future will permit plant expansion in either the northern or southern direction. (One of the existing pump stations has equipment badly in need of replacement.) The office displaced by the reconstruction of this station will be replaced by a new structure.

4.20 Construction of a new chemical storage and mixing facility on the same site as the existing structure will consolidate several existing facilities in various degrees of disrepair. Storage of alum is presently at several areas around the works and not only presents an untidy appearance, but also creates difficult operation procedures. By consolidating several chlorination stations, the safety of the operators is improved as well as the quality and safety of water.

4.21 Construction of a new laboratory, office and residence will replace the existing inadequate facilities. It is planned that the laboratory will be a central facility to provide services for the other treatment works for heavy metals, pesticides, and biological analyses as well as for the daily operational tests required for the Rod El Farag facility. The residence would replace the existing living quarters of the chief operator.

4.22 Several existing small facilities will need to be temporarily relocated during the construction period. These include fuel storage tanks, alum batch-mixing tanks, and a pre-chlorination facility. All of these can be relocated easily until the new structures are completed. Connections to existing pipeline may, of course, necessitate shut-down and draining of facilities, but this can be accomplished in the shortest time possible by pre-fabricating the connecting fittings and making several connections at low flow periods. Annex I shows the plot plan, existing plant and proposed improvements.

## 2. Transmission Mains

4.23 To deliver the anticipated increase in water production to the areas of critical need, new transmission mains are required in addition to the existing mains. Two transmission mains are therefore included in this project. The first, a 1,200 mm main, is to be constructed in Sharia El Corniche to connect with the existing 1,000 mm main paralleling the Ismailia Canal to supply the Kisms of Sahel, Shoubra and Rod El Farag. The second, a 1,000 mm main, would connect the existing 1,000 mm main mentioned above with another existing 1,000 mm main in Sharia Rod El Farag and would parallel an existing 200 mm distribution main in Sharia Shoubra.

### 3. Population Served

4.24 The extremely limited connections across the Nile effectively separate the distribution system into two parts serving the east and west sides of the Nile. Table 2 shows the present and projected populations in each area served by the GOGCWS.

TABLE 2

Population on East and West Sides of the Nile River

YEAR	EAST SIDE	WEST SIDE	TOTAL
1976	5,478,000	1,233,000	6,711,000
1980	6,086,000	1,365,000	7,451,000
1985	7,048,000	1,550,000	8,598,000

### 4. Water Demand and Capacity

4.25 In Figure 1 the projected production capacity, demand and the effect of the Rod El Farag expansion are shown for the systems on each side of the River. The present deficiency (demand - planned production) is about 500,000 cu m/d. Currently planned improvements would not reduce this deficiency by 1980-81. If the Rod El Farag expansion were implemented and on-line in 1981, about 40 percent of this deficiency (200,000 cu m/d) would be satisfied.

### 5. Effect on the Existing Water System

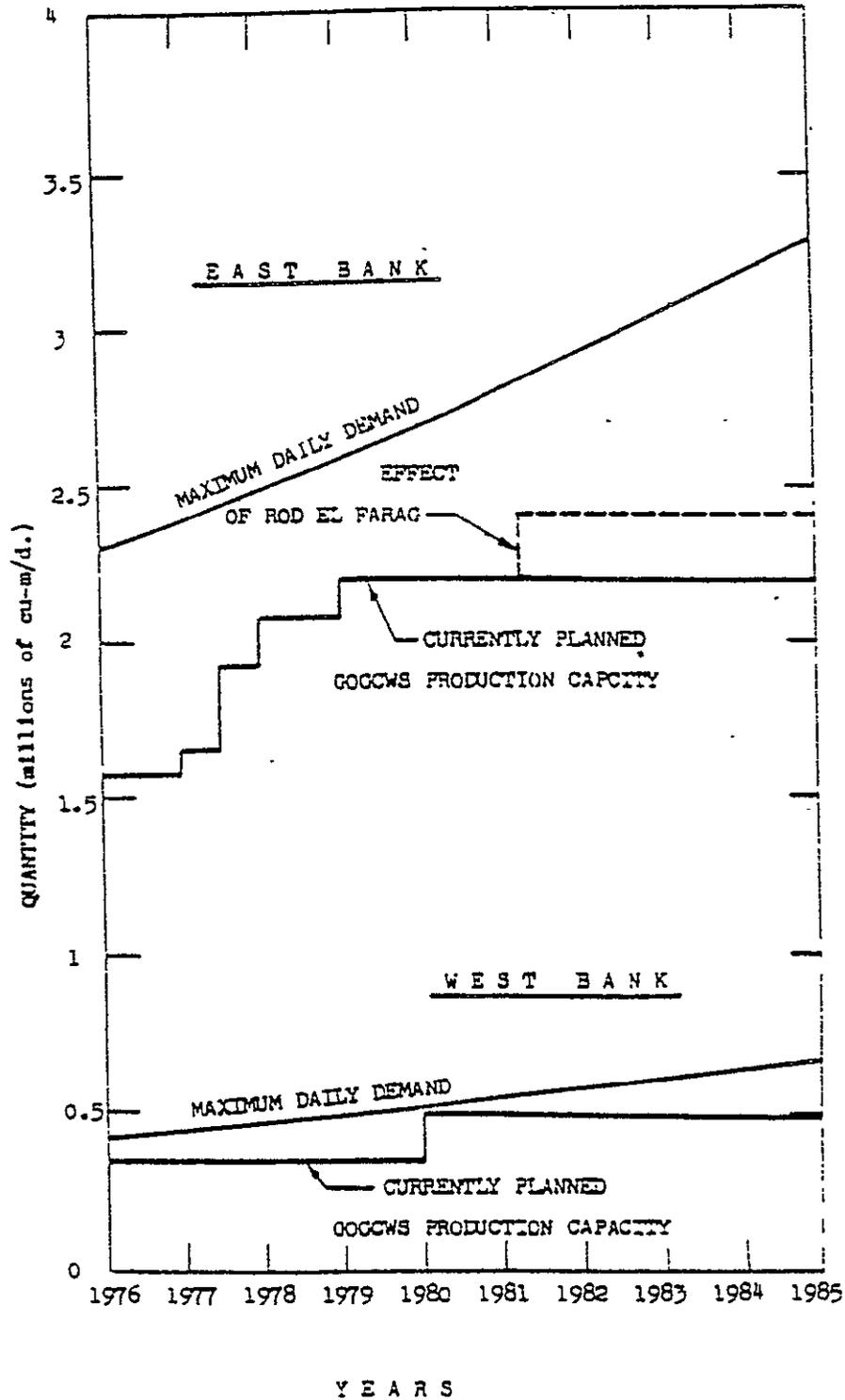
4.26 A hydraulic network model was used to estimate the improvement in system flows and pressures that could be expected from the Rod El Farag expansion and its connection to the distribution system.

4.27 Of the additional 200,000 cu m/d produced, 100,000 cu m/d would be delivered through the new 1,200 mm main going north, and 100,000 cu m/d would be evenly divided among the existing mains leaving the plant. Also, the GOGCWS improvements currently being

implemented are expected to be operational by the time this project has been completed. In addition, the Japanese are scheduled to design and install a 1,200 mm transmission main from Rod El Farag to the Masr El Kadima, Sayeda Zeinal and Khatifa Kisms. This will add to transmission available and ensure adequate capacity is available for the additional water resulting from this project.

4.28 Computer runs were made to analyze the system under these conditions, and Table 3 summarizes the results of that analysis.

Figure 1  
COMPARISON OF SUPPLY AND DEMAND  
ROD EL FARAG



Effects of Rod El Farag Improvements on  
Distribution System Pressures

System Junction No.	Hydraulic Grade Line Elevation, m	
	Current GOGCWS Improvements Only	Current GOGCWS and Rod El Farag Improvements
<u>North Section</u>		
86 (Mostorod)	36	50
73	35	47
<u>Central Section</u>		
1 (Rod El Farag)	34	41
30	37	41
25	31	36
47	23	24
41	15	17
<u>Southern Section</u>		
53	26	27
66	26	27
69	-1	1
58	31	31
62	25	25

1/ With the Rod El Farag expansion there was a general improvement of four to fifteen metres in pressures in the northern part of the system. The northwestern section of the City, including Shoubra El Kheima and Sahel kisms, will have pressure increases of 10 to 15 metres. Pressures in the northeast and northcentral portions will increase four to seven metres. In the central section, pressure will increase by one to seven metres.

2/ The estimated effect on several reservoirs is shown in Table 4. The improvement in water level at these five storage tanks ranges from one to 13 metres. (Note that these analyses are for average daily demand conditions.) At night, pressures would be greater; during periods of peak demand they would be less.

3/ The Rod El Farag expansion does not appear to burden the transmission network. Calculated maximum pipe velocities were 3.3 m/s; most velocities were under 2 m/s.

TABLE 4

Effect of Rod El Farag Improvements  
on Hydraulic Grade Line at Reservoirs

Reservoir	ELEVATION, m		HYDRAULIC GRADE LINE ELEVATION, m	
	Bottom	Overflow	Current GOGCWS Improvements Only	Current GOGCWS and Rod El Farag Improvements
Gabal Ahmar	55	62	52	56
Kalaat El Kabsch	46	63	48	49
Zeitoun	49	63	55	59
Bahteem	50	63	52	65
Mokattam	53	63	49	50

6. Compatibility with Present Planning

4.29 Expansion of the Rod El Farag Treatment Plant and construction of the new transmission mains is a project which would maximize the use of the existing water system, help to correct system pressure deficiencies, and enhance water quality. It is consistent with the current directions of the new waterworks master planning efforts.

4.30 Greater Cairo's Land Use Plan visualizes the central part of the city as maintaining its present urban characteristics. Therefore, the additions and improvements at Rod El Farag Treatment Plant are in conformity with the Land Use Plan, and would contribute to an improved quality of life within the area.

D. Metered Water Connections

4.31 Approximately one-fifth of Cairo's population of 8,000,000 people have no direct access to the city's water supply system. Within the service area of the GOGCWS, this represents about 1,234,200 people. Aware that the benefits of the water system have tended to bypass the poorest elements of this society, this project promises some direct relief by providing basic water supply and sanitation to these people.

1. Description of Areas to be Served

4.32 The Greater Cairo area is split into governorates and further into kisms. These kisms have been subdivided into types of housing classified by type of water supply available. The two lower classifications of water supply availability are standpipes (public fountains) and Class E housing. Water supplied to Class E housing is obtained by metered connections, by small hand pumps, from tank-cart vendors or carried many meters by hand. The population of the various kisms within the Greater Cairo area (exclusive of Helwan) who obtain water outside the buildings are identified in Annex X.

2. Sample Area

4.33 The Matereya kism, which was selected as one of the areas suggested for this supplemental program, is situated in the northern Metropolitan Cairo area as shown in Annex J and is densely populated with Class E housing. It is the largest Class E housing area and is also typical of the average kism in terms of standpipe (public fountains) water service usage. Class E housing is defined as that being occupied by the lower poor and consists of apartment blocks in poor condition and densely populated. Buildings are of one, two and three-story configuration, built of brick, mud or any available material with little or no facilities upon any site available. These are occupied generally by unskilled laborers, household servants, agricultural workers, etc., and are situated in all parts of Cairo.

4.34 The area will receive water from the Mostorod Water Plant which is just being placed into service. This plant presently has a capacity of 150,000 cu m/d which will be increased to 600,000 cu m/d, once transmission mains presently under construction are completed to deliver water into the North and East Cairo areas and connect with the existing distribution system. However, some streets are

without distribution mains, or the pipelines are too small to deliver water to a substantial number of potential customers. Under the project each area within the sample area to receive metered connections would be reviewed with the agencies involved to coordinate land use planning, utility locations, and street locations.

4.35 Annex J shows a small portion typical of the Matareya kism and consists of privately-owned parcels of land, occupied by a variety of structures or two or three-stories built by the residents. Each parcel is owned by one or more of the residents and is largely covered by the building. Shops are usually along the major streets with residents behind and above. A single-property houses several families. The buildings are brick without concrete reinforced columns or floors. Windows and doors are generally not covered and floors are made of brick. Streets are soil and sand with broken masonry, brick and other materials incorporated into the surface and are generally three to five meters in width.

4.36 Wastes are presently disposed of by seepage pits in the streets which are cleaned by governmental agencies on a periodic basis. These pits are generally small, but appear to have the capacity needed to accept the larger wastewater flows anticipated once water is available within each building.

### 3. Technical Discussion

4.37 A typical service connection is shown in Annex K and consists of a  $\frac{1}{2}$ -inch connection pipeline, a buried corporation cock to facilitate shut-down of the service for repair of the pipeline, a lockable corporation cock to facilitate shut-down for non-payment of water bills or to check and remove the meter for repair, a meter and hose bibb which would be inside the building to reduce theft and damage problems. The owner would then be responsible to deliver water to the remaining occupants.

4.38 The proposed installation also includes a floor sink and drain line to collect and transfer waste and spilled water to the existing seepage pits or other disposal points as required.

4. Selection Criteria

4.39 The primary goal of this project is to provide 40,000 metered water connections within the GOGCWS's service area to the people who cannot afford the high installation fees. This general goal, so easily stated, must be translated into specific engineering and construction criteria which must consider and account for the many technical, social and economic factors involved. To assist in this, the following general selection criteria have been established:

- a. Houses or buildings must be legally recognized by the GOE and approved for water service.
- b. Owners of the houses or buildings must make application for water connections and agree to pay for cost of water plus a monthly installment for service connections, with the criteria for fixing amounts of such installments to be determined in context of this project as an additional condition precedent to disbursement.
- c. Houses or buildings must be located within areas designated by the GOE as low income areas and needing help.
- d. Areas receiving water connections under this project must have sufficient supply facilities to meet the extra connected demand for the area.
- e. Houses or buildings generally must have access (within 30 meters) to a wastewater seepage pit or existing sewer system. Those buildings not meeting this criteria will be considered separately on a case-by-case basis.

4.40 The cost to install a metered water service connection has been estimated based on July 1977 prices for labor, materials and miscellaneous charges. Costs presently experienced by GOGCWS in meter service connection installations were also reviewed and utilized as applicable. The estimate for a typical connection and a detailed cost estimate are listed in Annex L. The typical connection estimates also include an estimate of wastewater collection and disposal systems where required.

TABLE 5

<u>ITEM</u>	<u>COSTS IN THOUSANDS OF US \$</u>		
	<u>LOCAL<sup>1</sup></u>	<u>FOREIGN</u>	<u>TOTAL</u>
A. Rod El Farag Improvements*			
Land	411		411
Construction Cost:			
Plant	1,893	9,619	11,512
Pipeline	448	2,702	3,150
Engineering Design	46	739	785
Engineering Supervision	286	800	1,086
Sub-Total	<u>3,084</u>	<u>13,860</u>	<u>16,944</u>
Physical Contingency (15%)	463	2,079	2,592
Sub-Total	<u>3,547</u>	<u>15,939</u>	<u>19,486</u>
Escalation	744	4,061	4,805
Sub-Total	<u>4,291</u>	<u>20,000</u>	<u>24,291</u>
B. 40,000 House Connections			
Installed materials, tools vehicles, etc.	5,018	4,675	9,693
Labor	429	960	1,389
Training		135	135
Engineering design	786	500	1,286
Water main extensions	4,290	3,700	7,990
Other	186	30	216
Sub-Total	<u>10,709</u>	<u>10,000</u>	<u>20,709</u>
C. Total Project Costs	<u>15,000</u>	<u>30,000</u>	<u>45,000</u>

1. Rate of 1 L.E. equals US \$1.43

\* The detailed cost estimate for the Rod El Farag Improvements is not in a form for reproduction as an annex. USAID has reviewed the detailed cost estimate and considers it to be a reasonable and accurate cost estimate based on the information available.

E. Summary

4.42 The technical aspects of the two activities have been discussed separately, however they are closely related. The expansion and rehabilitation of the Rod El Farag Water Treatment and water mains extension is needed to assure a reliable and adequate water supply at the pressures needed to supply some of the areas selected for service connections. Pipeline network analysis indicates that while the system initially can supply the additional water needed, in approximately three years shortages will become so acute that some areas may be forced to ration water.

4.43 The primary goal of a water utility is to produce and deliver to the consumer's tap, a safe, aesthetically acceptable water in sufficient quantity at a reasonable cost and pressure. These goals, so easily stated, will be only partially met by this project because of the tremendous backlog of work needed. However, without this project an acute problem will rapidly reach critical proportions.

4.44 In view of the foregoing, it is the position of USAID that the requirements of Section 611(a) of the Foreign Assistance Act of 1961, as amended, have been met. This project is based upon sound engineering plans as recommended by ES-Parsons and a reasonably firm cost estimate also prepared by ES-Parsons. The Mission has reviewed the plans and cost estimate and finds them reasonable and accurate. Also, in accordance with Section 611(a) of the Foreign Assistance Act, the capability of the borrower effectively to install, maintain and utilize the facilities to be financed by the project has been reviewed and confirmed and the USAID Director has certified to this effect in Annex C.

V. ENVIRONMENTAL ANALYSIS

A. Land Use

5.01 The proposed plant expansion work will be confined within the 82 hectares of the present plant site. The generally degraded urban environment surrounding this treatment plant site greatly reduces the impact of the temporary problems such as dust, noise and other effects from the construction work.

5.02 One of the underground pipeline routes is along the Sharia El-Kornich which is adjacent to a wide promenade along the east Bank of the Nile. Construction will be on the east side of this boulevard (probably in the frontage road) and will be aesthetically unattractive during the work period. Construction on the east branch of the transmission main will pass through dense residential areas and cause temporary disruption of traffic and other activities.

5.03 The land use effects of the proposed water service connections would be of a minor nature, and because of the highly disturbed existing environment in most of the dense urban areas where project work will be implemented, the significance of slight increases in dust and noise for a few days would be small. Most streets affected are not major thoroughfares and little traffic disruption will occur. The shallow character of the service connection excavations should not alter any land use patterns.

5.04 The land clearing operations involved for most pipeline excavations will disturb little or no plant ground cover. Because only short periods of open-trenches will be permitted during construction, the erosion and run-off problems should be minimal.

5.05 The land use classifications along most of the pipeline routes are commercial and light industrial. Most buildings are set well back from the street and the effects from construction activities can be minimized by proper control of dust, noise, refuse, etc. Therefore, alteration of land use other than temporary disturbances during construction would appear to be neither substantial nor important compared to existing environmental conditions.

## B. Water Quality

5.06 The major impact of this project is, of course, the addition of water with improved distribution and system pressures. This impact can be better appreciated in terms of the number of households served by this amount of water. Of the 200,000 cm/d produced, about 120,000 cm/d will be available for residential use (the balance is accounted for by losses and commercial, industrial and government uses). At a per capita use of 200 liters per day, this would provide water for at least 600,000 additional people each day.

5.07 Alternatively, it can be considered that this water will produce approximately 84,000 cm/d of waste waters and have a temporary adverse impact on the presently overloaded sewerage system. To reduce this impact, the project plans to develop the use of seepage pits for disposal of waste waters in areas where no sewage collection system exists. This will reduce the public's potential contact with untreated sewage. Similarly where sewage collection systems do exist, the project will require flushing and cleaning by the GOE in those areas where house connections are to be carried on under this project (see paragraph 5.19 below).

5.08 The present flow in the Nile River is about 100 million cm/d. Almost two-thirds of the City's water supply (1,138,000 cm/d) is drawn from the River. The balance of the water supply is groundwater. Assuming 60 to 70 percent of the total water supply is returned to the river as waste-water, the net effect on river quality from this project is negligible. Preliminary calculations of the river's self-purification capacity indicate that it exceeds the present organic and nutrient loads discharge from domestic and agricultural waste. This, of course, only applies to biodegradable organic matter. Inorganic salts and nutrients, e.g., nitrates and phosphates, have been steadily increasing and the increase is partly caused by the discharge of domestic wastes.

5.09 Filter backwash waters will be discharged from the filtration plant to the river. This backwash water contains algae and other particular matter filtered from the raw water plus the coagulant chemicals. The coagulants represent the only net input into the river. With the proposed filtration modifications and increase in capacity, there would be small increase in the discharge of alum, and polymer, but the overall effect would be a slight increase in turbidity near the treatment plant discharge.

5.10 Construction of the treatment plant expansion will involve placement of a new raw-water intake in the Nile River. The excavation and construction work increase the turbidity of the river along the east shore and downstream from the intake structure.

5.11 No other environmental impacts on water quality from the project appears to be either substantial or important compared to the existing environmental conditions.

C. Atmosphere

5.12 Although relatively minor and temporary, construction activities add to the air pollution in the area. To minimize these effects, the construction contractor will be required to:

- a. Keep construction equipment well tuned.
- b. Service filters, blowers and injectors on gasoline and diesel engines with particular attention given to the reduction of emissions.
- c. Remove all construction debris to approved dump sites - no burning of refuse will be permitted.
- d. Wet down all unimproved roads, and right-of-ways and other construction surfaces to prevent dust problems.

5.13 If possible the use of low sulfur fuels will be encouraged to alleviate the emission of sulfur oxides from construction equipment and vehicles.

5.14 Except for the small amount of air pollution from equipment during the construction period, there would appear to be no other atmospheric disturbances which would result from the proposed project.

D. Natural Resources

5.15 The major natural resource use is of course the increased use of water made possible by the proposed project. An additional 200,000 cm/d will be pumped from the Nile River, have chemicals added to make it suitable for domestic consumption, then distributed and used and finally discharged as waste-water. In this process, the water will dissolve approximately 300 mg/l of additional salts, 200 mg/l of degradable organic material and numerous bacterial organisms. Most of these pollutants are difficult and expensive to remove. With this use, the original characteristics of the water will be permanently altered.

5.16 However, the alternative to not providing this additional water is an increase in human suffering from health problems and a decline in the population's standard of well-being. It is universally accepted that an adequate supply of water for drinking, personal hygiene, and other domestic purposes are essential to public health and social well-being. The major consideration from a community's viewpoint is that the benefits derived from exploiting a natural resource far exceed the benefits of keeping that resource in its natural state.

E. Health

5.17 Although there is no doubt improved water supplies have the potential for and usually do improve the health of a population, it is also apparent that increased water usage increases the quantities of waste water. With improvements in the water supply, the frequency of sewage backups and flooding may increase. This could increase the public's potential contact with untreated wastes and the risk of enteric diseases unless waste disposal systems are adequate.

5.18 The 1976 census indicated that approximately 17 percent of buildings in Cairo are not connected to the present sewerage system. Reportedly the sewerage system is operated in a surcharged condition because of debris in the lines and there is little if any storage within the system. Sewerage levels are often near the surface of the ground and electrical and mechanical failures at the pumping stations result in sewerage flowing on the streets and in parts of the city.

5.19 If the proposed project is implemented, remedial measures may need to be taken to clean the sewers and rehabilitate the pumping stations. A temporary measure proposed as part of this project is to provide seepage pits for the disposal of sanitary waste waters. However, major improvements to the city's sewerage system will need to be undertaken in the longer term if the gains in public health benefits from the water system improvements are not to be offset by greater contact. This increased sewerage problem remains as the principal environmental risk resulting from the project. AID will require as a covenant in the Loan Agreement that the GOE furnish plans for and carry out sewerage flushing and cleaning in areas of house connections financed under this project.

F. General

5.20 Some late Islamic remains may be encountered in the excavations needed during construction. However, the significance of these archaeological discoveries would be diminished by the presence of better preserved remains of the same period in other parts of the city. Because all excavations are rather shallow, the quantity of excavation small (24,000 cu m) and the excavations in recent (less than 700 years) fill, the chances appear remote that any archaeological funds of importance will be uncovered.

G. Threshold Decision

5.21 The project will not adversely affect the basic aspects of the human environment such as air, water, land, flora and fauna. Also, while there may be environmental risk in the context of current sewerage conditions, the safeguards provided in the project should act to minimize this risk. Similarly, reasonably foreseeable effects of the project on organisms in the biosphere, including human life, are not expected to be either adverse or significant. In the same manner, the precautionary measures to be taken during implementation should act to minimize the temporary adverse effects of actual construction (see Annex N). Finally, the sum of the socio-economic and cultural effects should be positive (see above and discussion at Part VIII - Social Analysis).

5.22 On balance, therefore, and taking into consideration the health and general benefits to the living standards of people to be served by the project, a negative determination is indicated. Similarly, the threshold decision is that neither an Environmental Assessment nor Impact Statement is required.

## VI. FINANCIAL ANALYSIS

### A. Tariffs

6.01 Within the Greater Cairo area, there are different rate schedules for different districts. Within a given district, all customers, commercial, industrial or residential, pay according to the same rate schedule, except for a fifty percent reduction for mosques and churches. Some districts have a single rate per cubic meter independent of the quantity used, while others have sliding scale rates that, in general, decrease from 15 milliemes per cubic meter down to 10 milliemes at higher usages. The rate schedules have not changed since the government took over the water system from a French company 25 years ago, and revenues now cover only about half the cost of producing water. Non-potable water is charged at about one-half of the rates for potable water. Annex O shows the current tariff schedule.

6.02 The GOGCWS has proposed to the GOE that it be allowed to increase its rates. Included in the proposal is a recommendation that there be a single rate schedule for all districts of Cairo and that the rate be degressive, but the first 30 cubic meters per month to cost 12 milliemes (approximately the current average price), the next 20 cubic meters to cost approximately the full cost of producing water (probably about 25 milliemes), and all usage above 50 cubic meters per month to cost approximately double the full cost of production. GOGCWS believes that this rate structure would cover all costs and would discourage the waste and improvident use of water. The GOE has not yet acted on GOGCWS' proposal.

6.03 GOGCWS would also like to charge a higher rate for treated water used by industry since many industries could use water of lower quality. No charge is made for water discharged through fire hydrants.

6.04 A charge varying from about 65 to 210 LE, depending on the size and length of connection, is made for new consumer connections. In new developments, the developer is required to pay for the full cost of extending the system to his site. The work of installing the mains, the meters and the house connections is performed by GOGCWS' staff which bills the customer for the work.

B. GOGCWS1. Capital Investment Program

6.05 The GOGCWS ten-year capital budget for new waterworks is presented in Annex P. This capital budget reflects the continuous modifications in the planning activities of the GOGCWS and demonstrates its requirements for capital to construct needed facilities. See Annex P for listing.

2. Financial Condition

6.06 Annex Q shows GOGCWS' Income Statements for the years 1973 through 1976, and Annex R shows the corporation's Balance Sheets at December 31 for the corresponding periods. The statements are unaudited and not in the best format for analysis. They were recently received and are presently being reviewed with GOGCWS. While a detailed review of the statements will alter some of the amounts, they are descriptive enough for a general analysis of GOGCWS' financial condition.

6.07 According to GOGCWS' Income Statement from 1973 to 1976, water sold increased 24 percent, income increased 20 percent, and production costs increased 120 percent. As a result GOGCWS has gone from a profit of LE 993,000 in 1973 to a loss of LE 3,101,000 in 1976. Excluding financial costs (interest, taxes) the cost of producing water was 16.1 milliemes per cm in 1976. Using the average sales price of 12 milliemes, GOGCWS loses 4.1 milliemes, before interest and taxes, on every cubic meter of water sold. In our opinion, the cost of producing water is greater than 16.1 milliemes, since tests have shown that water production is overstated. With accurate data, production costs will probably approximate the 25 milliemes previously mentioned.

6.08 GOGCWS' Balance Sheets show the effect of the reduced income. In 1973 the organization showed retained earnings (after payment of a dividend of LE 991 thousand) of LE 460 thousand. In 1976 the retained earnings disappeared and the organization had a deficit of LE 3.3 million. During the period 1973 to 1976 fixed assets, including work in progress, increased by LE 17.3 million, while debt increased by LE 21 million, indicating that GOGCWS is borrowing to pay operating costs. Also, in 1976 accounts payable to suppliers increased by about LE 12 million over the 1973 amount; another source for covering operating costs.

6.09 The GOE is aware and concerned with the financial condition of its water and wastewater organizations. In 1976 the GOE requested AID assistance in financing the foreign exchange costs of a comprehensive management and tariff study of the entire water and wastewater sector. The GOE should complete its selection by end September 1977 of the firm to conduct this study. Assuming the firm commences work in November 1977, the study should be completed during March 1978 (16 months). Annex S shows the scope-of-work for this study.

6.10 We will await the results of this study prior to reaching agreement with the GOE on the actions to be taken with respect to financial reorganization or improvements. The loan agreement will require that the recommendation of the consultant, as agreed following discussions between the GOE and AID, will be implemented for the GOGCWS. However, given the current and projected financial condition of GOGCWS, we will require in form and substance subject to AID approval, as a condition of this loan, that at a minimum the GOE: (1) assure a continual cash flow to GOGCWS to allow it to meet all its financial obligations; (2) no later than December 31, 1979, recapitalize GOGCWS, either converting loans to equity or by increasing equity so that GOGCWS' debt does not exceed 150 percent of its assets; and (3) no later than December 31, 1979, allow GOGCWS an increase in tariffs to a level which will allow GOGCWS to earn a reasonable return on its assets properly valued and re-valued from time to time. The latter two conditions will serve as minimum terms for the discussion to be conducted on the range of possible changes following the consultant's report.

C. Rod El Farag Plant

6.11 Based on the current average price of 12 milliemes per cubic meter, annual revenues from the expanded Rod El Farag Plant will be LE 856,200. Costs, before interest, depreciation and administration expenses will be LE 909,091. Therefore, until tariffs are increased, the Rod El Farag Plant, after renovation and expansion, will still not improve GOGCWS' financial position; although it will not be as much a financial drain as the other plants in the system.

D. Financial Summary

6.12 The project financial summary is as follows:

TABLE 6Financial Summary

(in thousands of U.S. Dollars)

	<u>S</u>	<u>LE</u>
Cost:		
Rod El Farag Plant	20,000	4,291
House connections	<u>10,000</u>	<u>10,725</u>
TOTAL	30,000	15,016
Source:		
USAID Loan	30,000	-
GOE	<u>-</u>	<u>15,016</u>
TOTAL	<u>30,000</u>	<u>15,016</u>

6.13 The proposed terms to the GOE are AID's concessionary terms: forty (40) year loan with a ten (10) year grace period with interest at two percent (2%) during the grace period and three percent (3%) during the repayment period.

6.14 For the GOGCWS, we are proposing that the GOE relend the AID loan to the GOGCWS at terms subject to AID approval. These terms will be subject to review and possible adjustment following completion of the consultant's report above and agreement with the GOE on implementation of the consultant's recommendations. We recognize that relending will further contribute to GOGCWS' deficit, but once a new tariff has been set, it should reflect the costs of producing water and interest (the cost of capital) as real costs and contribute toward GOGCWS' ability to service and repay debt.

6.15 Historically, and to the present, governments, including the U.S., have subsidized water and sewage projects in that none pay the full cost of capital. On this basis, the initial terms for relending will probably be proposed at an interest rate of six percent, five-year grace and 25 years to repay. This relending rate would include an element of subsidy, but it would also conform with prevailing U.S. rates for long-term debt incurred by water and sewage authorities. (It is less, however, than the IBRD rate for its loan to the Alexandria Water Authority at 8.9 percent per annum with repayment over a 20-year period, including a 4.5 year grace period. IBRD terms are probably determined more by the cost of funds to the IBRD than by consideration of what may be the most appropriate water utility rate.)

6.16 Such relending terms should present no problem to the GOE or GOGCWS for the Rod El Farag project. There is, however, a question of whether we should allow softer terms for the house connections portion of the project. For this project, we will require GOGCWS to allow customers to repay the cost of installation over time (the amount would be billed with the water charge). The cost charged to the customer would equal GOGCWS' cost, plus interest, and be repayable over a five to ten-year period. Therefore, GOGCWS will not incur any additional expense. Also, gross revenues will increase as more dwellings are connected. Economically or financially, therefore, there is no justification for a lower rate for the house connection project. Collections in fact from all customers have been fairly prompt. We conclude, therefore, that we should maintain our relending terms for both projects. A plan for installment repayment of connection charges, including terms, will be an additional condition precedent under the Loan Agreement.

E. Disbursements

6.17 The following table shows the projected disbursements by years. A more precise schedule will be prepared at the start of project implementation:

TABLE 7

Projected Disbursements  
(In thousands of U.S. Dollars)

	<u>Rod El Farag</u>		<u>House Connections</u>	
	<u>\$</u>	<u>LE</u>	<u>\$</u>	<u>LE</u>
1977	100	40	100	30
1978	1,000	174	6,000	6,435
1979	5,000	1,072	3,900	4,260
1980	10,000	2,145	-	-
1981	<u>3,900</u>	<u>860</u>	<u>-</u>	<u>-</u>
TOTAL	<u>20,000</u>	<u>4,291</u>	<u>10,000</u>	<u>10,725</u>

F. Debt Service Capability

6.18 Egypt's external debt amounted to about \$12 billion at the end of 1976. Of this, roughly one-third was to Eastern European countries and primarily for past military equipment imports. The \$8 billion balance includes almost \$2 billion in deposit liabilities of the Egyptian Central Bank to the various Arab OPEC countries.

6.19 It is estimated that about \$950 million in principal payments on medium and long-term debt were made in 1976. An amount estimated at \$1.4 billion was owed on short-term bank credit facilities at the end of 1976. In 1977 Egypt received a loan of \$1.5 billion from CODE which is being used to substantially reduce its current short-term debt problem.

6.20 Debt service requirements in the future depend heavily on the extent to which new short-term debt can be avoided. Over the near term, we expect the debt service ratio (including short-term debt) to move between 25 and 30 percent of export and service earnings.

6.21 In view of Egypt's heavy debt burden, AID's normal concessional loan terms are proposed - forty (40) years, including a ten (10) year grace period, with an interest rate of two percent (2%) per year during the grace period and three percent (3%) per year thereafter. With these terms, particularly the ten-year grace period, repayment prospects for this \$30 million loan amendment appear reasonable.

## VII. ECONOMIC ANALYSIS

### A. General

7.01 As GOGCWS' water facilities are improved, per capita consumption will increase proportionately. For this purpose, a maximum per capita water consumption value of 250 lcd (66 gpcd) has been adopted for the year 1985. This figure compares favorably with actual water consumption figures for other large metropolitan areas throughout the world.

7.02 Future demand will also be influenced by population growth. This growth has been estimated by Taylor-Binnie, an English consulting engineering firm preparing the Cairo Wastewater Master Plan, through the year 2000 for a major part of the Greater Cairo Area. The projection indicates a population growth in the service area of approximately 11 percent by 1980 and 28 percent by 1985.

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TABLE 8

Projected Population

<u>Year</u>	<u>Population in Greater Cairo</u>	<u>Population in GOGCWS Area</u>
1976	8,000,000	6,711,000
1980	8,950,000	7,451,000
1985	10,500,000	8,598,000

---

7.03 Other factors affecting future water usage are the 40,000 house connections proposed by this project and the growth of population in the unserved areas who indirectly obtain water from the system. It is estimated that each new service connection will add 1.0 cm/d load on the system. This was calculated as follows:

$$100 \text{ lcd} \times 10 \text{ people/connection} = 1,000 \text{ lpd, or } 1.0 \text{ cm/d.}$$

It is anticipated that this load of 40,000 cm/d will be fully operational by the end of 1979. Also, the unserved population has been estimated at 1.9 million and by 1985 (assuming 84 percent of the total population have direct service) will place an additional load (1.9 million x 50 lcd) of 95,000 cm/d.

7.04 Based on the foregoing estimates of population and assumptions relative to population served and per capita water consumption, plus a water loss of 26.7 percent, the average daily requirements for the GOGCWS to the year 1985 are tabulated in Table 9 .

---

TABLE 9

Estimated Daily Water Requirements for GOGCWS

<u>Year</u>	<u>Average Day cm/d</u>	<u>Peak Day (1.25 x Average Day)</u>
1976	1,782,000	2,230,000
1980	2,270,000	2,837,500
1985	2,894,000	3,618,125

---

7.05 Present production facilities were shown in Table 1 are estimated at 1,748,000 cm/d. The following tabulation summarizes the additional production capacity expected to be added to the system by 1985 from presently planned facilities:

---

TABLE 10

<u>Project</u>	<u>Added Capacity in cm/d</u>	<u>Expected On-Line Date</u>
1. Mostorod Plant	300,000	Early 1978
	150,000	Early 1978
2. North Helwan Plant	80,000	1980
3. Maadi Plant	40,000	1979
4. Tebin Plant	60,000	Late 1977
5. Imbaba Plant	<u>150,000</u>	1981

Total Capacity 780,000 cm/d

---

7.06 As discussed in Section 2.06, there is estimated a current deficiency of 500,000 cm/d. Presently planned facilities will not keep pace with projected growth and this deficit is estimated to reach 1,190,000 cm/d by 1985. The data are tabulated in Table 11 .

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TABLE 11

Comparison of Projected Supply and Demand

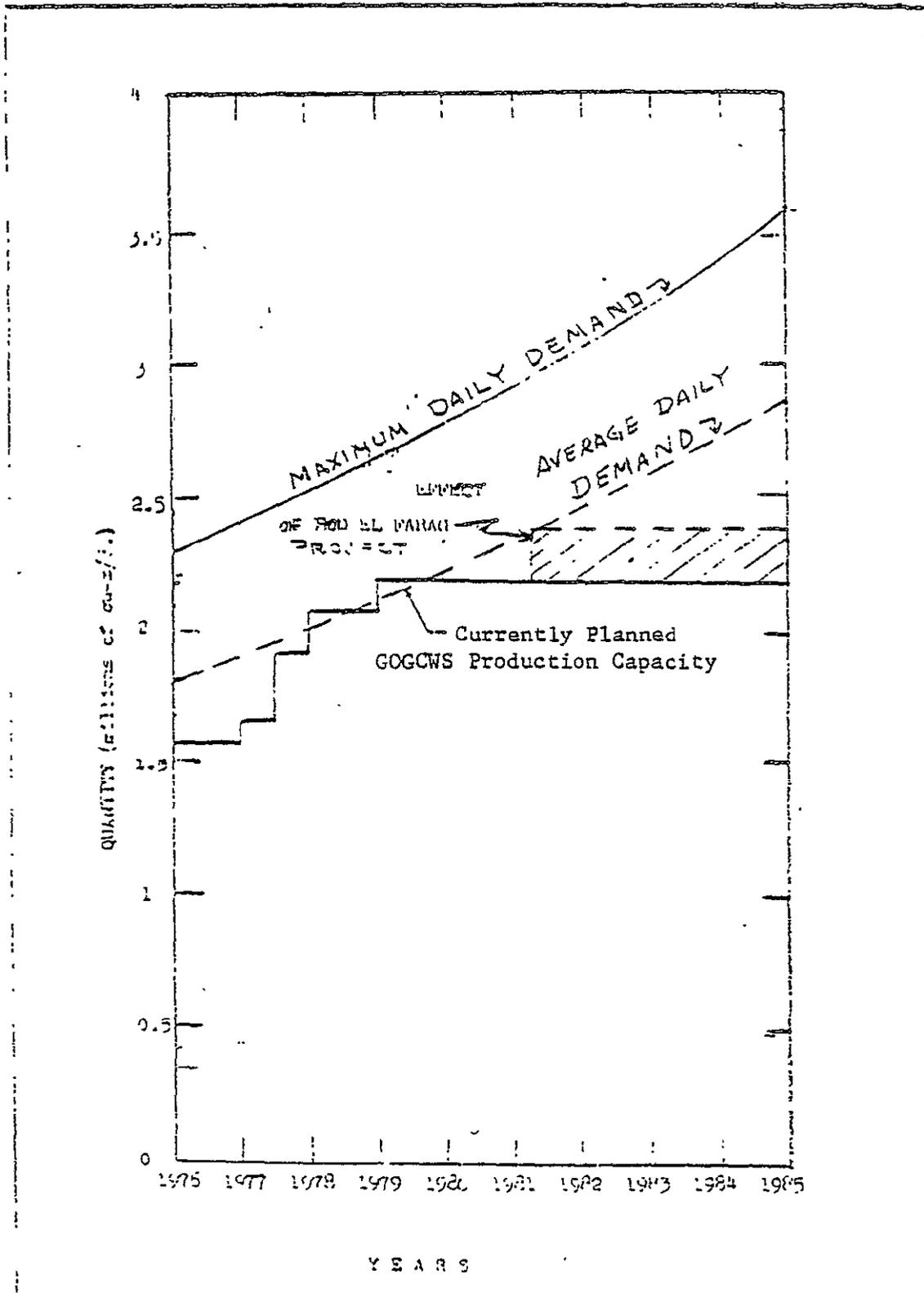
<u>Year</u>	<u>System Capacity cm/d</u>	<u>Maximum Daily Demand cm/d</u>	<u>Estimated Deficiency cm/d</u>
1976	1,748,000	2,230,000	500,000
1980	2,298,000	2,837,500	539,000
1985	2,428,000	3,618,125	1,190,000

---

7.07. Figure 2 shows projected water supply and demand for the period 1976 through 1985.

FIGURE 2

Comparison of Supply & Demand  
Rod El Farag



7.08 Based on estimates of 10 persons per connection and a continued connection rate of 11,000 per year by the GOGCWS, Table 12 projects the amount of connections needed by 1985 as 209,890. This represents an additional (roughly) 2.0 million people or 23.3 percent of the population expected to be served by the GOGCWS.

---

TABLE 12

Estimate of House Connections Made and Unsatisfied Demand

<u>Year</u>	<u>Population Unserved</u>	<u>No. Connections Needed</u>	<u>No. Connections by GOGCWS</u>	<u>Cumulative Deficit in Connections</u>
1976	1,234,200	72,700	11,000	61,700
1980	1,974,200	197,420	44,000	153,420
1985	2,649,000	264,890	55,000	209,890

---

B. General Economic

7.09 Ideally, economic justification of the project would rest on a comparison of the economic benefits with the costs. Benefits would include medical and hospitalization costs attributable to waterborne infection and inadequate hygiene which would be saved as a result of the improved water supply afforded by this project, and the consequential gains in productive man-days thereby secured. Unfortunately, statistics to support such calculations are not available. The prices consumers pay for their supplies cannot satisfactorily be used as a surrogate for the value of benefits received since willingness to pay can only be demonstrated at the present level of tariff, which would provide a negative rate of return.

26

### C. The Project

7.10 For purposes of analysis, we have attempted to determine at what rate GOGCWS must sell the water produced at the Rod El Farag plant and distributed to the 40,000 beneficiaries to achieve a satisfactory economic rate of return. On the cost stream we have increased capital costs by five percent for additional transmission cost (the present capital costs include most of the transmission cost and installation) and increased operating costs for the economic value of fuel and electricity. On the benefit stream, we have assumed new expansion at 200,000 cu m/d starting in the fifth year, or 62,050,000 cu m/y after allowing for a 15 percent loss. The rebuilding of the existing plant will mean saving 230,000 cu m/d of present production. Since this would have been available for four more years without plant reconstruction, it is thus considered a benefit starting only in the fifth year. The annual production from the reconstruction would be 71,350,000 cu m/y after allowing for a 15 percent loss. Total salable production would be 133,400,000 cu m/y. Based on the foregoing assumptions, the project would return an 18.5 percent rate of return at 42 milliemes per cubic meter of water. Consumers are willing to pay prices higher than 42 milliemes a cubic meter in other developing countries including those in the Middle East (Syria, Jordan). \* We therefore believe this project is economically attractive to Egypt. The benefit: cost ratio will exceed unity because the economic rate of return of 18.5 percent is greater than the opportunity cost of capital of 10 percent; discounting at the lower rate will result in a ratio above 1:1.

### D. Least Cost Analysis

7.11 At the present time, the Rod El Farag plant supplies about one-quarter of the total system production. It is the oldest plant in the system and the largest. Its location and function at the center of the main system ensures that it will remain the most important plant. There is no question of its remaining an essential element of the system over the long term. Technically, there is no feasible alternative for supplying water to the central section of Cairo without a prohibitive investment in transmission and distribution facilities. The project therefore meets the requirements of Section 611(b) of the Foreign Assistance Act and Section 101 of the General Provisions of the FY 1977 Appropriations Act as per the President's Memorandum of September 5, 1973.

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\* The city of Damascus' current tariff rate is equivalent to 94 milliemes and projected to reach 236 milliemes in 1984.

## VIII. SOCIAL ANALYSIS

### A. General

8.01 This analysis attempts to answer two questions. Who will receive the benefits of this project, and what benefits will this target group receive.

### B. Target Group

8.02 Without equivocation, it can be said that the target population of this project includes some of the most disadvantaged people in Egypt. It has been common over the last decade or two to consider urban dwellers no matter how poor to be somehow better off than their rural counterparts. In most developing countries this concept may be valid. In Egypt however, a special set of circumstances points to a reverse condition. After the disturbances of January 1977, a number of prominent sociologists commented on the trends in Egypt over the last decade which have eroded the standard of living of the urban dwellers while the rural population has experienced an increase in relative prosperity. See Annex U . The eroding of the urban standard of living has resulted from the continuing rise in the cost of living without a commensurate increase in real income for the urban poor. To some extent, this situation has been ameliorated by subsidies for basic consumer goods which have benefited the urban poor and middle class. Even with this system in place, however, the prosperity of urban areas has declined relative to the rural areas.

8.03 Living conditions in the rural areas have improved as a result of small increases paid by the government for primary farm products, and to a lesser extent from the benefits which have resulted from rural development programs carried out over the previous years.

8.04 For the urban dweller, this loss of real income combined with the inability of the government to meet investment needs in basic urban services, has led to a class of citizens whose living conditions have been deteriorating at a noticeable rate.

8.05 This group of urban poor is the target population of the project. The geographic area serviced by Rod El Farag cuts across the poorest areas of Cairo. The increased pressure and output from the plant will increase the quality and quantity of water to these people. The households which are connected to the water system under this project will all be Class E households which represent the poorest class of housing in Cairo. This project will therefore directly address the concerns of some of Egypt's most disadvantaged people.

C. General Impact

8.06 The second question is what will the impact of the additional water be on the target population. Although we have no direct statistical evidence that larger quantities of cleaner water will have a direct health input in the urban environment of Cairo, it is clear that without an improved quality and quantity of water supplied to the target group, no meaningful improvements can take place in their health standards. We expect that this project impacting together with the Urban Health Delivery Systems project, which the AID has proposed to fund in FY 78, should reduce the direct potential for transmission of water-borne disease by:

- increasing availability of water for personal hygiene,
- decreasing dependence on alternative, unsafe sources of water;
- increasing availability of water for washing producer foods;
- reducing the risk associated with contamination of the potable water system from cross-connections; and
- assisting the poorer people to better understand their health and sanitation environment.

Annex T shows in chart form the relationship between water supply and social conditions. Annex U is an article by Thomas W. Lippman, Washington Post, July 23, 1977, about living conditions in the project area.

D. Cultural and Socio-economic Effects

8.07 Water in the household is used for many purposes, including drinking and washing, and there are wide variations in the amounts of water people want and are able to use. The value people place on this water is reflected in water-use habits which are in turn dependant upon tradition and culture. For example, a simple lack of knowledge about the consequence of not using sufficient water to a great extent may determine the magnitude of health-related benefits derived from a given water system. Use of water in the household may vary from making tea to a cool spray for the children to play under. The amount used reflects the life style the individual follows and can afford. It also is directly related to the availability of water. That the daily use fluctuates widely within a given community is well documented. Precisely how it differs between individuals in different locations is not so clear. The role of this project in promoting the well-being of the targeted groups thus will vary.

8.08 As has been observed, where water is obtained outside the building, the women and children are usually the carriers of this water. Therefore, this proposed project will immediately benefit women more than men. After the introduction of the water system into the household, these women will be able to spend in more productive activities time formerly used in carrying water. Studies indicate that women in urban areas usually spend newly acquired free time on domestic chores such as washing clothes or tidying up their dwellings. The children, especially girls, relieved of water-carrying duties are usually able to attend school on a more regular basis.

8.09 Water service connections will improve the quality of life within the affected neighborhoods. Such improvements in areas where rental units are predominant however may allow building owners to raise rents of the poorly paid tenants. Improved conditions and appearance may attract higher paid workers who have the extra income to pay the higher rents. Therefore, the potential exists for the displacement of existing low economic classes by the improvement of living conditions. The probability, however, is that if such displacement takes place, apart from normal urban mobility patterns, it would affect only a small portion of the people to be served by this project.

8.10 The proposed improvements in water service will also help maintain Cairo as a major urban cultural center. This will of course tend to increase the attraction of the city for greater numbers of rural people - a circumstance that has both adverse and beneficial consequences.

8.11 There is no question that the long-term effects of this project and the induced cultural changes will have significant impact. The changes in the standard of living may bring about substantial changes in community cohesion and present life-styles. Like complex problems, the long-term effects include both benefits and detriments which on balance are most likely to be positive for most of the people of Cairo served by the project.

IX. IMPLEMENTATION

A. GOGCWS - Implementing Agency

9.01 The general responsibilities and powers of GOGCWS are described in Annex E. The purpose of this section is to describe the existing organizational structure with respect to its capacity for planning, designing, constructing, operating and maintaining the various water supply and distribution facilities that comprise the Greater Cairo Water System and to explain the implementing agency for this project.

9.02 The organization of GOGCWS consists of three major divisions and a legal department as shown in Annex G.

9.03 The Projects Division is to do most of the design work internally except for rare occasions when work overloads dictate the use of private consulting firms for portions of the work such as structural design. Using this procedure, the final design output has, in the past, tended to leave most detailing to the construction contractor, with only plot plans and general specifications provided by GOGCWS.

9.04 The Technical Matters Division is subdivided into four sections. The principal responsibility for operation and maintenance of pipelines falls to the Networks Section; the operation and maintenance of treatment plants and well-fields is done by the Plants Section; and the Works and Mechanical Section supports both with a machine shop and field crews. The Planning/Monitoring Department monitors current activities and carries out planning.

9.05 The Financial/Commercial and Administrative Matters Division is organized to handle the meter reading and billing to provide standard administrative support services such as personnel, financial, auditing, training, etc. This division also operates the computer department.

9.06 Several problems limit the successful operation of the Organization. Possibly the most serious problem is the lack of replacement equipment, spare parts and certain chemicals. For example, there is only a small chlorine production capability in Egypt, and chlorine must be imported and must, therefore, compete for foreign exchange with other national necessities.

9.07 There is a continuing shortage of adequately-trained engineers, chemists and technicians. The causes of this include a demand for skilled personnel that exceeds supply; low, government-regulated salaries that often fail to attract qualified people; and the lack of a well-developed, in-service training program.

9.08 On balance, however, with the assistance of the U.S. consultant for this project (see discussion below) and the work on organization and management to be carried out by the general consultant (see Part VI above and scope-of-work of Annex S), we conclude that the GOGCWS has the management and technical capability to implement and maintain this project. See also USAID Director's Section 611 (e) Certification at Annex C.

B. Contracting Procedure

1. Rod El Farag Treatment Plant

9.09 Design, engineering and procurement of equipment will be the responsibility of GOGCWS assisted by a U.S. consulting engineering firm. Construction and erection will be contracted to an Egyptian construction firm, which will be supervised by the GOGCWS and the U.S. consulting engineering firm.

9.10 All equipment, materials and services financed from AID funds will be of U.S. source and origin. Contracting will be in accordance with Handbook 11 - Host Country Contracting.

2. House Connections

9.11 Procurement and installation of house connections will be performed by the GOGCWS with the assistance by the U.S. consulting engineering firm. All equipment, materials and services financed from AID funds will be of U.S. source and origin. Contracting will be in accordance with Handbook 11 - Host Country Contracting.

3. Selection of Consulting Engineer

9.12 The GOGCWS has indicated its desire to utilize the services of Engineering Science - Ralph M. Parsons Corporation (ESP) for the above consulting engineering services. The firm is working closely with the GOGCWS in the preparation of the Greater Cairo Water Study and prepared the feasibility study for the Rod El Farag Plant and preliminary work on the house connections project. AID will review this request which is based on the following: first, the firm is familiar with the Cairo water system and the proposed projects. Second, they have obtained the confidence of GOGCWS and have an excellent working relationship. Third, the firm of Ralph M. Parsons has strong capability in construction management, an area where the GOGCWS is weak. Fourth, the selection of ESP will save approximately seven months in the project schedule, the time required to select a firm under AID competitive procedures. Fifth, ESP was selected initially under AID competitive procedures.

C. Schedule

1. Rod El Farag

9.13 A plan for implementation of the Rod El Farag Plant is shown in Annex V. It is anticipated that design of the facilities will require 11 months. Tenders will be released for pipe and equipment during the design phase to allow equipment to be on site to meet the construction schedule. Upon contracting an A/E firm, construction of the facilities should start in the seventeenth (17) month and be completed at the forty-fifth (45) month. Testing and start-up would proceed during the last few months of construction and would be designed to place the facilities into operation at the forty-fifth month.

9.14 A training program for local operators for familiarization of new equipment, required maintenance procedures and basic water treatment theory would be held during start-up. An operation and maintenance manual in English and Arab will be prepared as a guide during the training period and a reference during operations. The entire program will be completed within forty-eight (48) months from the date initial Conditions Precedent to Disbursement are met. Annex W shows the schedule on bar charts. The first task of the consulting engineer will be to prepare a critical path network.

30

2. House Connections

9.15 Field engineering, design, training of installation crews and procurement of material will take approximately five (5) months. Installation of service connections will start in the sixth (6) month and should be completed at the twenty-fourth (24) month. Working in three or more areas simultaneously, we estimate that 2,105 connections will be made per month. For this effort 218 individuals will be employed full time. The table at Annex W shows the number of employees by job classification and nationality. All foreign nationals will be existing employees of GOGCWS. American personnel will be provided by the consulting engineering firm.

9.16 In addition to the personnel needed for the installation work, a large force will be required for excavation of pipeline trenches. Consideration will be given to the possibility of organizing a "food for work" program utilizing PL 480 commodities.

D. Terminal Dates

1. Conditions Precedent

9.17 The Terminal Date for meeting Initial Conditions Precedent to Disbursement will be 120 days from the date of the signing of the Loan Agreement. The Terminal Date for meeting additional Conditions Precedent will be 180 days from signing of the Loan Agreement.

2. Letters of Commitment and Disbursement

9.18 The Project Assistance Completion Date (which will also be the Terminal Date for opening of Letters of Commitment) will be forty-two (42) months from the date that Initial Conditions Precedent to Disbursement are met. The Terminal Date for Disbursements will be twelve (12) months following the Project Assistance Completion Date.

E. Control and Monitoring Measures

9.19 At the commencement of his work, the consulting engineer will assist the GOGCWS in preparing a CPM/PERT network for project execution. This network will be monitored regularly by USAID/Cairo. Monthly reports on project execution will be required from GOGCWS and the consulting engineer. Considering the proximity of the Rod El Farag Plant and the proposed location of the house connections project, frequent site visits will be made. The GOGCWS will also be required to report regularly on its financial condition.

F. Evaluation

9.20 The project addresses the medium-term objectives of (a) reconstruction and expansion of the Rod El Farag Plant which will provide increased amounts of higher quality water to a significant number of poorer people living in the Rod El Farag and adjacent areas; and (b) the provision of water to 40,000 Class E households.

9.21 The present plan calls for evaluation at three levels. The first will be an annual evaluation which will review the consulting engineer's monthly and quarterly reports and serve as the major project monitoring report. The second level will analyze whether production of the Rod El Farag Plant reaches the level projected under this project. The third will determine whether the 40,000 Class E household connections are made. This third level of evaluation, and to some extent the second level, will provide data on whether the improvements in the system have reached the intended beneficiaries.

9.22 The second and third level evaluations will be carried out by USAID working with the GOGCWS. The household connections portion of the evaluation will be undertaken approximately 24 months after the project begins. The Rod El Farag production analysis will be undertaken within six months after start-up, the latter expected to take place by the 45 month.

9.23 There is a possibility that the Mission may do an overall impact evaluation of AID-financed water and sewerage projects in Egypt at some future date. The Mission considers that the presently available information is not adequate to decide on the usefulness or design of such an evaluation. As we develop a larger base of information from the Water and Sewerage Master Plans, from feasibility studies for specific projects and the Management and Tariff Study, and from implementation of on-going projects, we will be able to make more informed judgment concerning the usefulness of such an impact evaluation.

X. RECOMMENDATION, CONDITIONS AND COVENANTS

A. Recommendation

10.01 Subject to the conditions and covenants listed below, we recommend that AID authorize a loan to the GOE in the amount of \$30.0 million for rehabilitation and expansion of Rod El Farag Water Treatment Plant, the installation of water distribution mains, and the installation of 40,000 water service house connections. We further recommend that the loan terms to the GOE be that the loan principal be repaid in forty (40) years, including a ten (10) year grace period, with interest at two percent (2%) per annum during the grace period and at three percent (3%) thereafter; and that the Government of Egypt relend the funds to the GOGCWS on terms and conditions subject to AID approval, on a preliminary basis expected to be at an annual interest rate of six percent (6%) with the principal to be repaid over a twenty-five (25) year period, including a five (5) year grace period. Procurement of equipment and services will be of United States source and origin.

B. Conditions Precedent to Disbursement

10.02 We recommend that the Conditions Precedent to Disbursement be segregated into two groups. The first, or initial, set would be those conditions which must be satisfied before the employment of a consulting engineer. The second, or additional, set would be those conditions which must be satisfied before the purchase of plant and equipment for the Rod El Farag Plant and the installations and house connections.

10.03 Conditions Precedent to Initial Disbursement are:

- a. An opinion of the Egyptian Ministry of Justice or other legal counsel satisfactory to AID that the Loan Agreement and the corresponding relending agreement have been duly authorized and ratified by, and executed on behalf of, the GOE and are valid and legally binding obligations in accordance with their terms.

- b. The names of the persons who will act as the representatives of the GOE and GOGCWS and the specimen signatures of each.
- c. Evidence that the loan proceeds will be made available to GOGCWS at terms and conditions which AID has approved.
- d. An executed contract for the services of a U.S. A/E consulting firm for the preparation of detailed designs, assistance in procurement, training and construction supervision for the project.

10.04 Additional Conditions Precedent to Disbursement are:

- a. A financial and physical plan for the installation of distribution lines.
- b. A plan, acceptable to AID for the house connection project which show at a minimum the criteria for selecting customers, the financing to be made available to customers including terms of repayment.
- c. A detailed implementation plan, CPM/PERT form, for the rehabilitation and expansion of the Rod El Farag Plant.

C. Covenants

10.05 The GOE and the GOGCWS will be required to covenant:

a. Execution of the Project

- i. To cause the project to be carried out with due diligence and efficiency, and in conformity with sound engineering, construction, financial and administrative practices.
- ii. To cause the project to be carried out in conformance with all plans, specifications, contracts, schedules, and other arrangements, and with all modifications therein approved by AID pursuant to this agreement.
- iii. To submit for AID approval prior to implementation, issuance, or execution, all plans, specifications, construction schedules, bid documents, documents concerning solicitation of proposals relating to eligible items, contracts, and all modifications to these documents.
- iv. To submit plans for and to carry out sewerage flushing and cleaning in areas of house connections financed by this project.

b. Funds and Other Resources to be Provided

To make available on a timely basis any Egyptian currency and any foreign currency in addition to the loan, for the punctual and effective carrying out of construction, maintenance, repair and operation of the project.

c. Operation and Maintenance

To operate, maintain and repair the project in conformity with sound engineering, financial and administrative practices and in such manner as to insure the continuing and successful achievement of the purposes of the project.

d. Management

To provide qualified and experienced management for the project and to train such staff as may be appropriate for the maintenance and operation of the project.

e. Continuing Consultation

To cooperate fully with AID to assure that the purpose of the loan will be accomplished. To this end, the GOE, GOGCWS and AID shall from time to time, at the request of any party, exchange views through their representatives with regard to the progress of the project, the performance of the GOE and the GOGCWS of its obligations under the Loan Agreement, the performance of consultants, contractors and suppliers engaged on the project, and other matters relating to the project. The GOE and the GOGCWS shall specifically review and discuss with AID the recommendations of the management and tariff consultant to the GOGCWS and shall implement the recommendations agreed as a result of such discussions.

- f. In form and substance satisfactory to AID, the GOE shall assure adequate long-term financing for GOGCWS' expansion program which has been authorized and modifications and adaptations to such program. No later than December 31, 1979, the financing so provided will be divided between equity contributions and loans in such a manner that after the completion of loan transactions the debt to equity ratio will be no greater than 1.5:1. Also, no later than December 31, 1979, tariffs shall be set at a level high enough to produce a reasonable rate of return on average net fixed assets in operation, appropriately valued and revalued from time to time.

ANNEXES

TO

EGYPT: CAIRO WATER

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MINISTRY OF ECONOMY  
AND ECONOMIC COOPERATION

Mr. Donald S. Brown  
Aid Director  
U.S.A. Embassy  
Cairo.

Cairo, 5 Sept. 1977.

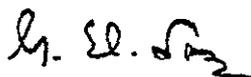
Dear Mr. Brown,

The Government of the Arab Republic of Egypt has placed an extremely high priority on certain social requirements which will enhance the quality of life for our citizens. With this in mind, we have reviewed the "Feasibility Report for FY 1977 for Cairo Water System Improvements", which was prepared by ES-Parsons under AID grant funding.

One project specified is the rehabilitation of the Rod El Farag Water treatment plant and providing 40,000 house service connections. Since the plant was built in 1901 and services nearly 30% of the Cairo water supply, we are aware that unless this plant is rehabilitated, an emergency health situation will exist if the plant fails. To eliminate such a disaster, the GOE requests that A.I.D. make available a U.S. dollar loan to cover the foreign exchange costs to rectify this situation.

The estimated foreign exchange cost for this project is U.S. \$30 million. Our Government will provide the Egyptian Pounds, estimated to be about L.E. 12 million, required to meet the local costs of the project.

Sincerely yours,

  
GAMAL EL-NAZER 36

MINISTRY OF ECONOMY  
AND ECONOMIC COOPERATION

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Aid Director  
U.S.A. Embassy  
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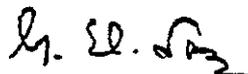
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Sincerely yours,

  
GAMAL EL-NAZER 37

PROJECT AUTHORIZATION AND REQUEST FOR ALLOTMENT OF FUNDS

PART II

Name of Country/Entity: Arab Republic of Egypt      Name of Project: Cairo Water Supply  
Number of Project: 263-0038

Pursuant to Part 2, Chapter 2, Section 532 of the Foreign Assistance Act of 1961, as amended, I hereby authorize a Loan to the Arab Republic of Egypt ("Cooperating Country") of not to exceed Thirty Million United States Dollars (\$30,000,000) ("Authorized Amount") to help in financing certain foreign exchange costs of goods and services required for the project as described in the following paragraph. The project consists of assistance to the Government of the Arab Republic of Egypt for (1) rehabilitation and expansion of the Rod El Farag Water Treatment Plant in Cairo and (2) extension of the existing Cairo water distribution system through installation of water connections in 40,000 homes, (hereinafter referred to as the "Project"). Loan funds will be reloaned to the General Organization Greater Cairo Water Supply (GOGCWS), for implementation of the Project. The entire amount of the A.I.D. financing herein authorized for the project will be obligated when the Project Agreement is executed. I hereby authorize the initiation of negotiation and execution of the Project Agreement by the officer to whom such authority has been delegated in accordance with A.I.D. regulations and Delegations of Authority subject to

the following essential terms and covenants and major conditions; together with such other terms and conditions as A.I.D. may deem appropriate:

a. Interest Rate and Terms of Repayment.

The Cooperating Country shall repay the Loan to A.I.D. in United States Dollars within forty (40) years from the date of first disbursement of the Loan, including a grace period of not to exceed ten (10) years. The Cooperating Country shall pay to A.I.D. in United States Dollars interest from the date of first disbursement of the Loan at the rate of (a) two percent (2%) per annum during the first ten (10) years, and (b) three percent (3%) per annum thereafter, on the outstanding disbursed balance of the Loan and on any due and unpaid interest accrued thereon.

b. Source and Origin of Goods and Services.

Except as A.I.D. may otherwise agree in writing, goods and services financed by A.I.D. under the project shall have their source and origin in the United States.

c. Conditions Precedent to Initial Disbursement.

Prior to any disbursement, or the issuance of any commitment documents under the Project Agreement Borrower shall, except as A.I.D. may otherwise agree in writing, furnish in form and substance satisfactory to A.I.D.:

(1) An opinion of the Egyptian Minister of Justice, or other legal counsel satisfactory to A.I.D., that the Loan Agreement and the Reloan Agreement have been duly authorized by, and executed on behalf of the Arab Republic of Egypt and GOGCWS, and that they constitute valid and legally binding obligations in accordance with their terms.

(2) A statement of the names of the persons who will act as the representatives of the Borrower and GOGCWS, together with a specimen signature of each.

(3) Evidence that the Loan funds will be made available to GOGCWS on terms and conditions acceptable to A.I.D.

(4) An executed contract acceptable to A.I.D. with consulting engineering firm acceptable to A.I.D. for services relating to the Project.

d. Additional Conditions Precedent.

Prior to any disbursement, or the issuance of any commitment documents under the Project Agreement to finance any costs other than for consulting engineering services, Borrower shall, except as A.I.D. may otherwise agree in writing, furnish in form and substance satisfactory to A.I.D.:

(1) A financial and physical plan for the installation of distribution lines.

(2) A plan, acceptable to A.I.D. for the house connection project which shows at a minimum, the criteria for selecting customers and the financing to be made available to customers.

(3) A detailed implementation plan for the rehabilitation and expansion of the Rod El Farag Plant.

e. Covenants.

In addition to the covenants in the A.I.D. standard form Project Loan Agreement the following covenants are applicable:

(1) Except as A.I.D. may otherwise agree in writing, the GOE shall provide or cause to be provided adequate long term financing for GOGCWS's expansion program which has been authorized and for modifications and adaptations to such program. No later than December 31, 1979, the financing so provided shall be divided between equity contributions and loans in such a manner that the debt to equity ratio will be no greater than 1.5:1.

(2) No later than December 31, 1979, water tariffs in Cairo shall be set at a level high enough

to produce an annual rate of return of 6 percent per annum on average net fixed assets in operation, appropriately valued and revalued from time to time.

Signature \_\_\_\_\_

\_\_\_\_\_  
Name of Authorizing Officer

\_\_\_\_\_  
Office Symbol

4/0

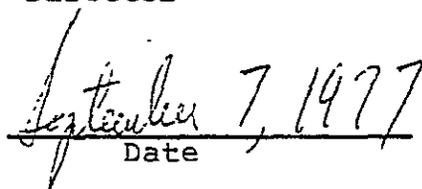
CERTIFICATION PURSUANT TO SECTION  
611 (e) OF FAA 1961 AS AMENDED

-----

I, Donald S. Brown, Director, the principal officer of the Agency for International Development in Egypt, having taken into account, among other things, the maintenance and utilization of projects in Egypt previously financed or assisted by the United States, do hereby certify that in my judgment Egypt has both the financial capability and the human resources to effectively install, maintain and utilize the capital assistance to be provided for (a) the rehabilitation and expansion of the Rod El Farag Water Treatment Plant and (b) the connection of water service in approximately 40,000 households.

This judgment is based upon general considerations discussed in the capital assistance paper to which this certification is to be attached.

  
\_\_\_\_\_  
Donald S. Brown  
Director

  
\_\_\_\_\_  
Date

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6C(2) - PROJECT CHECKLIST

Listed below are, first, statutory criteria applicable generally to projects with FAA funds, and then project criteria applicable to individual fund sources: Development Assistance (with a sub-category for criteria applicable only to loans); and Security Supporting Assistance funds.

CROSS REFERENCES: IS COUNTRY CHECKLIST UP TO DATE? IDENTIFY. HAS STANDARD ITEM CHECKLIST BEEN REVIEWED FOR THIS PROJECT?

GENERAL CRITERIA FOR PROJECT.1. App. Unnumbered; FAA Sec. 653(b)

(a) Describe how Committees on Appropriations of Senate and House have been or will be notified concerning the project;  
(b) is assistance within (Operational Year Budget) country or international organization allocation reported to Congress (or not more than \$1 million over that figure plus 10%)?

An "Advice of Program Change" has been prepared for transmittal to the appropriate committees of Congress. Obligations under this amendment will not take place prior to 15 days after the date of delivery of this notification. The intended obligation is within the level of funds appropriated for Egypt for FY 1977.

- (a) Yes  
(b) Yes

2. FAA Sec. 611(a)(1). Prior to obligation in excess of \$100,000, will there be (a) engineering, financial, and other plans necessary to carry out the assistance and (b) a reasonably firm estimate of the cost to the U.S. of the assistance?

No further legislative action is required to implement the project.

3. FAA Sec. 611(a)(2). If further legislative action is required within recipient country, what is basis for reasonable expectation that such action will be completed in time to permit orderly accomplishment of purpose of the assistance?

Yes

4. FAA Sec. 611(b); App. Sec. 101. If for water or water-related land resource construction, has project met the standards and criteria as per Memorandum of the President dated Sept. 5, 1973 (replaces Memorandum of May 15, 1962; see Fed. Register, Vol 38, No. 174, Part III, Sept. 10, 1973)?

The Mission Director has so certified. See Annex C.

5. FAA Sec. 611(e). If project is capital assistance (e.g., construction), and all U.S. assistance for it will exceed \$1 million, has Mission Director certified the country's capability effectively to maintain and utilize the project?

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A.

6. FAA Sec. 209. 619. Is project susceptible of execution as part of regional or multi-lateral project? If so why is project not so executed? Information and conclusion whether assistance will encourage regional development programs. If assistance is for newly independent country, is it furnished through multi-lateral organizations or plans to the maximum extent appropriate?
- The project is not susceptible of execution as part of a regional or multilateral project. Egypt is not a newly independent country.
7. FAA Sec. 601(a); (and Sec. 201(f) for development loans). Information and conclusions whether project will encourage efforts of the country to: (a) increase the flow of international trade; (b) foster private initiative and competition; (c) encourage development and use of cooperatives, credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture and commerce; and (f) strengthen free labor unions.
- This project is designed to increase the quantity and quality of potable water in Cairo. It will not have any significant impact on items (a) through (f).
8. FAA Sec. 601(b). Information and conclusion on how project will encourage U.S. private trade and investment abroad and encourage private U.S. participation in foreign assistance programs (including use of private trade channels and the services of U.S. private enterprise).
- The great majority of funds expended will be for goods and services from private U.S. concerns.
9. FAA Sec. 612(b); Sec. 636(h). Describe steps taken to assure that, to the maximum extent possible, the country is contributing local currencies to meet the cost of contractual and other services, and foreign currencies owned by the U.S. are utilized to meet the cost of contractual and other services.
- The Agreement will so provide.
10. FAA Sec. 612(d). Does the U.S. own excess foreign currency and, if so, what arrangements have been made for its release?
- Yes. Release by the GOE is not a problem at present.

B. FUNDING CRITERIA FOR PROJECT

1. Development Assistance Project Criteria

- a. FAA Sec. 102(c); Sec. 111; Sec. 281a. Extent to which activity will (a) effectively involve the poor in development, by extending access to economy at local level, increasing labor-intensive production, spreading investment out from cities to small towns and rural areas; and (b) help develop cooperatives, especially by technical assistance, to assist rural and urban poor to help themselves toward better life, and otherwise encourage democratic private and local governmental institutions?

Not applicable.

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b. FAA Sec. 103, 103A, 104, 105, 106, 107. Is assistance being made available: [include only applicable paragraph -- e.g., a, b, etc. -- which corresponds to source of funds used. If more than one fund source is used for project, include relevant paragraph for each fund source.]

- (1) [103] for agriculture, rural development or nutrition; if so, extent to which activity is specifically designed to increase productivity and income of rural poor; [103A] if for agricultural research, is full account taken of needs of small farmers;
- (2) [104] for population planning or health; if so, extent to which activity extends low-cost, integrated delivery systems to provide health and family planning services, especially to rural areas and poor;
- (3) [105] for education, public administration, or human resources development; if so, extent to which activity strengthens nonformal education, makes formal education more relevant, especially for rural families and urban poor, or strengthens management capability of institutions enabling the poor to participate in development;
- (4) [106] for technical assistance, energy, research, reconstruction, and selected development problems; if so, extent activity is:
  - (a) technical cooperation and development, especially with U.S. private and voluntary, or regional and international development, organizations;
  - (b) to help alleviate energy problem;
  - (c) research into, and evaluation of, economic development processes and techniques;
  - (d) reconstruction after natural or manmade disaster;
  - (e) for special development problem, and to enable proper utilization of earlier U.S. infrastructure, etc., assistance;
  - (f) for programs of urban development, especially small labor-intensive enterprises, marketing systems, and financial or other institutions to help urban poor participate in economic and social development.

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(5) [107] by grants for coordinated private effort to develop and disseminate intermediate technologies appropriate for developing countries.

c. FAA Sec. 110(a); Sec. 208(e). Is the recipient country willing to contribute funds to the project, and in what manner has or will it provide assurances that it will provide at least 25% of the costs of the program, project, or activity with respect to which the assistance is to be furnished (or has the latter cost-sharing requirement been waived for a "relatively least-developed" country)?

d. FAA Sec. 110(b). Will grant capital assistance be disbursed for project over more than 3 years? If so, has justification satisfactory to Congress been made, and efforts for other financing?

e. FAA Sec. 207; Sec. 113. Extent to which assistance reflects appropriate emphasis on; (1) encouraging development of democratic, economic, political, and social institutions; (2) self-help in meeting the country's food needs; (3) improving availability of trained worker-power in the country; (4) programs designed to meet the country's health needs; (5) other important areas of economic, political, and social development, including industry; free labor unions, cooperatives, and Voluntary Agencies; transportation and communication; planning and public administration; urban development, and modernization of existing laws; or (6) integrating women into the recipient country's national economy.

f. [FAA Sec. 28](b). Describe extent to which program recognizes the particular needs, desires, and capacities of the people of the country; utilizes the country's intellectual resources to encourage institutional development; and supports civic education and training in skills required for effective participation in governmental and political processes essential to self-government.

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B1

g. FAA Sec. 201(b) 2)-(4) and -(8); Sec. 201(e); Sec. 211(a) 1)-(3) and -(8). Does the activity give reasonable promise of contributing to the development: of economic resources, or to the increase of productive capacities and self-sustaining economic growth; or of educational or other institutions directed toward social progress? Is it related to and consistent with other development activities, and will it contribute to realizable long-range objectives? And does project paper provide information and conclusion on an activity's economic and technical soundness?

h. FAA Sec. 201(b)(6); Sec. 211(a)(5), (6). Information and conclusion on possible effects of the assistance on U.S. economy, with special reference to areas of substantial labor surplus, and extent to which U.S. commodities and assistance are furnished in a manner consistent with improving or safeguarding the U.S. balance-of-payments position.

2. Development Assistance Project Criteria (Loans only)

Not applicable.

a. FAA Sec. 201(b)(1). Information and conclusion on availability of financing from other free-world sources, including private sources within U.S.

b. FAA Sec. 201(b)(2); 201(d). Information and conclusion on (1) capacity of the country to repay the loan, including reasonableness of repayment prospects, and (2) reasonableness and legality (under laws of country and U.S.) of lending and relending terms of the loan.

c. FAA Sec. 201(e). If loan is not made pursuant to a multilateral plan, and the amount of the loan exceeds \$100,000, has country submitted to AID an application for such funds together with assurances to indicate that funds will be used in an economically and technically sound manner?

d. FAA Sec. 201(f). Does project paper describe how project will promote the country's economic development taking into account the country's human and material resources requirements and relationship between ultimate objectives of the project and overall economic development?

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e. FAA Sec. 202(a). Total amount of money under loan which is going directly to private enterprise, is going to intermediate credit institutions or other borrowers for use by private enterprise, is being used to finance imports from private sources, or is otherwise being used to finance procurements from private sources?

f. FAA Sec. 620(d). If assistance is for any productive enterprise which will compete in the U.S. with U.S. enterprise, is there an agreement by the recipient country to prevent export to the U.S. of more than 20% of the enterprise's annual production during the life of the loan?

3. Project Criteria Solely for Security Supporting Assistance

FAA Sec. 531. How will this assistance support promote economic or political stability?

4. Additional Criteria for Alliance for Progress

[Note: Alliance for Progress projects should add the following two items to a project checklist.]

a. FAA Sec. 251(b)(1), -(8). Does assistance take into account principles of the Act of Bogota and the Charter of Punta del Este; and to what extent will the activity contribute to the economic or political integration of Latin America?

b. FAA Sec. 251(b)(8); 251(h). For loans, has there been taken into account the effort made by recipient nation to repatriate capital invested in other countries by their own citizens? Is loan consistent with the findings and recommendations of the Inter-American Committee for the Alliance for Progress (now "CEPCIES," the Permanent Executive Committee of the OAS) in its annual review of national development activities?

This assistance will result in an increase in the quantity and quality of potable water to be distributed principally to the urban poor of Cairo. Consequently, it will promote economic and political stability, at a minimum, in Cairo, Egypt's largest and most important city.

Not applicable.

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GC(3) - STANDARD ITEM CHECKLIST

Listed below are statutory items which normally will be covered routinely in those provisions of an assistance agreement dealing with its implementation, or covered in the agreement by exclusion (as where certain uses of funds are permitted, but other uses not):

These items are arranged under the general headings of (A) Procurement, (B) Construction, and (C) Other Restrictions.

A. Procurement

- |  |  |
|--|--|
| 1. <u>FAA Sec. 602</u> . Are there arrangements to permit U.S. small business to participate equitably in the furnishing of goods and services financed?   | Procurement of goods and services will be pursuant to established A.I.D. regulations                         |
| 2. <u>FAA Sec. 604(a)</u> . Will all commodity procurement financed be from the U.S. except as otherwise determined by the President or under delegation from him?   | Yes.   |
| 3. <u>FAA Sec. 604(d)</u> . If the cooperating country discriminates against U.S. marine insurance companies, will agreement require that marine insurance be placed in the U.S. on commodities financed?  | Yes.   |
| 4. <u>FAA Sec. 604(c)</u> . If offshore procurement of agricultural commodity or product is to be financed, is there provision against such procurement when the domestic price of such commodity is less than parity?   | There will be no such procurement.   |
| 5. <u>FAA Sec. 609(a)</u> . Will U.S. Government excess personal property be utilized wherever practicable in lieu of the procurement of new items?  | Consideration will be given to the use of excess property when practical.                                    |
| 6. <u>MMA Sec. 901(b)</u> . (a) Compliance with requirement that at least 50 per centum of the gross tonnage of commodities (computed separately for dry bulk carriers, dry cargo liners, and tankers) financed shall be transported on privately owned U.S.-flag commercial vessels to the extent that such vessels are available at fair and reasonable rates. | Yes.   |
| 7. <u>FAA Sec. 621</u> . If technical assistance is financed, will such assistance be furnished to the fullest extent practicable as goods and professional and other services from private enterprise on a contract basis? If the facilities of other Federal agencies will be utilized,  | Technical assistance, to the greatest extent practical, will be from private enterprise on a contract basis. |

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are they particularly suitable, not competitive with private enterprise, and made available without undue interference with domestic programs?

8. International Air Transport. Fair Competitive Practices Act, 1974

If air transportation of persons or property is financed on grant basis, will provision be made that U.S.-flag carriers will be utilized to the extent such service is available?

Yes.

B. Construction

1. FAA Sec. 601(d). If a capital (e.g., construction) project, are engineering and professional services of U.S. firms and their affiliates to be used to the maximum extent consistent with the national interest?

Yes.

2. FAA Sec. 611(c). If contracts for construction are to be financed, will they be let on a competitive basis to maximum extent practicable?

Yes.

3. FAA Sec. 620(k). If for construction of productive enterprise, will aggregate value of assistance to be furnished by the U.S. not exceed \$100 million?

Not applicable.

C. Other Restrictions

1. FAA Sec. 201(d). If development loan, is interest rate at least 2% per annum during grace period and at least 3% per annum thereafter?

Not applicable.

2. FAA Sec. 301(d). If fund is established solely by U.S. contributions and administered by an international organization, does Comptroller General have audit rights?

Not applicable.

3. FAA Sec. 620(h). Do arrangements preclude promoting or assisting the foreign aid projects or activities of Communist-Bloc countries, contrary to the best interests of the U.S.?

The Loan Agreement will so stipulate.

4. FAA Sec. 636(i). Is financing not permitted to be used, without waiver, for purchase, long-term lease, or exchange of motor vehicle manufactured outside the U.S. or guaranty of such transaction?

Financing is not permitted to be used for such purposes.

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5. Will arrangements preclude use of financing:
- a. FAA Sec. 114. to pay for performance of abortions or to motivate or coerce persons to practice abortions? Yes.
  - b. FAA Sec. 620(d). to compensate owners for expropriated nationalized property? Yes.
  - c. FAA Sec. 660. to finance police training or other law enforcement assistance, except for narcotics programs? Yes.
  - d. FAA Sec. 662. for CIA activities? Yes.
  - e. App. Sec. 103. to pay pensions, etc., for military personnel? Yes.
  - f. App. Sec. 106. to pay U.N. assessments? Yes.
  - g. App. Sec. 107. to carry out provisions of FAA Sections 209(d) and 251(h)? (transfer to multilateral organization for lending). Yes.
  - h. App. Sec. 501. to be used for publicity or propagand<sub>1</sub> purposes within U.S. not authorized by Congress? Yes.

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EGYPT: Water and Wastewater Sector

1. Existing Organizations and Systems

The responsibility for the water and wastewater utilities in Egypt is divided among a number of organizations. The General Organization Greater Cairo Water Supply (GOGCWS), General Organization for Sewerage and Sanitary Drainage (GOSSD), General Organization for Water Supply (GOWS) are all nominally divisions of the MOHR, but each organization has its own board of directors and they operate to a large degree as autonomous organizations. The Alexandria Water General Authority (AWGA) reports directly to the Governor of Alexandria.

In the three Suez Canal Cities of Suez, Ismailia and Port Said, the public water supply is a responsibility of the Suez Canal Authority (SCA). The chief function of this Authority, however, is the operation and improvement of the Canal itself and water service is a subsidiary function. Sewerage service is provided by the respective Governorates, with support from the GOSSD.

Elsewhere in Egypt, water supply in the larger centers may come under either GOWS or the individual governorates. In the smaller villages and rural areas, the Department of Rural Affairs (DRA), an agency of MOHR, plays a significant role. Where sewerage systems exist, they most commonly are the responsibility of the governorates, though GOSSD may provide some support in the form of design assistance. Construction is normally performed by private or public contractors.

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TABLE 1  
ORGANIZATIONS RESPONSIBLE FOR WATER AND SEWERAGE  
IN EGYPT

<u>Location</u>	<u>WATER</u>		<u>WASTEWATER</u>	
	<u>Design</u>	<u>Operations &amp; Maintenance</u>	<u>Design</u>	<u>Operations &amp; Maintenance</u>
Cairo	GOGCWS	GOGCWS	GOSSD	GOSSD
Helwan	GOGCWS	GOGCWS	GOSSD	GOSSD
Alexandria	AWGA	AWGA	GOSSD	GOSSD
Canal Region Cities	SCA	SCA	GOSSD	Governorates
Other Cities and Rural Areas	GOWS or DRA	GOWS, DRA or Governorates	GOSSD	Governorates

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AWGA	- Alexandria Water General Authority
DRA	- Department of Rural Affairs
GOGCWS	- General Organization Greater Cairo Water Supply
GOSSD	- General Organization for Sewerage and Sanitary Drainage
Governorate	- Government of the area (approximately equivalent to a province in other countries)
GOWS	- General Organization for Water Supply
SCA	- Suez Canal Authority

Except as otherwise noted, the organizations dealing with water and wastewater are funded by the Egyptian Government and their revenues are considered as part of the general revenues of the Government.

Thus, the revenues received are not directly tied to the costs of operating the utilities. Each organization submits an annual funding request to the Ministry of Finance, showing its anticipated operating needs (usually based on historical cost experience) and the capital funds requested (generally linked to a list of specific projects).

In most cases, the organizations have done their own project planning. Egyptian or foreign consulting engineers are sometimes used for part of or all of the design. Construction of civil works for major facilities is usually performed by Egyptian contracting firms, either public or private, not by the organizations' own forces. Turnkey contracts, for the design, furnishing and installation of equipment, are common.

In general, Egyptian Government public sector employment policies are followed. However, certain major changes in these public sector employment policies are currently under consideration.

General Organization Greater Cairo Water Supply

(GOGCWS): The GOGCWS is responsible for the operation and maintenance of the potable water and non-potable water (for industry and garden irrigation) systems in Greater Cairo, including Helwan. This responsibility also extends to the planning of new projects, overseeing design and the supervision of construction. The present organization chart is shown in Annex G. The staff of GOGCWS currently totals about 8,400.

There are numerous laws and regulations affecting GOGCWS, some dating back to 1865 when the first water supply system was constructed.

About two years ago, the GOGCWS prepared a study of its operations, to support a request for changes in tariffs. (No action has been taken yet on this request.) This study is of interest insofar as it included samples of customer usage, leakage estimates, cost of plant, and data on water consumption.

Most users who have piped service within their buildings have meters on their lines. In apartment buildings, however, there is only one meter for the entire building rather than one meter per apartment. The GOGCWS would like to change this but feels it would be too expensive to convert existing buildings. It is, however, considering requesting legislation to require a meter for each apartment in new buildings. Public fountains (approximately 500) are also metered and the government pays for the water consumed. There are approximately 210,000 metered subscribers, about 7,000 of which are for government agencies. Meters are read every two months.

Alexandria Water General Authority (AWGA): The AWGA is responsible for the planning, construction, supervision, operation and maintenance of the potable and nonpotable (garden water) systems for the city of Alexandria, plus a high-pressure fire-fighting system for the Western Harbor area. The Authority also provides potable water to a large rural district south of the city in Behera

Governorate. (The Mariout Water Treatment plant is located in, and serves this rural area.) Furthermore, AWGA supplies potable water, via pipeline, to towns along the coast as far as Mersa Matrouh, 288 km west of Alexandria. An organization chart is shown in Annex G; the staff of AWGA at present includes about 3,200 employees.

Suez Canal Authority (SCA): The primary responsibility of the Suez Canal Authority is the operation, maintenance and improvement of the Suez Canal but it has a number of subsidiary functions. Among these is responsibility for the planning, design, operation and maintenance of the potable water system within the urban areas of Suez, Ismailia, and Port Said, and the non-potable, garden water system in Ismailia. There is no non-potable water system in Suez or Port Said at the present time.

General Organization for Water Supply (GOWS): The GOWS is responsible for project planning, design and supervision of construction of potable water systems for all areas outside of the six cities, and in some cases operates and maintains these systems. The systems of GOWS fall into three classes :

a) "Major Projects" -- These are large, central water installations, providing treated water from surface sources and serving large rural areas. A typical project might serve about 1,000,000 people and contain 1,500 km of pipe. All but three of these "major projects" are in the Delta. In Upper Egypt, groundwater is normally used and the water supply systems tend to be smaller and serve more limited areas. The GOWS designs and operates these systems, also.

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b) Cities and Major Towns Outside of the Six Cities --

About seventy percent of the cities, other than the six cities, have their own water supply systems. This includes even those within areas served by GOWS "major projects". In some cases, these cities buy treated water from a GOWS "major project" for delivery through their own systems, but most of these cities have opted to have their own treatment works. Normally municipalities under the Governorates operate such systems; only about ten percent of these city systems are operated by GOWS.

The GOWS usually designs all of these systems and any expansions. Typically, GOWS may suggest an expansion on the basis of its own forecast of future water demand and the Governorate requests planning and design service. In the past, this has meant that nearly all planning and design of significant water facilities outside of the six cities has been done by GOWS.

c) Small Rural Systems -- Water supplies in the smallest settlements (most often a well, an elevated tank, and a few public fountains) are designed and operated locally, usually by the local branch of the Department of Rural Affairs, a division of MOHR with local offices in the Governorates. The GOWS may provide technical advice and design assistance on these projects, but only on request.

The demarcation of the boundary between areas served by GOWS and those served by the systems in the "six cities" is not well defined. In theory at least, a conflict of jurisdictions could

occur if one of the "six cities" were to expand into an area served by a GOWS water system, but no case is known in which this has happened.

Billing and collecting are performed by the local utility. Thus GOWS is involved only in those systems which it operates. By policy, the water supplied through public fountains is free. Only customers who have water piped into their buildings pay for it. Therefore, only about ten percent of the water produced by the "major projects" is sold. Since most of the water is distributed free, no attempt is made to have these systems pay for themselves.

General Organization for Sewerage and Sanitary Drainage (GOSSD):

The GOSSD is responsible for planning, designing and supervising the construction of waterborne wastewater systems throughout all of Egypt and for the operation and maintenance of the wastewater systems in Alexandria, Cairo and Helwan. An organization chart is shown in Annex . GOSSD, at present, employs about 12,100 people.

Wastewater discharges are governed by Law No. 92 of 1966, which is essentially a sewer use ordinance. All connections to systems operated by the GOSSD must be approved by the GOSSD. Industrial wastes discharged to the systems must meet certain requirements.

Customers are not charged for use of wastewater systems and the GOSSD does no billing or collecting, except for connection charges. All financing of the capital and operating costs of the wastewater systems is by the central Government. Budgets for those systems operated by municipalities under the Governorates (i.e., all systems other than Greater Cairo and Alexandria) are included

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within the budgets for the Governorates. There are waterborne wastewater systems (with treatment) in fourteen cities other than Greater Cairo, Alexandria and the three Canal Cities, and discussions of and/or planning for systems in about a dozen more cities. An additional twelve wastewater systems exist in the major Delta towns; however, these have no treatment facilities.

Project planning and design are done by GOSSD in Cairo. The GOSSD has its own design staff, and outside consulting engineers are used relatively little. (Typically, contractors awarded jobs provide the final structural designs).

## 2. Existing Water and Wastewater Systems

Some portions of the water distribution systems in all six cities are quite old, the original construction having been started more than a century ago. It is reported that in Cairo there is a sharp increase in the number of mains that burst when the pressure approaches the 60 m design head. In Suez, Ismailia, and Port Said, the systems are considered to operate at 30 m head and fears have been expressed about the ability of these distribution systems to withstand higher operating pressures. These cities suffered extensive damage during the war years from 1967 to 1973 and the full extent of damage to the buried distribution systems has not been determined.

Extensions of the systems over the years generally proceeded wherever needs were perceived and funds made available, without an

overall plan. Leak detection programs have not been performed in the past. Despite these problems, service is being provided to the six cities and water at the customers' tap is reported to consistently meet drinking water standards, although the pressure is often unsatisfactorily low.

Although the wastewater systems are not as old as the water systems, their general condition must be characterized as unsatisfactory. The capacity of the collection systems is generally inadequate, since expansions to these systems have not kept pace with the expansion of the water systems. Furthermore, because of age, poor quality of jointing materials, the high water table in most cities and, in the Canal Zone, war damage, it is suspected that large amounts of infiltration and exfiltration occur. Much of the pumping equipment is inoperable or obsolete and sewage occasionally overflows into the streets. Except for the Zenein Secondary Treatment Facility in Cairo, virtually none of the wastewater treatment plants provides any appreciable degree of treatment. In the Cairo area, the raw wastewater is discharged into drainage canals which are known to be used as sources of irrigation water. In the coastal cities, raw wastewater is discharged from short outfalls into waters which are used for recreation and commercial fishing. The physical condition of these systems most certainly reflects a scarcity of resources.



### 3. Existing Rates and Tariffs

In general, the rates charged for water have not been increased for many years, and all of the water utilities incur costs which far exceed their revenues.

Many of the consumers, especially those using public fountains, have very low incomes. There is concern that if an attempt were made to charge these persons for portable water, they would use alternative, unsafe sources and that the costs associated with the consequent decline in public health would exceed the cost of providing free portable water. It is also recognized, however, that the low rates charged for water do not encourage conservation and that there is a wide-spread misuse of water. Increases in water rates usually require prior approval by the local council and the Governorate administration.

There have been some pressures brought by foreign lending institutions to have the utilities increase their revenues to cover their costs. In response to these pressures, the position has been taken that the utilities sell their water to the Government which then resells the water to the public. Were this pattern consistently true, it would be the Government, not the utility that subsidizes the operation of the systems.

No attempts have ever been made to charge for sewerage service except for connection charges. At one time, industries were charged for discharging effluent into the waste-water systems, however, this practice has been discontinued.

General Organization Greater Cairo Water Supply

(GOGCWS)

(See Financial Section)

Alexandria Water General Authority (AWGA) The

tariffs of the AWGA shows a degressive rate in effect for households with usage greater than 10 cubic meters. There are different rates for the towns along the coast to the west, government buildings, military installations, factories and large users. The AWGA also receives compensation for: water consumed through public fountains, water supplied to ships, garden irrigation water, water discharged through public and private fire hydrants, sprinklers, and the rental and the repair of privately owned meters.

The latest revision to tariffs was effected July 1, 1976. Further modifications to the tariffs are under consideration.

Although revenues from the tariffs have come much closer to covering the costs of the water in Alexandria, the size of the deficit has grown.

Suez Canal Authority (SCA): The current rates for water in Suez, Ismailia and Port Said are essentially those that were in effect in 1945 and the revenues do not cover the costs of the water utilities. The SCA intends to re-examine and increase the rates when the current plant expansions are completed. Approval by the Governorates of the increased rate will be required, but not that of the central Government.

General Organization for Water Supply (GOWS): The rates for the GOWS-operated utilities vary from facility to facility. Although the rates charged to regular customers of the major projects approximate the full cost of producing the water, total revenues are far below total costs because most of the water is distributed free through public fountains. As noted previously, only about ten percent of the water produced is sold.

#### 4. Sector Constraints!

Sector planning and organization at present are centralized for sewerage and to a lesser degree for water with MOHR. An advisory Committee of four members was established in the MOHR in August 1975, for initiating and coordinating project preparation. In cooperation with the operating authorities this committee prepares studies and projects in the sector and submits these to the Ministry of Planning for including

in the draft 5-Year Plan. In the current plan the Ministry of Planning forecasts a total expenditure of LE 250 million for water and LE 103 for sewerage for the plan period 1976-1980. The total of these funds are tentatively allocated (i) Cairo (LE 142 million); (ii) Alexandria (LE 52 million); (iii) other urban areas (LE 104 million); and (iv) rural water supply (LE 55 million). The Government's immediate plans are for the urban areas; to complete on-going projects and improve existing facilities which in many cases have greatly deteriorated through increasing neglect and consistent overloading. Emphasis will be given to improving facilities in the rural areas during the last two years of the 5-Year Plan.

With regard to sector policies, the Government seems keen to promote decentralization by placing more responsibility on the shoulders of local institutions. At present the municipalities operate the urban systems (outside Cairo, Alexandria and the Canal cities) but control of overall sector activities remains centralized in the MOHR. In 1975 the Government passed a decree that all water and sewerage facilities located within the municipalities, legally belong to that municipality and the elected local bodies (Local Councils) are legally responsible for managing such facilities. Due to

3

limited technical and managerial capability of the local institutions and the lack of a revenue earning base for sewerage, the process of transferring ownership and management from the previously centralized organization to municipal Governments has not been started. Implementing this decentralization policy without strengthening the municipal governments constrains sector development.

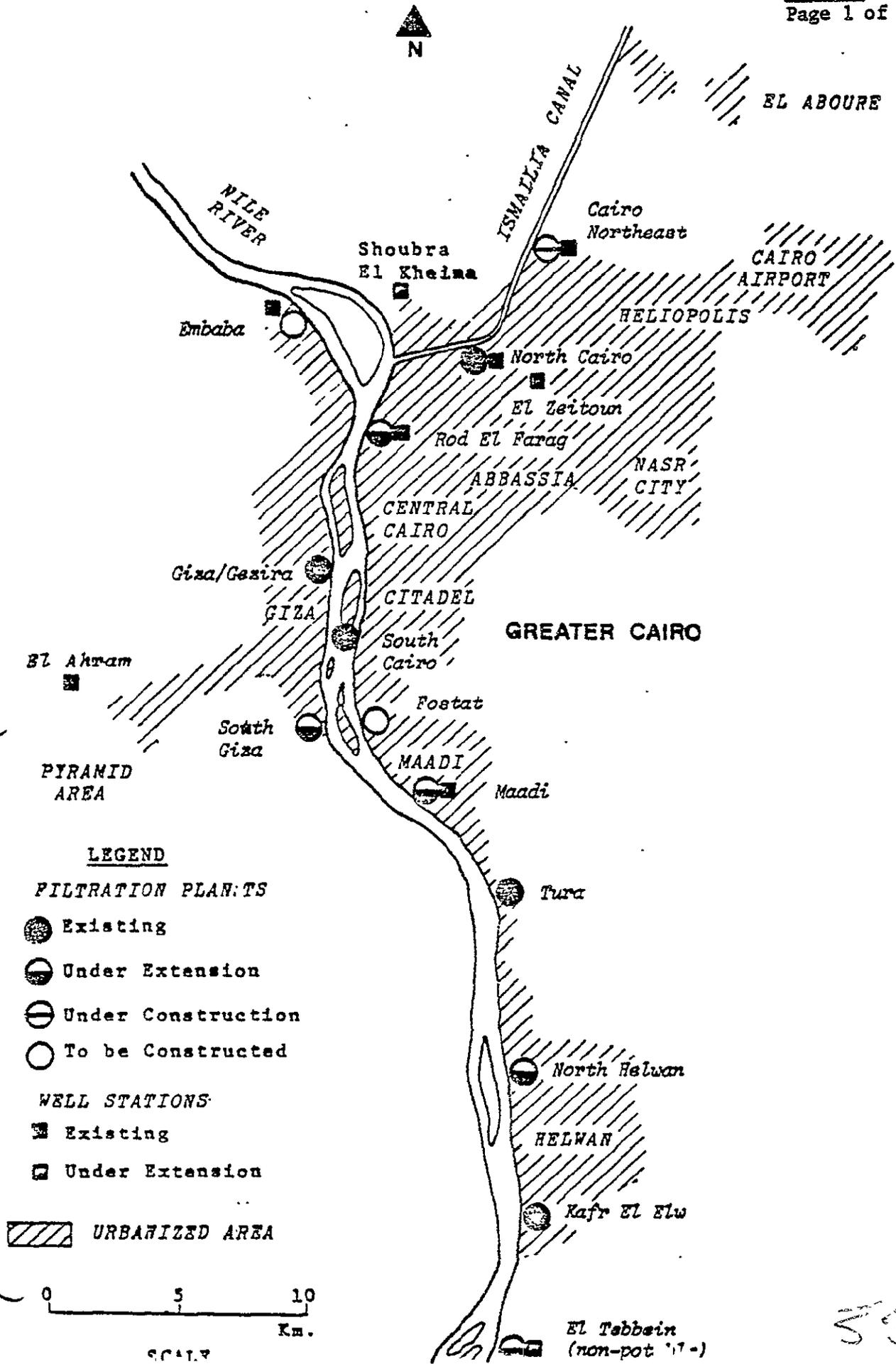
Major constraints to sector development arise from the Government's tariff and employment policies as well as a general shortage of funds for projects. At present water and sewerage like many other basic consumption goods in Egypt are subsidized. Public water and sewerage authorities are regarded as providing social services and are, therefore, not required to be financially viable. Because of Government employment policies every university graduate is assured of a staff position and is allocated to public enterprises regardless of need. The Government however is considering more flexible tariff and employment policies as part of the general process towards a greater decentralization of decision-making in state-owned enterprises and entities and better economic management.

Waste-water charges are now existent and water tariffs are low and the revenues generated in any case revert to

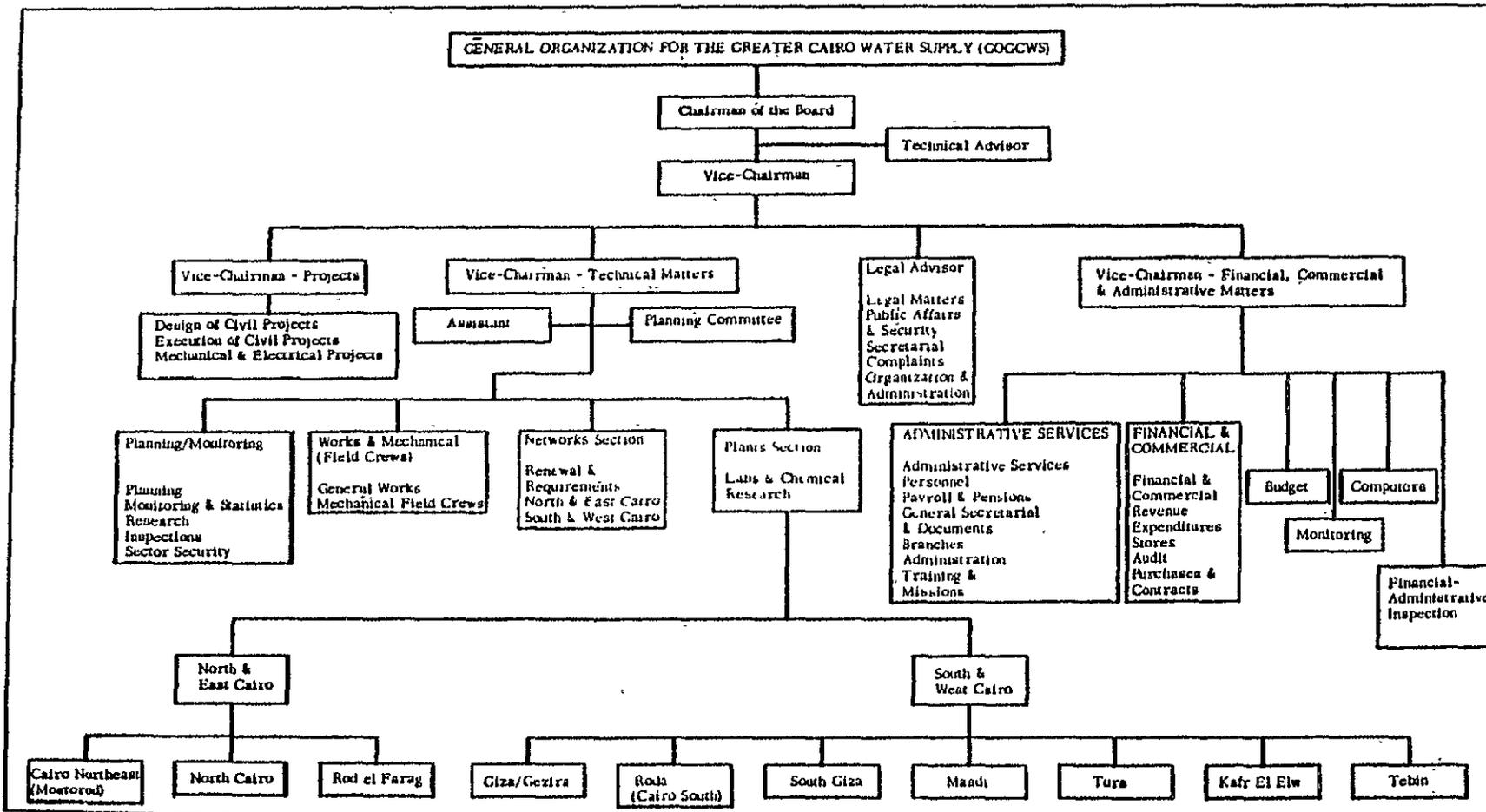
the central budget from which funds for new construction and operating costs must in turn be obtained. As a result of this approach staff morale is low, there is no premium on efficiency, little incentive for financial discipline and steady decline in service. The Government's target of providing a comprehensive social water service remains unrealized; the poor use polluted water or buy expensive water from vendors. In the sewerage service similar constraints apply.

Availability of skilled manpower, is less of a problem though many of Egypt's technicians and engineers are being attracted to other Arab countries by substantially higher salaries. AID's strategy in the sector is to assist Egypt in rehabilitating and planning of its urban water and sewerage systems by encouraging the Government to adopt relevant tariff and management employment policies that will facilitate growth and efficiency. The scope of such organizational and policy changes as seems appropriate are expected to emerge from the AID Financed Management and Tariff Study (MTS).

Included in this paper as Annex S is the complete scope of work for the MTS. Through this one study AID plans to present to the GOE a report containing recommendations which will rationalize the water and wastewater systems in Egypt.



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GENERAL ORGANIZATION FOR THE GREATER CAIRO WATER SUPPLY (GOGCMS)

Address: 42 Ramses Street  
Cairo, A.R.E

12 A.

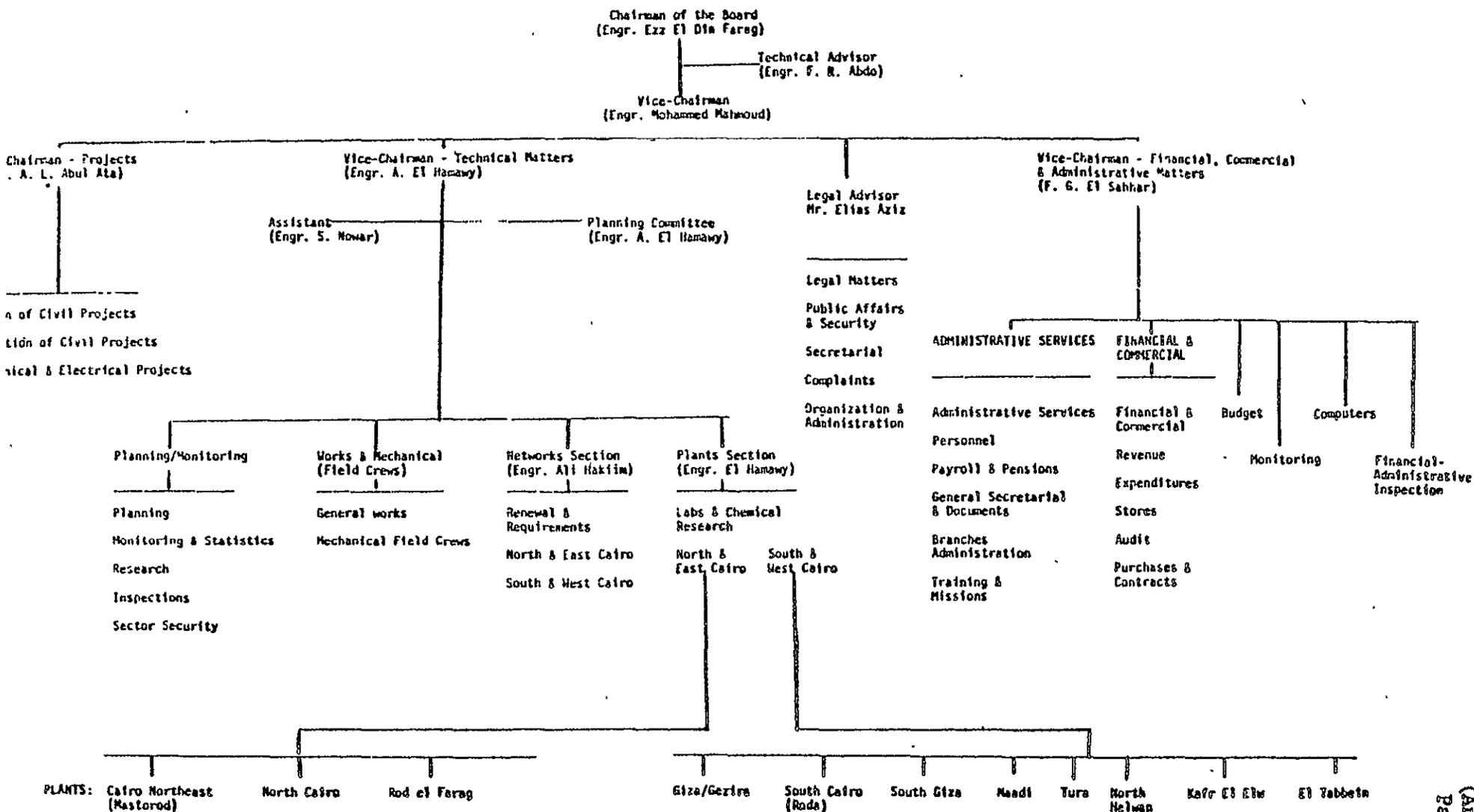


TABLE 4.1

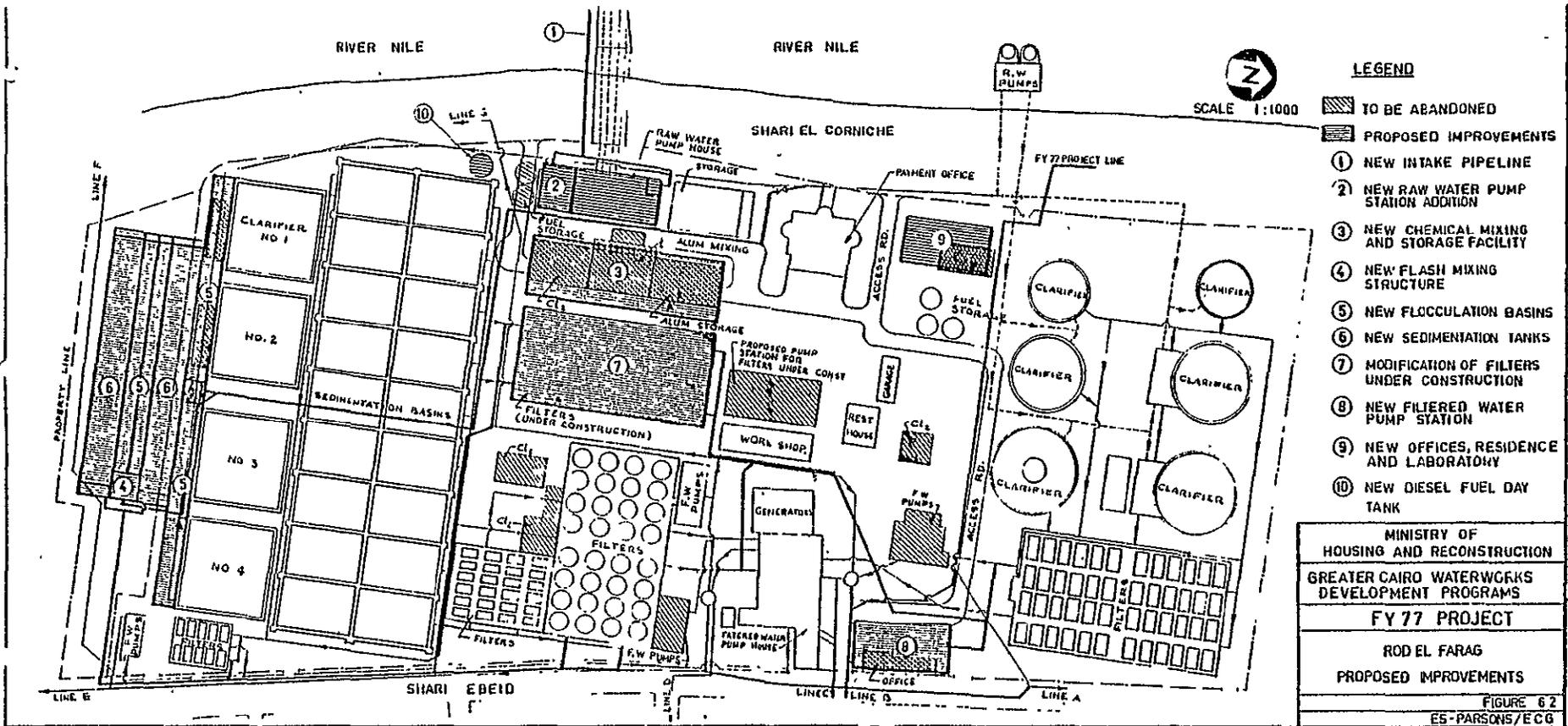
SYSTEM ANALYSIS AND RECOMMENDED PROCESS PARAMETERS  
ROD EL FARAG (SOUTH) TREATMENT PLANT

Unit	Existing Conditions	Recommended Parameters
Maximum capacity, cu m/d	230 000	460 000
<u>PRIMARY SYSTEM</u>		
<u>Chemical Mixing</u>		
Number	None	2
Volume ea, cu m	-	0.25
Detention time, min	-	
<u>Flocculation Basins</u>		
Number	2	4
Type	Mechanical	Mech. / Gravity
Volume ea, cu m	750	
Detention time, min	18	25
<u>Sedimentation Basins</u>		
Number	4	6
Surface loading, cu m/sq m·d	36	50
Weir loading, cu m/m·d	1 438	250
<u>SECONDARY SYSTEM</u>		
<u>Chemical Mixing</u>		
	None	None
<u>Flocculation Basins</u>		
	None	None
<u>Sedimentation Basins</u>		
Number	9	9
Surface loading, cu m/sq m·d	33	50
Weir loading, cu m/m·d	1 703	250
<u>Filter System, Jewel</u>		
Number of units	32	32
Type	Single media	Single media
Hydraulic loading, cu m/sq m·h	4.0	5.0
Backwash rate, cu m/sq m·min	0.64	1.1

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Continued - TABLE 4.1

Unit	Existing Conditions	Recommended Parameters
<u>Filter System, Patterson</u>		
Number of units	12	12
Type	Single media	Single media
Hydraulic loading, cu m/sq m <sup>2</sup> h	5.2	5.0
Backwash rate, cu m/sq m <sup>2</sup> min	0.64	0.83
<u>Filter System, Patterson</u>		
Number of units	24	24
Type	Single media	Single media
Hydraulic loading, cu m/sq m <sup>2</sup> h	5.3	5.0
Backwash rate, cu m/sq m <sup>2</sup> min	0.71	0.83
<u>Filter System, New</u>		
Number of units	12	12
Type	Single media	Dual media
Hydraulic loading, cu m/sq m <sup>2</sup> h	5	10
Backwash rate, cu m/sq m <sup>2</sup> min	0.50	1.1
<u>Chemical Feed System Dosage</u>		
Chlorine, g/cu m	6-8	5-20
Lime, g/cu m	0	0-50
Alum, g/cu m	15-25	0-30
Polymer, g/cu m	1-1.5	0-5
Activated carbon, g/cu m	0	0-10
<u>Pump Station Capacity</u>		
Raw water :		
with standby, cu m/d	758 000	840 000
without standby, cu m/d	1 000 000	1 250 000
Treated water :		
with standby, cu m/d	700 000	840 000
without standby, cu m/d	807 000	1 250 000

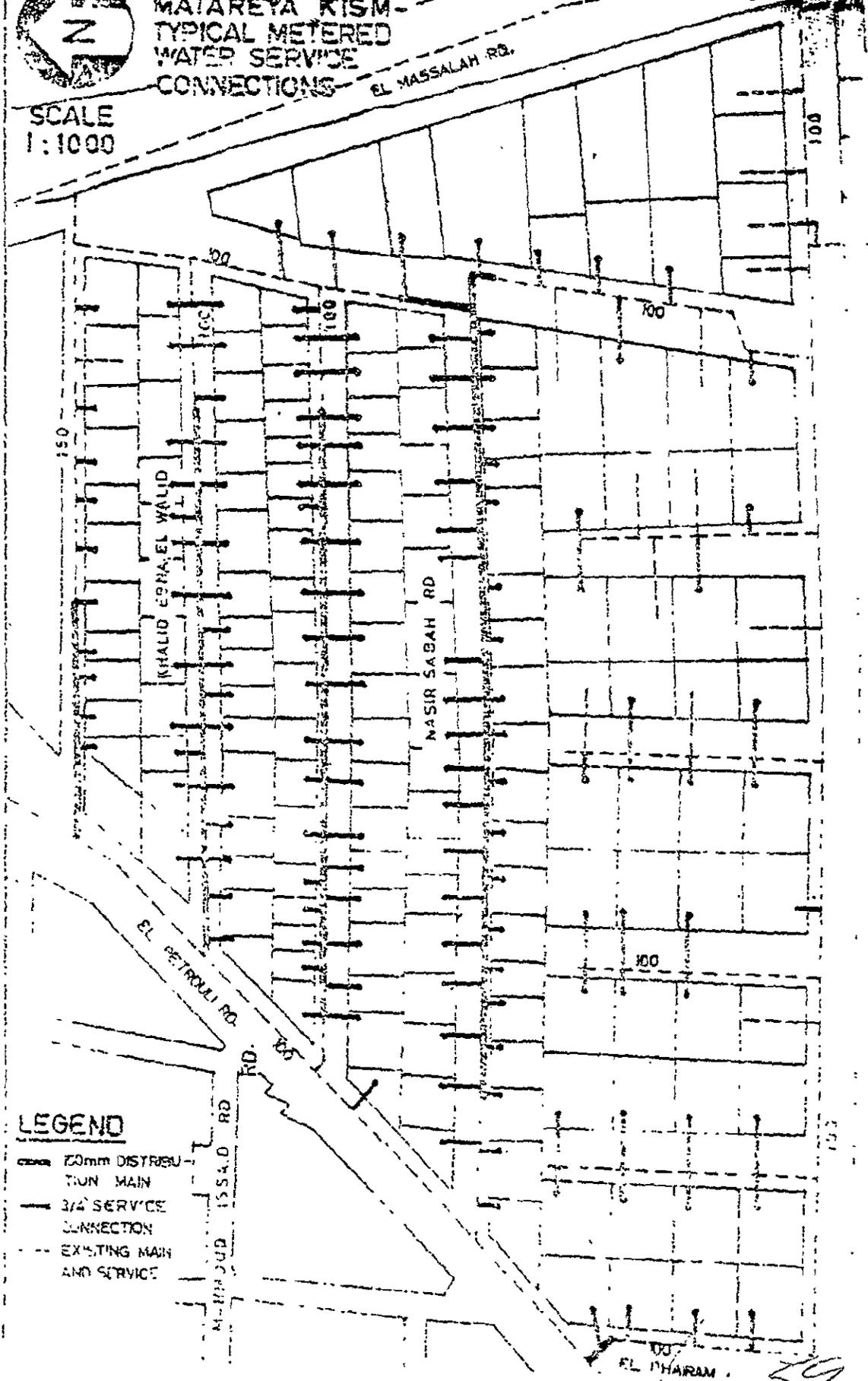


64



A PORTION OF  
MATAREYA KISM-  
TYPICAL METERED  
WATER SERVICE  
CONNECTIONS

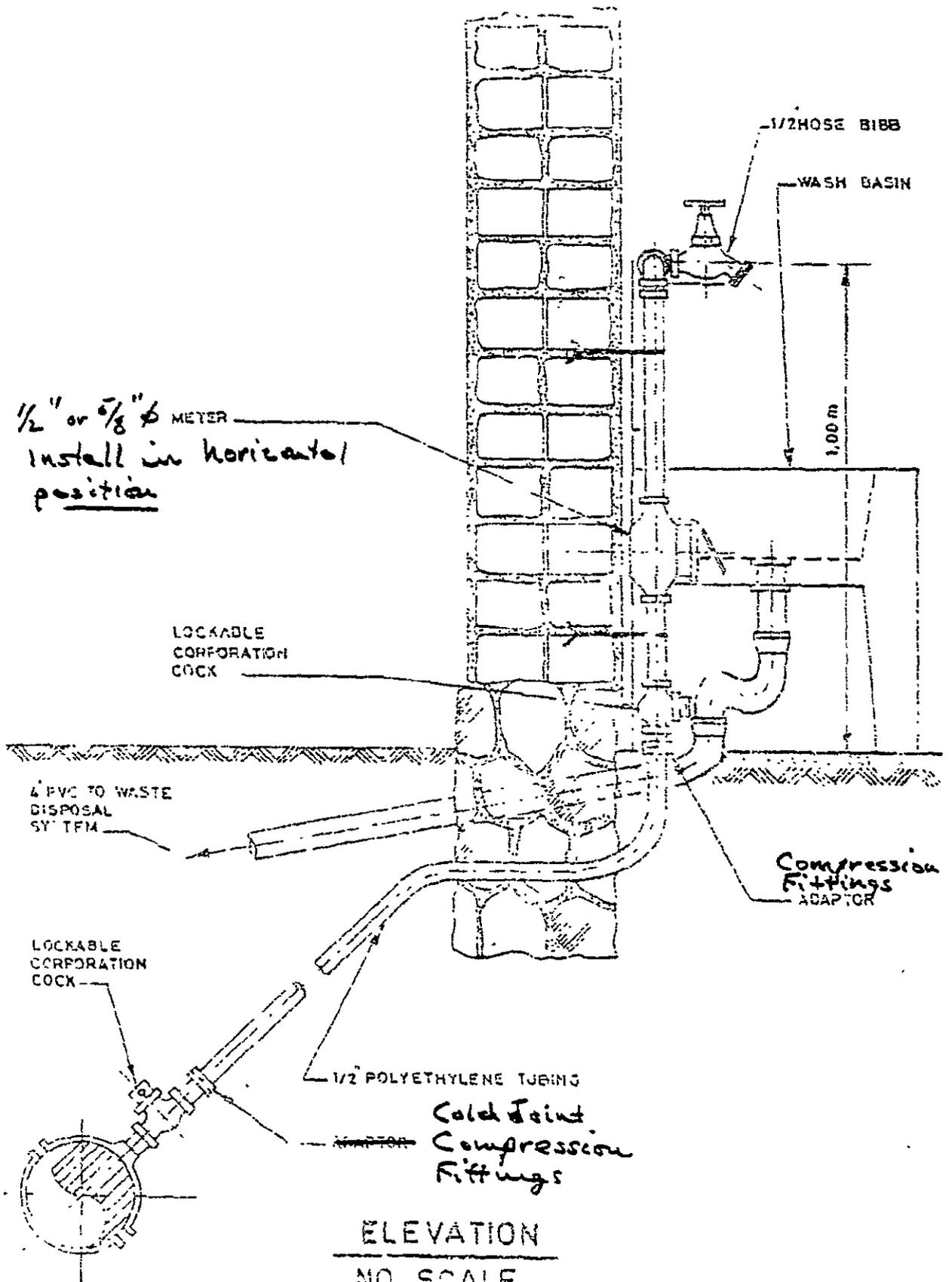
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**LEGEND**

- 70mm DISTRIBUTION MAIN
- 3/4" SERVICE CONNECTION
- - - EXISTING MAIN AND SERVICE

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Estimated Cost for Typical Metered Service Connection

<u>Description</u>	<u>\$ US</u>	<u>Cost in</u> <u>LE</u>
Material: 1/2 pipe, valves, sink	25	5
Meter	10	
Installation	<u>5</u>	<u>5</u>
Sub-total	40	10
Contingency (20%)	<u>8</u>	<u>2</u>
TOTAL	48	12

For areas which require main extensions to service the street in front of the properties, the cost for this extension should be added to the above cost. This estimate is shown in Table 14 and assumes each property to be 10 meters in length and with a 6-inch main extension.

Estimated Cost for Main Extensions

<u>Description</u>	<u>\$ US</u>	<u>Cost in</u> <u>LE</u>
Material: 6-inch pipe and valves	80	-
Installation	<u>-</u>	<u>30</u>
Sub-total	80	30
Contingency (20%)	<u>16</u>	<u>6</u>
TOTAL	96	36

As some areas may require wastewater collection and disposal systems, costs for these systems require an additional expenditure and the estimate per structure is shown below:

Estimated Cost for Disposal System

<u>Description</u>	<u>\$ US</u>	<u>Cost in</u> LE
Hse Drain Line 10 meters 4" Ø P.E. Pipe	45	
Sewer System: 10 meters of pipe @ 1.5 L.E./m	-	15
Seepage Pits 8 pits/block @ 500 L.E./pit	-	100
+ 40 properties/block	<u>-</u>	<u>-</u>
Sub-total	45	115
Contingency (20%)	<u>9</u>	<u>23</u>
TOTAL	54	138

The seepage pits were based on 16 cm/d percolation rate and 37 l/c.d wastewater discharge. The percolation rate will differ depending upon the type of soil and rubble in the various kisms. Each pit would be 1.5 meters square by 6 meters deep constructed of concrete and concrete block and would be installed in the streets and covered with a reinforced concrete access opening. Six-inch clay or concrete sewers with cleanouts would be installed to direct wastewater to the seepage pits. A typical installation is shown on Annex M. For each block of 40 properties, 8 pits would be required, each serving 5 properties. The sewer system would be installed so that the seepage pits could be abandoned once sewage collection mains were installed into the area.

In some cases building drains can be directed to existing sewers, rather than using seepage pits.

COST ESTIMATE AND IMPLEMENTATION PLAN

Assume Installation of 40,000 hse. connections over life of project. Will need approximately 5 months time for procurement and delivery of imported materials; also mobilization of design team, engineering and training of crews. Actual installation of connections in field estimated to take 19 months.

Total project time: 24 months

$$\frac{40,000 \text{ conn.}}{19 \text{ mons.}} = 2105 \text{ conn./month}$$

Assume 48 hour work week (this includes 8 hrs/wk travel time to and from job site).

Say:      travel          work          lunch          work          travel

            7:30 to 8:00 to 12      to 12:30 to 3:30 to 4:30

            0.5 hr          4 hrs.                                  3hrs          .5 hr.                  = 8 hrs.work

Thus, actual work time will be 40 hours/week.

Note: Will need to consider paying 8 hours/week overtime.

$$4.33 \text{ wks/mo} \times 19 \text{ mo} \times 40 \text{ hrs/wk} = 3293 \text{ work hours}$$

$$40,000/3293 \text{ hrs.} = \underline{12} \text{ connections/work hour}$$

Assuming trenches dug, etc. ready for installation crews to start work, estimate following:

1.0 hrs. to make tap and install corporation cock;  
1.5 hrs. to install P.E. pipe, meter, faucet, etc.  
1.5 hrs. to install sink and drain lines

4.0 hrs. total time per connection

Using water tapping crew consisting of following:

1 lead man  
1 helper  
1 laborer  
3, Total Crew

Thus, need 12 pipe tapping crews on total of (12x3) 36 men

Meter and line installation crew, consisting of:

1 lead man  
1 helper  
1 laborer  
3, Total crew

Thus, need 18 meter and line installation crews, or  
total of (12 connections/hr x 1.5 hrs/conn. x 3-man crew) = 54 men

Drain line crew consisting of:

1 lead man  
1 helper  
2 laborers  
4, Total crew

Need 18 crews (12 connections/hr x 1.5 hrs/conn x 4 men) = 72 men

Plan to work concurrently 3 areas; therefore need following:

U.S.	1 - project superintendent
U.S.	1 - deputy project superintendent
U.S.	3 - area supervisors
Egyptian	9 - foreman
"	12 - pipe tapping crews of 36 men
"	18 - meter installation crews of 54 men
"	18 - drain line crews of 72 men
"	3 - area timekeepers
"	15 - drivers dispatcher
"	3 - materials clerks
"	<u>1 - mechanic</u>
	198 men
	<u>3 - interpreters</u>
	201 <u>Total manpower</u>

Estimate will need 14 - 3/4 ton pickup trucks to handle personnel, tools, equipment and materials, as follows:

1 - for project supervisor  
1 - for deputy project supervisor  
3 - for area supervisors  
9 - for foremen  
14 Vehicles (3/4 ton pickup truck)

Vehicles will be needed to move workers to and from job site.  
Assume 12 vehicles used for this purpose, 19<sup>4</sup> men/12 = 16+ per vehicle  
(3 passengers in front, 13 in back)

Cost of vehicles:	\$ 7,500 each	x 14	=	\$105,000
Freight:	\$ 700	x 14	=	9,800
Spare parts:				<u>5,000</u>
				\$119,800
			say:	<u>\$120,000 #1</u>

Tapping machines, leveller B-4

Cost:	\$ 600 each	x 14	=	\$ 8,400
Freight:			=	1,500
Spare parts:			=	<u>2,000</u>
				\$ 11,900
			say:	<u>\$ 12,000 #2</u>

Corp. cocks @	\$ 1.50 each	x 44,000	=	\$ 66,000
Freight:	44,000 lbs.			<u>9,900</u>
				\$ 75,900
			say:	<u>\$ 76,000 #3</u>

Polyethene pipe, 1 inch  $\phi$ : need 10 meters  
per connection: x 40,000 conn. = 400,000 m.

@:	\$ 3.00 per meter	=	\$ 1,200,000
+	10% wastage	=	120,000
Freight:	3lbs/meter x 44,000 = 132,000 lbs	=	<u>26,400</u>
			\$ 1,346,000
			say: <u>\$1,400,000 #4</u>

Stop cocks:

@	\$ 1.50 each	x 44,000	=	\$ 66,000
Freight:				<u>9,900</u>
				\$ 75,900
			say:	<u>\$ 76,000 #5</u>

Meters, water turbine type plastic

Cost:	\$ 10 each x 44,000	\$ 440,000	
Spares:	10%	44,000	
Freight:	2 lbs/cock	<u>25,000</u>	
		\$ 509,000	
		say:	<u>\$ 510,000 #6</u>

Faucets, brass

Cost:	\$ 1 each x 44,000	\$ 44,000	
Freight:	1 lb. each	<u>10,000</u>	
		\$ 54,000	
		say:	<u>\$ 55,000 #7</u>

Compression fittings:

Cost:	\$ 3 per connection x 40,000	\$ 120,000	
Spares:	10%	12,000	
Freight:		<u>10,000</u>	
		\$ 142,000	
		say:	<u>\$ 142,000 #8</u>

1/2 inch Ø drainage pipe P.E., 10m/conn.  
times 40,000 = 400,000 meters

Cost:	\$ 5 per meter	\$ 2,000,000	
Spares:	10%	200,000	
Freight:		<u>30,000</u>	
		\$ 2,230,000	
		say:	<u>\$ 2,250,000 #9</u>

#10. Tools, wrenches, compression fitting tools,  
test bench, etc. \$ 30,000  
Freight: 5,000  
\$ 35,000 \$ 35,000 #10

#11. Pipeline (main) extension:

6" Ø lines @ \$10/meter x 150,000 m = \$1,500,000  
4" Ø lines @ \$ 8/meter x 200,000 m = 1,600,000  
Valves and fittings 500,000  
Freight 100,000  
\$3,700,000 \$ 3,700,000 #11

SUMMARY

# 1 Vehicles \$ 120,000  
2 Tap. machines 12,000  
3 Corp. cocks 76,000  
4 P.E. pipe 1,400,000  
5 Stop cocks 76,000  
6 Meters 510,000  
7 Faucets 54,000  
8 Compression fittings 142,000  
9 P.E. drainage pipes 2,250,000  
10 Tools, equipment, etc. 35,000  
11 Pipeline (mains) extension 3,700,000  
\$ 8,375,000

Labor (U.S.)

1 Supervisor 22 months  
2 Deputy supervisor 20 months  
3 Area supervisor 60 months  
102 man months  
& Admin. 120 man months

120 x \$8,000 = \$ 960,000

Training (in-country)

15 man months x \$ 8000 \$ 120,000  
Equipment \$ 15,000  
\$ 135,000

Engineering Design

50 man months x \$10,000 \$ 500,000

TOTAL F.E.X. for Project: \$9,970,000

say: \$10,000,000

LOCAL CURRENCY COSTS

Foreman

9 man x 22 months = 198 mm  
198 x LE 100 = LE 19,800

Crew Leadmen

48 men x 21 months = 1008 mm  
1008 x LE 70 + LE 70,560

Crew Helpers

48 men x 19 months = 912 mm

912 x LE 50 = LE 45,600

Crew Laborers

66 men x 19 months = 1254 mm

1254 x LE 30 = LE 37,620

Timekeepers and Materials Clerks

6 x 20 months = 120 mm

120 x LE 70 = LE 8,400

Drivers, Dispatchers

15 x 21 months = 315 mm

21 x LE 50 = LE 15,750

Mechanic

1 x 21 months x LE50 = LE 2,100

Interpreters

3 x 22 months x LE 80 = LE 5,200

Purchasing Agents (local)

3 x 22 mos. x LE 100 = LE 6,600

Typists

2 x 22 mos. x LE 100 = LE 4,400

Messengers and Guards

20 x 22 mos. x LE 40 = LE 17,600

Accountant

2 x 22 mos. x LE150 = LE 6,600

Office Manager

1 x 24 mos. x LE 600	=	LE 14,400
TOTAL LOCAL LABOR (A&E)	=	LE 254,630
CONTINGENCY + Escalation 20%	=	<u>50,926</u>
		LE 305,556
OVERHEAD & PROFIT 80%	=	<u>244,444</u>
		LE 550,000

LOCAL MATERIALS

Gasoline

14 vehicles x 10 gals/day x 26 days/mo x 22 mos. = 80,000 gals. x LE.50/gal.	=	LE 40,000
Oils and lubrication	=	<u>20,000</u>
Total Fuel:	=	LE 60,000

Cement (Connections)

40,000 bags x 100 lbs/2000 lbs/ton = 8000 tons	=	LE 144,000
---	---	------------

Steel

100 lbs/conn. x 40,000/2000 = 8000 tons, LE 50 x 8000 tons	=	LE 400,000
---	---	------------

Gravel

8000 tons @ LE 10/ton	=	LE 80,000
-----------------------	---	-----------

Sand

24,000 tons @ LE 5/ton	=	LE 120,000
------------------------	---	------------

Cement Block

2000 pits x 1000 blk/pit = 2,000,000 blk  
2,000,000 x LE .50 = LE 1,000,000

Clay Pipe

4"φ 200,000 meters x LE 2 = 400,000

6"φ 300,000 meters x LE 3 = 600,000

Caulking Material

50,000

Connection "Y" is LE 2 80,000

Bedding Sand 50,000

Tools

1,000 shovels @ LE 2 = 2,000

1,000 picks @ LE 2 = 2,000

500 buckets @ LE 2 = 1,000

5,000 5,000

Fittings, Clamps, etc.

40,000 x LE 3 = 120,000

Total Materials

LE 2,924,000

Contingency 10% 292,400

Administrative Costs 10% 292,400

---

Total for Local Materials LE 3,508,800

Excavation Crews

Assume 1 man can dig 2 cubic meters/day  
and back fill 4 cm/day

A. Connections - estimate 5 cm/connection  
5 x 40,000 = 200,000 cm excavation  
2 cm/man day = 100,000 man days  
200,000 backfill/4 cm/man day = 50,000 man days  
Total Excavation and Backfill in man days = 150,000  
20% Cont. 30,000  

---

180,000 man days

B. Drainage

5 cm/connection  
5 x 50,000 = 200,000  
2 cm/man day = 100,000 man day excavation  
200,000 cm/4cm/man day 150,000 man day back fill  
Contingency 20% 30,000  

---

Total 180,000 man days

Seepage Pits

2000 pits x 10 cm = 20,000 cm  
20,000/2 cm = 10,000 man days  
Backfill = 2,000 = 12,000 man days

Removal of Spoil

10,000 man days

Drainage Lines (sewers)

5 cm x 40,000 connections = 200,000 cm  
2 cm/man day = 100,000 man days  
Backfill = 50,000 man days  
Contingency 20% = 30,000 man days  

---

180,000 man days

Total Man Days Excavation and Backfill

1. Connections	180,000
2. Drainage	180,000
3. Pits	12,000
4. Sewers	180,000
5. Spoil	10,000

Total 562,000 Man days

@ LE .50/man day = LE 281,000

No. Crews

552,000 ÷ 3293 = 167 men

say 210 men @ 10 men/crew 21 crews  
21 foremen

21 foremen x 19 x LE 50 = 19,950

Total for Excavation

Laborers 210 men = LE 281,000

Foremen 21 19,950

Total LE 300,950

Say LE 300,000

Other Direct Costs

Warehouses, Rental

3 x LE 200/man x 22 men = 13,200

Yard for Vehicles

LE 1,000 x 22 men = 22,000

Office Space

LE 500/man x 24 = 12,000

Furniture & Equipment

Lump Sum = 50,000

---

LE 97,200

Say Le 100,000

Summary LE Costs

Other Costs	LE 100,000
1. Contractor's Local Staff	550,000
2. Local Materials	3,508,800
3. Local Excavation Crews	300,000
4. Cost Water Main Extensions	3,000,000

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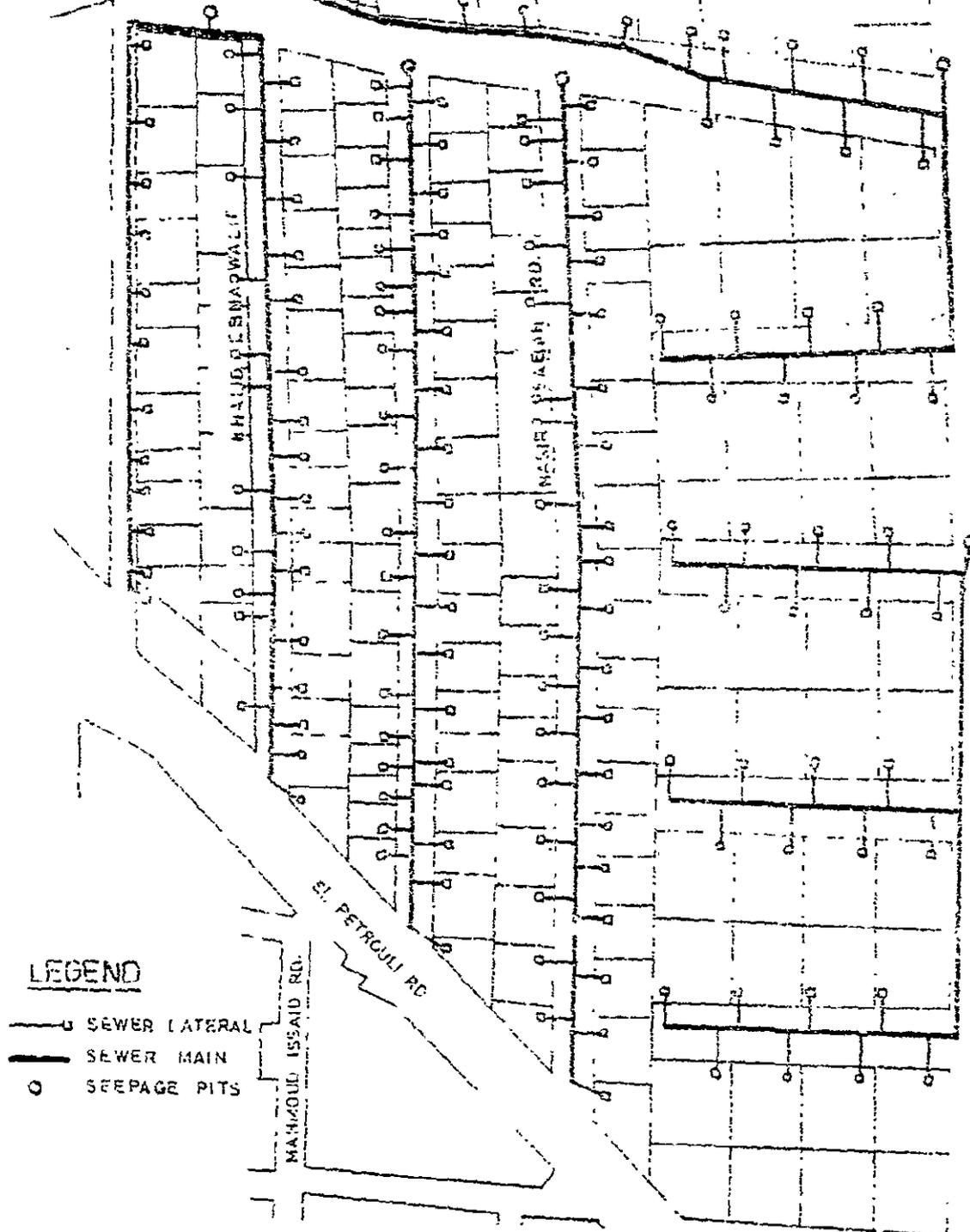
LE 7,458,800

Say LE 7,500,000



A PORTION OF  
MATAREYA KISM  
TYPICAL WASTE WATER  
COLLECTION SYSTEM

SCALE  
1:1000



LEGEND

- SEWER LATERAL
- SEWER MAIN
- SEEPAGE PITS

THRESHOLD DECISION BASED ON  
INITIAL ENVIRONMENTAL EXAMINATION

Project Location: Cairo, Arab Republic of Egypt

Project Title: High Impact Project , Great Cairo Water Supply System

Funding (Fiscal Year and Amount): FY 77, Maximum \$30.0 Millions

IFE Prepared By: Jack R. Snead      Date: 9/1/77

Environmental Action Recommended:

Negative Determination

Mission Decision:

(Approval/Disapproval of Environmental Action Recommended in the IEE)

APPROVED: \_\_\_\_\_

DISAPPROVED: \_\_\_\_\_

DATE: \_\_\_\_\_

Clearances:

Environmental Coordinator: JRSnead

Date: \_\_\_\_\_

Other Mission Offices: CDE: RNBakley

Date: \_\_\_\_\_

CDE: PSLewis

Date: \_\_\_\_\_

INITIAL ENVIRONMENT EXAMINATION

NARRATIVE DISCUSSION

1. Project Location: Cairo, Arab Republic of Egypt
2. Project Title: High Impact Project, Great Cairo Water Supply System
3. Funding (Fiscal Year and Amount):
4. Life of Project: 4 Years
5. IFE Prepared By: J. R. Snead      Date: 9/1/77
6. Action Recommended: Negative Determination
7. Discussion of Major Environmental Relationships of Project

Relevant to Attached Impact Identification and Evaluation Form:

For Environmental Discussion, See Section V.

IMPACT IDENTIFICATION AND EVALUATION FORM

Impact Areas and Sub-areas

Impact  
Identification  
and Evaluation<sup>1/</sup>

A. LAND USE

1. Changing the character of the land through:

a. Increasing the population

L

b. Extracting natural resources

L

c. Land clearing

L

d. Changing soil character

N

2. Altering natural defenses

L

3. Foreclosing important uses

L

4. Jeopardizing man or his works

L

5. Other factors

\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

B. WATER QUALITY

1. Physical state of water

L

2. Chemical and biological states

L

3. Ecological balance

L

4. Other factors

\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

- <sup>1/</sup>N - No environmental impact  
L - Little environmental impact  
M - Moderate environmental impact  
H - High environmental impact  
U - Unknown environmental impact

IMPACT IDENTIFICATION AND EVALUATION FORM

C. ATMOSPHERIC

- |                    |                                   |
|--------------------|-----------------------------------|
| 1. Air additives   | <u>          N          </u>      |
| 2. Air pollution   | <u>          L*          </u>     |
| 3. Noise pollution | <u>          L*          </u>     |
| 4. Other factors   | <u>                          </u> |
| _____              | _____                             |
| _____              | _____                             |

D. NATURAL RESOURCES

- |  |                                   |
|--|-----------------------------------|
| 1. Diversion, altered use of water       | <u>          M          </u>      |
| 2. Irreversible, inefficient commitments | <u>          L          </u>      |
| 3. Other factors                         | <u>                          </u> |
| _____                                    | _____                             |
| _____                                    | _____                             |

E. CULTURAL

- |                                    |                                   |
|------------------------------------|-----------------------------------|
| 1. Altering physical symbols       | <u>          L          </u>      |
| 2. Dilution of cultural traditions | <u>          N          </u>      |
| 3. Other factors                   | <u>                          </u> |
| _____                              | _____                             |
| _____                              | _____                             |

F. SOCIOECONOMIC

- |  |                                   |
|--|-----------------------------------|
| 1. Changes in economic/employment patterns | <u>          H          </u>      |
| 2. Changes in population                   | <u>          L          </u>      |
| 3. Changes in cultural patterns            | <u>          L          </u>      |
| 4. Other factors                           | <u>                          </u> |
| _____                                      | _____                             |
| _____                                      | _____                             |

IMPACT IDENTIFICATION AND EVALUATION FORM

G. HEALTH

- |                                     |          |
|-------------------------------------|----------|
| 1. Changing a natural environment   | <u>H</u> |
| 2. Eliminating an ecosystem element | <u>L</u> |
| 3. Other factors                    |          |
| _____                               | _____    |
| _____                               | _____    |

H. GENERAL

- |                          |          |
|--------------------------|----------|
| 1. International impacts | <u>N</u> |
| 2. Controversial impacts | <u>N</u> |
| 3. Other factors         |          |
| _____                    | _____    |
| _____                    | _____    |

1. OTHER POSSIBLE IMPACTS (not listed above)

\* Temporary effects during construction only

Prepared By: J. R. Snead Date: 9/9/77

Project Location: Cairo, Arab Republic of Egypt

Project Title: High Impact Project, Cairo Water Supply System

GOGCWS POTABLE WATER RATES

Schedule 1.

Rates applicable to general, public supply in Greater Cairo Zone

<u>Zone</u>	<u>Consumption Range cu m</u>	<u>Rate milliemes/cu m</u>
Cairo, Zeitoun, Basatin	Flat rate	12
Maadi	Flat rate	19
Giza, Guezira, Zamalek and Shoubra El Kheima	1 - 200	14
	201 - 1000	12
	1001 - up	10
Helwan	1 - 200	15
	201 - 1000	13
	1001 - up	11

Note: For Heliopolis filtered water is invoiced at the rate of 6.7 milliemes/cu m.

Schedule 2.

Rates applicable to independent organizations and institutions in all zones

<u>Zone</u>	<u>Consumption Range cu m</u>	<u>Rate milliemes/cu m</u>
Cairo and Zeitoun	Flat rate	12
Giza and Shoubra El Kheima	1 - 100	14
	101 - 500	12
	501 - up	10
Maadi	Flat rate	19
Helwan	1 - 100	15
	101 - 500	13
	501 - up	11

Notes:

- a. The Cairo Governorate and its departments are charged the raw water rate (5 to 15 milliemes/cu m depending on zone) for potable water.
- b. Youth Protection Centres, Popular Clubs, and the Arab Socialist Union are granted a 75 percent reduction in rates.
- c. Within the Cairo Zone, a rate of 8 milliemes/cu m is applied to all Mosques associated with the Ministry of Wakfs. A reduction of 50 percent from the public rate (schedule 1) is granted to these Mosques in the Giza, Helwan, Shoubra El Kheima, and Maadi zones.

Schedule 3.

Rates applicable to Ministries and Government Administration

<u>Zone</u>	<u>Rate</u> <u>Milliemes/cu m</u>
Cairo and Zeitoun	11.8
Giza and Shoubra El Kheima	10
Maadi	19
Helwan	11

MODIFIED TEN YEAR PLAN, 1976-1985. GENERAL ORGANIZATION OF

Project	Total Project Cost			Expended to 10/31/76		Proposed 1977 Budget		Approved 1977 Budget	
	Total	Local	Foreign	Local	Foreign	Local	Foreign	Local	Foreign
1. Embaba Filtration Plant First Phase	20 700	11 000	9 700	1 800	-	2 000	2 000	200	-
2. Embaba Filtration Plant Second Phase	19 000	7 000	12 000	-	-	-	-	-	-
3. Fostat Filtration Plant	28 100	15 000	13 100	1 300	-	2 000	2 000	100	-
4. Fostat Transmission Lines	11 500	3 500	8 000	-	-	-	-	-	1 000
5. Moutamad Filtration Plant First Phase	4 204	1 133	1 071	2 971	1 071	-	-	160	-
6. Moutamad Filtration Plant Second Phase	10 000	15 000	15 000	-	-	-	-	-	-
7. Moutamad Raw Water Plant	8 000	3 000	5 000	-	-	-	-	-	-
8. South Gaza Filtration Plant Expansion - First Phase	2 600	1 883	717	1 723	717	400	-	160	-
9. South Gaza Filtration Plant Expansion - Second Phase	14 000	7 000	7 000	-	-	-	-	-	-
10. New Helwan Filtration Plant	20 000	11 000	9 000	-	-	-	-	-	-
11. Rasfa (Centre South) Filtration Plant Expansion	7 000	3 000	4 000	-	-	-	-	-	-
12. North Helwan Filtration Plant Expansion - First Phase	1 825	1 500	325	915	-	300	-	300	325
13. North Helwan Filtration Plant Expansion - Second Phase	6 000	2 500	3 500	-	-	-	-	-	-
14. Taba Settled Water/Filtration Plant Expansion	13 000	5 000	8 000	-	-	500	-	-	-
15. Maudi Filtration Plant Expansion	15 000	1 325	175	80	-	420	80	150	175
16. Red El Farag Filtration Plant Expansion	1 500	1 400	100	300	-	300	300	300	100
17. Red El Farag Filtration Plant Renovation	15 000	5 000	10 000	-	-	-	-	-	-
18. Shoubra El Khayma Settled Water/Filtration Plant	23 000	8 000	15 000	-	-	200	-	-	-
19. Gaza Filtration Plant Renovation	10 000	6 000	4 000	-	-	-	-	-	-
20. Kala Filtration Plant Renovation	10 000	6 000	4 000	-	-	-	-	-	-
21. New Mills and Pumps	40 000	10 000	30 000	2 850	50	1 000	3 000	850	2 250
22. Distribution System Renovation	15 000	11 000	4 000	400	-	900	100	800	200
23. Storage Reservoirs	15 000	15 000	-	845	-	1 400	-	855	-
24. Well Development	4 000	2 000	2 000	100	-	300	300	100	300
25. Misc. Filtration Plant Improvements	7 000	2 000	5 000	610	-	300	200	200	130
26. Misc. Construction	4 000	4 000	-	200	-	500	-	200	-
27. Logistics	8 000	3 000	5 000	500	-	300	200	200	-
28. Plant Efficient System Improvements	6 000	3 000	3 000	100	-	200	200	200	-
29. Personnel Salaries	3 000	3 000	-	-	-	100	-	150	-
30. Equipment/Material Storage	1 000	500	2 500	-	-	-	200	-	-
31. Other Construction and Improvements	8 000	3 000	5 000	200	-	500	500	100	450
32. Various Plant Intake Improvements	1 000	1 000	-	-	-	1 000	-	500	-
33. Mountgat Well Field	1 244	1 244	-	444	-	900	-	-	-

AVAILABLE  
BEST COPY AVAILABLE

GREATER CAIRO WATER SUPPLY (All costs in thousands of Egyptian Pounds,

(Annex P)

Page 2 of

AVAILABLE  
BEST COPY

1978		1979		1980		1981		1982		1983		1984		1985	
Total	Foreign	Total	Foreign												
2 500	1 400	2 500	2 400	2 500	2 500	2 000	1 200	-	-	-	-	-	-	-	-
-	-	-	-	-	-	1 500	3 000	1 500	3 000	1 700	2 500	1 500	2 500	800	1 000
2 500	1 000	1 000	1 000	4 000	4 500	4 100	2 600	-	-	-	-	-	-	-	-
500	4 000	2 000	1 000	1 000	-	1 000	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2 000	-	1 500	1 000	2 500	3 500	2 500	3 500	2 500	3 000	2 000	2 000	1 000	1 000	1 000	1 000
1 500	1 000	1 000	2 000	500	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	200	500	1 000	1 500	2 000	1 500	2 000	2 000	1 300	1 000	500	500	-
-	-	-	-	-	-	2 500	2 000	2 500	3 000	2 500	2 000	2 500	1 000	1 000	1 000
-	-	-	500	1 000	1 500	1 000	1 500	1 000	500	-	-	-	-	-	-
285	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	500	500	1 000	800	1 500	800	500	400	-	-	-
-	-	500	1 000	1 000	1 000	1 000	2 000	1 000	2 000	1 000	1 000	500	500	-	500
400	-	370	-	325	-	-	-	-	-	-	-	-	-	-	-
100	-	300	-	200	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	1 000	1 000	1 000	2 500	1 000	2 000	1 000	2 000	1 000	2 000	-	500
-	-	-	500	1 000	2 500	2 000	3 500	2 000	3 500	1 500	3 500	1 000	1 000	500	500
-	-	-	-	-	-	1 000	1 000	1 500	1 000	1 500	1 000	1 500	1 000	500	-
-	-	-	-	1 000	1 000	1 500	1 000	1 500	1 000	1 000	1 000	500	-	500	-
400	3 000	1 000	4 000	1 000	4 000	1 000	4 000	1 200	5 000	1 200	5 000	300	1 500	200	1 200
1 800	300	2 000	400	1 000	600	1 000	500	1 000	500	1 000	500	1 000	500	1 000	500
2 000	-	2 000	-	1 800	-	1 500	-	1 500	-	1 500	-	1 500	-	1 500	-
100	200	100	200	200	200	200	200	200	200	200	200	200	200	200	200
150	670	150	600	150	600	150	600	150	600	150	600	135	600	135	600
450	-	450	-	450	-	450	-	450	-	450	-	450	-	450	-
500	800	500	800	500	800	500	800	300	800	-	800	-	200	-	-
500	600	500	600	500	600	500	600	500	600	200	-	-	-	-	-
450	-	400	-	400	-	400	-	400	-	400	-	400	-	-	-
100	500	100	500	100	500	100	500	100	500	-	-	-	-	-	-
700	500	700	500	700	500	400	500	400	550	400	600	300	650	700	750
500	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
200	-	200	-	200	-	200	-	-	-	-	-	-	-	-	-
17 835	20 070	19 070	21 000	23 125	26 800	28 500	34 500	21 000	31 250	20 500	24 500	15 085	13 200	8 585	7 800

Prior to the start of the AID-financed master plan, the GOGCWS had planned and/or started the following projects;

- A. The new Mostorod (Cairo Northeast) Filtration Plant with a capacity of 450,000 cm/d was completed in early 1977. A transmission main is presently under construction, and the plant will be able to deliver about 300,000 cm/d by 1978. The remaining 150,000 cm/d capacity should be added upon completion of another transmission main in 1980, which is to be financed and constructed by the Japanese.
- B. In addition to non-potable raw water supply facilities and transmission mains in Heliopolis and Helwan, the Japanese have also agreed to provide about 9 Km of potable water transmission mains from the Rod El Farag Filtration Plant (see Part IV above).
- C. Construction is underway to increase the capacity by 40,000 cm/d in Maadi. The work should be completed in 1979.
- D. A facility at North Helwan is also being expanded in a fashion similar to that at the Maadi plant to accommodate a total flow of 80,000 cm/d. It should be in operation by at least 1980.
- E. The Embaba Filtration Plant (300,000 cm/d capacity) is planned. Following international bidding in mid-1977, German financing was settled for equipment purchases and installation. It is planned to become operational in 1980.
- F. GOGCWS also plans the construction of the Fostat Filtration Plant of 600,000 cm/d capacity, together with major transmission mains and storage capacity. Design contracts for this facility have not been awarded and completion of the project is estimated after 1985.
- G. Expansion plans for the Rod El Farag Filtration Plant to add 100,000 cm/d to the existing capacity which are now merged in this proposed project.

OPERATING STATEMENT INFORMATION  
 GENERAL ORGANIZATION GREATER CAIRO WATER SUPPLY  
 1973, 1974, 1975, 1976

	<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>
<u>PHYSICAL DATA</u>				
Volume of Water Sold (Million cu m)	468.9	514.0	561.8	581.9
Service Connections Made	5 521	8 663	12 065	11 393
 <u>FINANCIAL DATA (Thousands of Egyptian Pounds)</u>				
Production Sold (Water 95%, Meter Rental 5%) L.E.	5 405	L.E. 5 928	L.E. 6 212	L.E. 6 529
Services Sold (Connection Charges)	<u>313</u>	<u>358</u>	<u>452</u>	<u>763</u>
Total Production Revenue	5 718	6 286	6 664	7 292
 Production Cost	 2 342	 2 946	 4 546	 4 868
Production Services Cost	2 383	2 789	3 979	5 525
Total Production Cost	4 725	5 737	8 525	10 393
 Production and Transactions Surplus (Deficit)	 993	 549	 (1 861)	 (3 101)

COMPARATIVE BALANCE SHEETS  
GENERAL ORGANIZATION GREATER CAIRO WATER SUPPLY  
31 DECEMBER 1975, 1974, 1973, 1972

(Thousands of Egyptian Pounds)

<u>ASSETS</u>	<u>1975</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>
1 Fixed Assets	22 310	23 099	28 925	37 555
2 Projects Under Execution	9 700	11 261	10 410	12 001
3 Warehouse Stocks	3 159	1 142	4 934	6 722
4 Government Bonds	93	93	93	93
5 Customers Debits	2 306	3 021	2 695	3 016
6 Suppliers and Other Debit Accounts	2 597	2 906	6 055	2 858
7 Credit Balances	-	4 546	4 308	7 644
8 Cash in Bank, etc.	586	2 091	5 649	5 863
9A Current Deficit			177	3 361
9B Jobs Surplus Account		751		
9C Paid to Ministry of Finance	991			
10 Total	<u>41 942</u>	<u>51 912</u>	<u>65 248</u>	<u>79 096</u>
 <u>LIABILITIES</u>				
1 Owned Capital	10 290	10 290	10 290	10 290
2 Legal Reserves	1 077	1 291	1 196	1 752
3 Provision (Depreciation, etc.) Reserves	12 601	13 166	13 868	15 279
4 Local Long Term Loans	9 184	11 971	17 828	31 388
5 Foreign Long Term Loans	893	515	433	-
6 Creditors and Creditor Banks	1 709	1 568	1 675	2 654
7 Other Credit Balances, etc.	5 727	12 859	17 603	17 628
8 Debtors and Debit Balances	-	15	55	105
9 Current Operations Account	460	207	-	-
10 Total	<u>41 942</u>	<u>51 912</u>	<u>65 248</u>	<u>79 096</u>

ARAB REPUBLIC OF EGYPT  
MINISTRY OF HOUSING AND RECONSTRUCTION  
CAIRO, EGYPT

TERMS OF REFERENCE  
AND  
REQUEST FOR TECHNICAL PROPOSAL  
FOR  
MANAGEMENT AND TARIFF STUDIES  
RELATIVE TO WATER/SEWERAGE SYSTEMS

MAY 1977

WATER AND WASTEWATER  
MANAGEMENT AND TARIFF STUDY

(Annex S)  
Page 2 of 38

"SCOPE OF WORK"

5.0 CONSULTANT'S TASKS

5.1 CONSULTANT'S SERVICES

The services to be provided by the Consultant shall include:

- (a) Performance of management studies and development of management plans for water and sewer public utilities in Cairo, Helwan, Alexandria, Suez, Ismailia and Port Said, which shall include recommendations for the implementation of these plans.
- (b) Performance of a rate study for water and sewer service for Cairo, Helwan, Alexandria, Suez, Ismailia and Port Said, with recommendations of reasonable and proper rates and tariffs for water and sewer utility service.

5.2 REVIEW OF EXISTING INFORMATION

The Consultant shall review all relevant and available existing information related to management and tariffs. This review shall include at least the items listed below :

1. All reports by the three consultants who are preparing Water and Sewerage Facilities Master Plans for Cairo, Helwan and Alexandria.
2. All reports by the two consultants who are preparing Water and Sewerage Works Master Plans for Alexandria and Greater Cairo (including Helwan).

3. All reports by three consultants who are preparing Water-works and Wastewater Facilities Master Plans for Port Said, Ismailia and Suez.
4. A report entitled Water Supply System Feasibility Report, March, 1976, prepared by the Alexandria Water General Authority.
5. A report entitled Report on the Water Supply Systems of Greater Cairo, March, 1976, prepared by the Survey Team on the Water Supply System of Greater Cairo from the Japan International Cooperation Agency.
6. All legislation affecting the utilities. (See 5.3.2. and 5.4.2.)
7. All recent regular budgetary, financial or operating reports by the existing water and sewerage organizations.
8. Portions of the Area Master Plans for Port Said, Ismailia, and Suez and the Suez Canal Zone Regional Master Plan, especially those sections relating to the implementation and management of the development process.

### 5.3 MANAGEMENT STUDY AND PLAN

#### 5.3.1 Outline of the Study

The work outlined herein shall culminate in a Final Report on the Management Study recommending one or more programs for the staged development of the organizations or agencies needed to meet the current and future operational and management needs of the water and wastewater systems through the year 2000. The detailed portions of the studies and plans shall be restricted to the six cities of Cairo, Helwan, Alexandria,

Suez, Ismailia and Port Said. The recommended management structures should, however, be flexible enough to accommodate future expansion and extension of service to new areas adjacent to the cities or to more distant areas that may be economically served by the systems under study. The Consultant is also expected to recognize two additional elements in his studies. Firstly, the recommendations that he develops will have implications in terms of national legislation and policies. Secondly, the recommended programs may form the model for utility management in other locations within Egypt.

The Study and Final Report shall cover the following areas of concern, which are further detailed on the following pages :

- 1) Organizational Environment
- 2) Organizational Structure
- 3) Personnel System
- 4) Procedures and Methods
- 5) Management Information System
- 6) Physical Assets
- 7) Data Processing
- 8) Organizational Manual

#### 5.3.2 Organizational Environment

- A. The Consultant shall examine and report upon the legislative and regulatory bases of the agencies involved in the water and sewerage services of the six cities, their institutional position relative to the framework of the national and regional governments, and their relationship with other Government agencies. He shall examine Government administrative practices for the purpose of identifying and detailing the modifications required to implement the recommended management plan(s) and to enhance the institutional capabilities of the existing agencies.

- B. The Consultant shall identify all external factors, legal or administrative, which may affect decisions regarding the reorganization and/or unification of the water and wastewater agencies. In this regard, the Consultant shall specifically consider the policies and programs of organizations within the Government responsible for the formulation and revision of administrative practices and procedures.

### 5.3.3 Organizational Structure

- A. The Consultant shall examine the policies, objectives and functions of existing utilities serving the six cities.
- B. The Consultant shall review and report upon the organizational structures of these same existing utilities, paying particular attention to:
  - i) Functional coverage to determine the extent to which all functions required by legislation and agency objectives are being performed.
  - ii) Managerial appropriateness to determine whether the organization properly delegates authority and responsibility, properly divides work and functional areas, facilitates coordination between divisions, permits exercise of appropriate direction and control and provides for self evaluation and improvement.
- C. The Consultant shall analyze and report upon the advantages and disadvantages, and the difficulties to be faced in implementing the following:
  - i) Extending the "public utility" form of organization and management to all the water and wastewater utilities in six cities. This would cover not only the question of autonomous management (as in the case of the GOGCWS

and AWGA) and the powers delegated to this management but also questions of capital structure, bonding powers, ability to seek external financing, etc.

- ii) Combining some or all of the water and wastewater utilities along geographical or functional lines.
- iii) Other organizational alternatives which would allow the agencies, merged or separate, to better perform their functions.
- iv) Establishing one or more regional or national agencies for: setting policies and standards; financing or allocating financing among utilities; providing common services needed by all water and wastewater utilities such as procurement, training, administration, accounting, billing, computer services, etc. ; and/or operating the utilities. Some of the above would be compatible with the "public utility" concept while others could be carried out only under an alternative form of organization.

#### 5.3.4 Interim Report - Covering Organization Environment and Structure

Within six months from the Starting Date of these studies, the Consultant shall prepare and submit, in the manner prescribed in Section 6.4, an "Interim Report on the Organizational Environment and Structure of Water and Wastewater Organizations," which shall include a discussion of the information gathered and the results of the analyses performed in accordance with Sections 5.3.2 and

5.3.3 above. This Interim Report shall also develop and discuss the advantages and disadvantages and the feasibility (paying particular attention to the practical aspects of implementation) of at least the following plans:

- Plan A. Improvement of the existing organizations under the existing legislation.
- Plan B. Establishment of new or modified organizations under the existing legislation.
- Plan C. Improvement of the existing organizations under new or modified legislation.
- Plan D. Establishment of new or modified organizations under new or modified legislation.

In this Interim Report, the Consultant shall state his recommendations on the Plan set forth and the form or organization that appears to him to be the most feasible and advantageous, and shall discuss the staged implementation of his recommendations.

In developing and analyzing alternatives, the Consultant shall emphasize those alternatives which will allow the utilities the appropriate degree of autonomy, financial independence and self-supported growth. The organizational structure recommended for each utility should specifically define, on a department by department basis: responsibilities and authority; basic functions; interrelationships of such functions; coordination with other departments; and general procedures for the discharge of duties.

Within 45 days after receipt of this Interim Report the MOHR will approve, partially or conditionally approve, or disapprove the Consultant's

recommendations and report. Should the report or recommendations be disapproved, or be only partially or conditionally approved, the Consultant will be furnished a written statement of the reasons for less than full approval and the Consultant shall immediately restudy, revise or modify the material as necessary to produce a report that is acceptable and will receive the MOHR's written approval. Fifteen days will be allowed for revision of the report, if necessary. This will be done in parallel with the Consultant's continuing work. The MOHR approval will identify the organizational structure for which the Consultant shall design the managerial and administrative systems described in Section 5.3.5 through 5.3.10. Approved copies of the revised report will also be submitted in the manner and numbers prescribed in Section 6.0.

Should the MOHR fail to : approve, partially or conditionally approve or disapprove the Consultant's recommendations and report within 45 days after receipt of such report, the Consultant may continue with the Study using the plan set forth and the form or organization that appears to him to be most feasible and advantageous, as discussed in the report.

#### 5.3.5 Personnel System

- A. The Consultant shall review and analyze the existing personnel systems including, but not necessarily limited to, the procedures for recruitment, selection, assignment, training, performance evaluation, promotion, discipline, transfer and separation of employees and pay schedules.
- B. The Consultant shall make a qualitative but reasonably detailed review of the effectiveness with which personnel are used at the operating, technical and managerial levels. Of particular concern are the following :

- (i) Are employees, particularly at the lower levels, aware of the purpose of the agency and their own role within it?
- (ii) Are the tasks of employees adequately defined by the agency?
- (iii) Are these tasks explained to and understood by the employees?
- (iv) Are tasks appropriate to the positions of the employees and to their backgrounds?
- (v) Is work properly scheduled?
- (vi) Is there adequate supervision to ensure fulfillment of the employees' tasks?

Interviews with a limited sample of employees at the various levels may be undertaken with the full approval of the agencies involved and with strict regard to any requirements of confidentiality.

- C. For the organizational structure selected, the Consultant shall design a personnel system for each utility including at least those items mentioned in paragraph A. above. The personnel system shall be consistent with the Government policies for employment in the public sector unless the utilities are specifically exempted from such policies by laws recommended by the Consultant and accepted by MOHR,<sup>1</sup> and which have a high probability of being enacted.
- D. For the selected organizational structure, the Consultant shall recommend the number and type of personnel needed within each utility, paying due attention to local conditions. The levels of skill, training, experience, etc. required for the various types of personnel shall be clearly stated.

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<sup>1</sup> In the case of Alexandria, the MOHR expects to secure the agreement of AWGA.

- E. The Consultant shall compare the staff of the existing organizations with the staff required for the proposed organizational structure. He shall evaluate the sufficiency of existing staffs, for meeting the need of the proposed structure, identifying shortages and surpluses. He shall prepare a 10-year (or other suitable period) staffing plan for each proposed utility which will set forth means to eliminate these shortages or surpluses, including recommended methods for implementing it within the context of the management plan and reflect the system expansions recommended in the Waterworks and Wastewater Facilities Master Plans.
- F. For the staffing plan prepared for each utility, the Consultant shall set forth a long-term training program. This program will cover the following :
- management functions
  - operational procedures
  - maintenance procedures

The purpose of these training programs will be :

- a) to instruct personnel of each utility in the concepts and specific applicability of the revised duties, methods, techniques and procedures advanced by this Consultant in response to Sections 5.3.5 through 5.3.10; and
- b) to insure that methods and techniques recommended and prepared by the other consultants are, in fact, transmitted to the utility's personnel. (Course content for this latter group will consist of materials prepared by the other consultants. This Consultant is not expected to consider this material in greater detail than is necessary to structure the courses).

The training program will include, for each course of instruction established, an outline of the material to be covered (including references, sources and standard manuals) and an outline curriculum.

In addition, the Consultant will make recommendations on possible participant training programs in the U.S. and elsewhere, taking into account training programs supported by the U.S. Agency for International Development. This participant training program shall be limited to personnel in the management and professional levels.

The Consultant shall prepare an estimate of the local and foreign costs of the long-term training program set forth for each utility. This estimate of cost shall include at least the following items :

- Instructors
- Instructional materials
- Classroom space
- Administrative costs
- Costs of overseas training programs, including travel, subsistence and curriculum costs, as obtained from appropriate international agencies.

G. Based on the analyses of paragraph A and B above, the Consultant shall recommend improvements that can be made to the present personnel systems of each of the existing organizations during the interim period until the new organizational structure selected is implemented.

#### 5.3.6 Procedures and Methods

A. The Consultant shall review and analyze the existing procedures and methods employed in the water and wastewater utilities to accomplish the given work in at least the following functional areas :

- (i) Project planning, including project analysis, programming, budgeting and the monitoring of performance against objectives.
- (ii) Operation and maintenance of the waterworks and wastewater systems.
- (iii) Billing and collecting including : meter reading practices; testing meter performance and rotating or replacing meters; meter repair; billing techniques and the flow of activities involved in bill preparation; procedure followed in collecting; general effectiveness of collections; and policies for adding or discontinuing accounts.
- (iv) Procurement and inventory control, including the physical locations of the main and subsidiary stores; the laws governing procurement; and the practices followed in undertaking to purchase, receive, store, issue and control the inventory (e.g. inventory levels, determination of reorder levels and size of orders, associated record-keeping, etc.) of materials, spare parts, and other supplies.
- (v) Mapping and record-keeping relative to the physical plant and distribution/collection systems, including as-built drawings, location drawings and listing of valves, hydrants, etc.

Review shall be made of the sequence established for various work elements and the manner in which work is assigned and controlled. Consistent with his work as outlined in Section 5.3.5, the Consultant shall also review skill utilization, work methods, work measurements, work standards, tools and equipment. (Except as noted, it is intended that the Consultant concentrate on the manner in which methods and procedures are chosen, implemented and controlled. The more detailed, technical contents of the procedures and methods need be dealt with only to the extent that they generally affect the efficiency and effectiveness of the organization).

- B. To support the organizational structure selected, the Consultant shall recommend procedures and methods for each utility, covering no fewer than the functional areas and items described in paragraph A. above and considering the points discussed below.

The planning procedures shall include systems for long range planning covering ten years into the future; with annual updating and extension of the planning period.

In designing the inventory system for each utility, the Consultant shall give consideration to a system that includes, inter alia, bin cards, order and requisition forms, summary sheets and master files, and to having these in a form which is readily convertible to computer processing. The Consultant shall specify the basis which should be used for determining minimum and maximum inventory levels and lot sizes or orders for frequently consumed items and set forth procedures to optimize the size of the inventory.

In designing new billing and collecting procedures, the Consultant shall give consideration to : distribution of the workload in the billing departments; billing the individual customer rather than the building or other multiple-unit (with or without separate metering); minimizing bills under collection or in arrears; use of computers; and making the best use of data for financial or other studies, especially water consumption studies.

In designing the systems of mapping and record keeping for the physical plant and distribution/collection systems, the Consultant shall investigate the requirements for and the feasibility of using a micro-film system for drawing storage and retrieval.

- C. For each of the existing organizations, the Consultant shall recommend improvements based on the analyses and recommendations above that can be made to the present procedures and methods, in at least the functional areas described in paragraph A, during an interim period until the new organizational structure selected is implemented.

#### 5.3.7 Management Information Systems

- A. The Consultant shall review and analyze the existing management information systems, including at least all formal reports, budgets, statements of accounts, tabulations of operating data, documents pertaining to new projects and informal channels of communication if they are significant.
- B. For each utility under the organizational structure selected, the Consultant shall develop a comprehensive but simple and flexible management information system, which will provide timely and adequate information to the various levels of management to facilitate decision-making and proper operational and budgetary control. The system shall be designed to permit timely evaluation of the utility's performance relative to physical work accomplishment, i.e. capital projects and the operation and maintenance of facilities, and relative to financial expenditures vs. revenue generation. The information systems shall include, but not necessarily be limited to :
- (1) Periodic reporting from well-defined responsibility centers, acting through the channels of accountability specified in the organization structure, which will permit systematic monitoring of actual financial performance and operational (or other non-financial) performance and comparison to objectives and budgets. Forms, contents and routes of these reports are to be fully specified. Financial reports shall be designed to distinguish between controllable and non-controllable costs.

- (ii) A budgeting system, including a capital budget and an overall operating budget, comprised of more detailed sub-budgets for the various departments, emphasizing controllable costs.
  - (iii) A system of accounting to provide the data needed to prepare financial statements, such as revenue accounts, cash flow statements and balance sheets, and to determine rates (Section 5.4). Procedures for the evaluation and depreciation of assets should be included. (See Sections 5.4.4 & 5.4.6). This system shall be consistent with the Egyptian Standardized Accounting System (E.S.A.S.).
  - (iv) A data collection system that will collect, record and preserve data required for planning the capital budget and establishing the operating budgets, plus planning data needed for the ten-year plans. (See Section 5.3.6).
  - (v) A data collection system that will supply the cost accounting data required : (a) to monitor the actual performance of each responsibility center; (b) to provide cost data on responsibility center operations prior to allocation of costs to production or other areas; and (c) to provide cost data and statistics on unit and total cost of production. The cost accounting system shall be designed to supplement the Egyptian Standardized Accounting System (E.S.A.S.).
- C. For each utility the Consultant shall also develop an information system for top-level management. This system shall consist of a consolidation of selected data, which are to be submitted at regular reporting intervals and provide a complete, timely and definitive picture of the financial and operating status of the utility.

- D. For each of the existing organizations, the Consultant shall recommend improvements based on the analyses of paragraph A above that can be made to the present management information systems in the interim period until the new organizational structure selected is implemented.

#### 5.3.8 Physical Assets

- A. The Consultant shall review and analyze the physical assets of the existing organizations (exclusive of the water and sewage treatment plants, pumping stations, and distribution/collection systems),<sup>1</sup> that are either in use or available for use, with respect to their impact on the functioning of the existing organizations. The assets studied shall include, but not necessarily be limited to: buildings or other space (offices, warehouses, storage yards, etc.); office supplies and equipment; supplies and equipment for operation and maintenance; communication facilities and transport. The Consultant shall review the locations and general layouts of the facilities and the general suitability and adequacy of the amounts and types of equipment and supplies. It is intended that this Consultant concentrate on the utility and adequacy of the physical assets included in this paragraph in so far as they affect the management, administration, and functioning of the utilities.
- B. The Consultant shall also review and analyze the policies and practices followed in controlling and maintaining the physical assets included under paragraph A, covering at least the following areas

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<sup>1</sup>It is expected that the engineering consultants on the concurrent related projects will have studied and reported upon the physical assets required for technical operations. It is not intended that this Consultant duplicate these efforts nor is it intended that he inventory or itemize the physical assets in greater detail than is necessary to complete the approximate valuation of assets referred to in Section 5.4.4.

of concern :

- Keeping of records relating to the assets
- Scheduling of regular preventive maintenance
- Decision making regarding repair versus replacement
- Acquisition and disposal practices

- C. The Consultant shall recommend the approximate amounts and general types of physical assets, of the kinds mentioned in paragraph A above, required to properly support the organizational structure selected during the next 10 years, and policies and practices to be followed in controlling these physical assets. An estimate of the cost of the additional assets required, of the kind included in paragraph A, shall be prepared. This shall be an approximate estimate, suitable for inclusion in the overall valuation of future assets referred to in Section 5.4 of these Terms of Reference.
- D. Based on the analyses of paragraphs A and B above, the Consultant shall recommend improvements that can or should be made in the present levels or types of physical assets, plus the policies and practices used in controlling these physical assets, in the existing organizations during the interim period until the new organizational structure selected is implemented.

#### 5.3.9 Data Processing

- A. The Consultant shall review and analyze present methods of data processing in the existing organizations, including but not necessarily limited to methods of processing data on the following types :
- Cost accounting
  - Control of costs versus budgets
  - Financial reporting
  - Inventory records
  - Customer accounts and billing
  - Statistical analyses

The Consultant shall include in the study the use that is made, or could reasonably be made, of electronic data processing equipment. In this Study, the Consultant shall consider possible use of this equipment for technical programs, as these may be prepared by other consultants or, in the future, by the agencies.

- B. The Consultant shall, after careful consideration of local conditions, recommend data processing methods and equipment to support the organizational structure selected.
- C. Based upon the analyses above, the Consultant shall recommend improvements that can be made to the present data processing methods of the existing organizations during the interim period until the new organizational structure selected is implemented.
- D. Based on the existing or recommended extent of computer use by either the existing or new organizations, the Consultant shall determine and report on the advantages and disadvantages of the following:
  - (i) A data processing center to be used jointly by all water and wastewater utilities;
  - (ii) A data processing center for each utility or group of utilities;
  - (iii) Other possible arrangements, involving common programs, joint use with other agencies, use of outside data processing services, etc.;
  - (iv) Ownership of computers vs. leasing;

and shall state his recommendations. The Consultant shall identify the general computer facilities that are needed, including central processing unit, memory, input/output devices, peripheral equipment and mode of operation. The Consultant shall take into consideration the capital and operating costs of alternative systems and the existing regulations governing the use of computers by public enterprises. The possibility of renting excess in-house computer time to outside users shall be explored and evaluated.

#### 5.3.10 Organization Manual

For the organizational structure selected, the Consultant shall prepare an Organization Manual with separate sections on each utility, containing, but not necessarily limited to, the following:

- (i) Organization charts for the utility, showing lines of responsibility and recommended staffing level broken down by type of skill.
- (ii) A definition of the objectives and functions of each department.
- (iii) Job description for each category or class of key jobs, including at least work content, qualifications required, accountability, and relative wage or salary rates. (With respect to the last item the Consultant should make recommendations concerning the actual levels of wages and salaries, noting those needed to attract qualified personnel. It is recognized, however, that wage and salary levels for all Government personnel are governed by other considerations well outside the control of MOHR).

#### 5.3.11 Interim Report - Covering Management Systems (10 months)

Within ten months from the Starting Date of these studies the Consultant shall submit an "Interim Report on Management Systems" covering the material discussed in Section 5.3.5 through 5.3.9 and an outline of the Organizational Manual discussed in Section 5.3.10. The management plan proposed in the Interim Report on Management Systems shall be designed for the organizational structure selected. The Interim Report on Management Systems shall also include the Consultant's recommendations on the improvements to present systems (in the existing organizations) that can be made during the period until the selected organizational structure is implemented. These recommended

systems (in the existing organizations) that can be made during the period until the selected organizational structure is implemented. These recommended improvements shall clearly state the actions that should be taken, by which persons or organizations, and the intended and expected results, but the recommendations need not be as detailed as the systems designed for the selected organizational structure. As far as it is practicable, the recommended improvements should build towards the systems designed for the selected organizational structure and should be compatible with them.

The Interim Report on Management Systems shall be submitted in the manner and numbers prescribed in Section 6.5.

5.3.12 Draft Final Report on the Management Study (13 months)

Taking into account the comments received from MOHR and others on earlier reports, and other consultant's reports, the Consultant shall submit a Draft Final Report as prescribed in Section 6.6. This report shall present the accepted organizational structure and management plan, including the management systems and the organization manual for the approved structure, and the recommended improvements to systems currently in force in the existing organizations.

5.3.13 Final Report on the Management Study (16 months)

Following receipt of comments on the Draft Final Report, the Consultant shall submit a Final Report as prescribed in Section 6.7. This Final Report shall take into account the Final Reports of the other consultants.

5.3.11 Early Study of Management Procedures Applicable to the Alexandria Water General Authority

In order to fulfill requirements of the Alexandria Water General Authority (AWGA) which are tied to a potential loan from the International Bank for Reconstruction and Development (IBRD), the Consultant shall complete certain elements of the management study, as they apply to AWGA, in advance of the remainder of the study. To facilitate this work, the Consultant will be provided with a copy of the Appraisal Report (dated February 8, 1977), prepared by the staff of the IBRD. The Consultant shall familiarize himself thoroughly with this document.

Specific elements of the management study which are to be completed in advance include the review and appraisal of the existing planning, decision making and control procedures of AWGA and the preparation of recommendations for improvement of these procedures.

In his appraisal, the Consultant shall pay specific attention to the following points :

- (a) whether adequate machinery exists for defining the objectives of the Authority's future operations, for undertaking the planning necessary to achieve these objectives and for quantifying the results expected;
- (b) whether responsibility for the implementation of the Authority's plans is clearly assigned and whether those to whom this assignment is made clearly understand what is expected of them;
- (c) the extent to which decision-making is delegated to the lowest level commensurate with the maintenance of adequate overall control;

- (d) the ability of the statistical, operational and financial information systems to provide managers at each level with timely, accurate and pertinent information for the purpose of monitoring the performance of the Authority relative to its objectives;
- (e) the adequacy of existing personnel procedures relating to staff motivation and evaluation, particularly :
  - (i) the selection and quantification of performance standards for each job classification;
  - (ii) the methods for evaluating the performance of each job holder and reviewing the results with him;
  - (iii) promotion policies and the procedures for identifying and selecting candidates for promotion;
  - (iv) the use of incentives (monetary or otherwise) to encourage good performance; and
  - (v) other means which are used or may be used to improve staff morale;
- (f) whether technical or other training needs are systematically reviewed and whether facilities (in-house or elsewhere) are adequate to meet these needs.

In developing recommendations for improving current management systems procedures in AWGA, the Consultant shall consider the results of his review of points (a) through (f) above and shall prepare recommendations specifically addressing the following :

- (a) Procedures for preparing annual budgets, which are currently prepared only at the Authority level, in a manner that will provide separate departmental budgets defining the expenditure limits that apply to each responsible manager for the forthcoming financial year.

- (b) A system of financial control that will :
- (i) Separately establish the costs of each identifiable part of the Authority's operation (i.e., the operation of individual treatment works) .
  - (ii) Establish periodically the costs incurred by each department so these may be compared with the departmental budgets described in (a) above.
  - (iii) Separately identify the revenues, costs and profit or loss attributable to serving each major geographical area of supply or class of consumer.
- (c) Improvements in the current management information systems that will insure that the reports and data provided to management personnel at the various levels are timely, accurate and adequate for each respective manager to carry out his assigned duties and for the monitoring of the Authority's performance.
- (d) Improved personnel procedures for enhancing the motivation and performance of the Authority's personnel. In preparing his recommendations, the Consultant shall give due consideration to national policies governing public sector employment and shall recommend procedures which, within the constraints of these policies, will provide maximum incentives for staff members whose performance is above normal.

5.3.15 Special Report on Management Procedures in the Alexandria Water General Authority (4 months)

At the conclusion of the above study, the Consultant shall prepare a Special Report which sets out the results of his review, as detailed above, and contains recommendations on the improvements in the management procedures of AWGA that he deems necessary. This report should also contain a section identifying any urgent training needs and the Consultant's recommendations on how these needs may best be met.

In this Special Report, the Consultant shall clearly separate recommendations involving procedural changes, wholly within the power of AWGA to implement, from recommendations that require legislative changes for their implementation.

The Special Report shall be submitted within four months from the Starting Date of these studies. The MOHR will provide the Consultant with the comments of AWGA within 30 days from the date of submission.

5.3.16 Implementation of Recommended Changes in Procedures and Management Practice.

It is intended that AWGA shall adopt, at an early date, those revisions in procedures and management practices that are within its power to implement (without legislative changes). The purpose of this will be to provide a case study of the effectiveness of revisions recommended by the Consultant, which may be used to modify or substantiate proposals developed during the remainder of the studies.

During the 30-day period following receipt of the comments of AWGA on the Special Report, the Consultant shall meet with the Chairman and staff of the Authority, reach a common understanding on the recommended changes to be implemented and complete a supplement to the Special Report - setting forth the substance of this understanding and commonly agreed parameters for measuring the effectiveness of the changes to be instituted.

Following completion of this supplement and continuing through the thirteenth month of these studies, the Consultant shall provide the services of a part-time advisor to AWGA who shall :

- (a) Advise the staff of AWGA on the implementation of the agreed-upon changes.
- (b) Review the progress of implementation.
- (c) Make such reviews and analyses as are necessary to determine the effectiveness of the changes that are implemented.

The Consultant shall employ an internal reporting system that will insure that the findings and recommendations of the advisor on the modified planning, decision-making and control procedures of AWGA are incorporated into the Consultant's final recommendations on management systems in the Draft Final and Final Reports.

## 5.4 TARIFF STUDIES

### 5.4.1 Purpose of the Tariff Studies

The purpose of the tariff studies is to prepare and recommend separate rate schedules or tariffs for potable and non-potable water supply services and sewerage services. The tariffs or rate schedules shall produce gross annual revenues sufficient to : (1) cover all overhead, operating and maintenance expenses; (2) establish an adequate depreciation reserve; (3) provide debt service for the system improvements and expansions proposed under the Waterworks and Wastewater Facilities Master Plans for each of the six cities; and (4) allow for contingencies. An alternative and additional computation of gross annual revenues shall be based on the principle that total revenues be sufficient to cover total operating costs, including depreciation charges, and provide no less than 6% return on investment.

The Consultant shall consider "degressive rates" (a higher unit charge for greater use) where customers' ability to pay and other factors warrant consideration of such rate schedules. Several alternative rate schedules shall be prepared and the rationale for each set forth, but in all cases the total estimated revenues from any such rates shall approximate the total pro-forma revenue requirements, including revenues needed for debt service.

Estimated revenue from the rates proposed shall reflect the Consultant's estimate of the impact of the rate changes on water use. Such adjustments shall be fully explained.

### 5.4.2 Review of Legislation

The Consultant shall review existing Government legislation, decrees, policies and administrative practices which will affect the establishment or revision of service rate schedules.

Governmental subsidies to water supply and sewerage services shall be identified and the Government's rationale for such shall be presented. The form of these subsidies shall be noted, i.e., payments based upon the metered use of water through public fountains or in low income areas (explicit subsidies), payments made to cover overall shortfalls in revenues relative to capital and operating costs (implicit subsidies), etc. The Consultant shall identify any legislative or administrative constraints on the revision of rate schedules and recommend actions required to remove or overcome such constraints.

#### 5.4.3 Sources of Data

The basic data required for the cost of service studies shall be obtained, to the maximum extent practicable, from the accounting and other records of the utilities and from the cost estimates provided by the other consultants for proposed improvements. The utilities will provide clerical personnel to assist in obtaining cost and other data in cooperation with and under the general supervision of the Consultant. The Consultant shall provide the supervisory staff required to direct these efforts.

In all cases, this Consultant will examine the consistency, relevance and reasonableness of the data provided by others and shall, if necessary, adjust these data or collect additional data. It shall remain the sole responsibility of the Consultant to obtain or develop the data needed for completing all required studies.

#### 5.4.4 Inventory and Valuation of Property

It is desired to provide the utilities with the future basis for maintaining the inventory and valuation records of all their property, classified in conformance to the guidelines recommended in the Uniform System of

Accounts for Class A Water and Sewer Utilities or guidelines of equal standard. The Consultant shall classify property and plant in accordance with such guidelines, and shall obtain the book cost of used and useful property and plant from accounting records to the extent that it is practicable to do so.

If it proves impracticable to obtain the book value in this manner, the Consultant shall prepare estimates based upon :

- drawings and maps of the agencies
- the results of the evaluations of the conditions of major components undertaken by the consultants for the concurrent related projects
- actual inspection of facilities

A detailed valuation is not considered feasible within the context of this study, but reasonable, approximate estimates of cost for major items of the facilities, plant and equipment currently in use are desired.

For each system, two final estimates of the value of existing assets shall be prepared. One of these shall reflect, as nearly as possible, the cost at the time of construction (Historical Cost). The other shall be an estimate of the current replacement cost of these facilities.

Estimates of the cost of projected facilities will be obtained from the consultants engaged on the concurrent related projects in each respective city. <sup>1</sup>

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1 Master Plan proposals are expected to be available in draft form by the following dates :

- |   |   |                   |
|---|---|-------------------|
| Wastewater Facilities, Cairo & Alexandria | - | January 1, 1978   |
| Wastewater Facilities, Helwan             | - | February 1, 1978  |
| Waterworks, Alexandria                    | - | August 1, 1978    |
| Waterworks, Greater Cairo                 | - | October 1, 1978   |
| Sanitary Facilities in Suez Canal Cities  | - | September 1, 1978 |

For Cairo Waterworks and the Suez Canal Cities, the Consultant may find it necessary to base his estimates on early data, developed during discussions with the responsible consultants, and recognize the tentative nature of these estimates.

5.4.5 Existing Rates and Revenues

The Consultant shall review the existing financial policy and practice relative to service rate structures and schedules. He shall review these practices with respect to customer classification, cost apportionment, rate structures, such as flat or stepped rates, block rates, minimum billing, etc., and rate levels. He shall present an overview of the existing practices regarding revenue generation, including subsidization, and identify problem areas.

The Consultant shall identify all sources of revenue currently accruing to the existing organizations, such as appropriations from the Ministry of Finance, grants and subsidies, user charges, special assessments, service fees and others. He shall tabulate the relevant annual revenues received by the following organizations during each of the last three (3) years :

GOGCWS	- Gross Annual Revenues
AWGA	- Gross Annual Revenues
SCA	- Annual revenues accruing from water service and internal transfers to cover deficits from water service.
GOSSD	- Annual revenues from fees in the six cities and government appropriations allocable to service in the six cities, to the extent this is possible.
GOWS	- Annual revenues accruing from service within the present urban areas of the six cities or government appropriations to cover the cost of such service (if any).
Governorates	- Annual appropriations to the Governorates of the Suez Canal Region for the provision of sewerage in Suez, Ismailia and Port Said.
DRA	- Not to be considered.

The tabulation shall show the revenues received from each identifiable source including sources not listed above but which the Consultant deems relevant. For the supply of potable and non-potable water, the Consultant shall review current policies and practices and analyze the sources and amounts of revenues in a manner which will facilitate subsequent preparation of revenue forecasts through the year 2000. Revenues from industrial or garden water supply shall be studied separately from potable water supply service. Income from sewerage services shall be considered separately from water services.

Bill Analysis : The Consultant shall provide guidance in the collection of the basic data required, and shall prepare a complete water bill analysis covering customer usage for 12 months. The Consultant shall furnish MOHR the computer program(s) provided or developed for this work.

#### 5.4.6 Gross Revenue Requirement

The Consultant shall determine the annual gross revenue requirement as :

Annual gross revenue required by the existing organizations to cover the cost of water and sewerage service in the six cities in the years 1973 through 1977.

Annual gross revenue requirement of each utility included in the selected organizational structure, or transitional structures, during the next ten years, plus the years 1990 and 2000.

This annual gross revenue requirement shall be comprised as follows :

Operating Expenses - The Consultant shall obtain from the respective agencies data on administration, operating and maintenance expenses incurred during the year 1973 through 1976. The

data on expenses shall, as far as is practicable, be broken down to show salaries and wages, electric power, chemicals and miscellaneous, with separate items for maintenance and repairs. These data shall also be categorized to show separate costs for the principal elements of each system, i.e., sources of supply, treatment plants, pumping stations, distribution system and storage facilities for water systems and similarly for sewerage systems. Expenses pertaining to industrial or garden water supply for public and private use will also be classified according to principal elements.

The Consultant shall obtain data on operating expenses during future years from the consultants on the concurrent related studies. He shall check these data for completeness and consistency with the historical pattern of costs and modify them as necessary to fit the selected organizational structure and transitional structures.

Depreciation Rates and Reserves - The Consultant shall determine and recommend proper depreciation rates based on an analysis of the useful service lives of various depreciable property units in service. Derivation of depreciation rates shall be fully explained. Depreciation rates so developed shall be applied to existing facilities which are to be inventoried and valued in the manner described above and also to proposed new facilities. The Consultant shall determine an appropriate depreciation reserve for use in determining a reasonable return, for inclusion in each pro-forma expense statement for rate making purposes.

Debt Servicing - Based upon his analysis of financial data obtained from the MOHR and the respective agencies relative to current indebtedness and future financial planning concerning the proposed expansions of water supply and wastewater facilities, the Consultant shall forecast annual budget requirements for servicing the debt of the existing organizations and of the proposed utilities through the year 2000.

Contingencies - The Consultant shall determine reasonable budget requirements to cover contingencies, seasonal fluctuations in service demand and anticipated escalation of operating costs.

5.4.7 Gross Revenue Requirement - Alternative Computation

The Consultant shall also determine the gross annual revenue requirement of the respective organizations for the years stated in Section 5.4.6 on the basis of the following principle: that gross annual revenues shall be sufficient to cover total operating costs, including depreciation charges, and provide no less than 6% return on investment.

Return on investment shall be computed by dividing the operating surplus (before long-term interest charges) by the average value of fixed assets in operation during any particular year. This average value shall be based upon the current replacement cost of existing facilities.

5.4.8 Allocation of Gross Investment in Plant for Rate Making Purposes

The Consultant shall allocate investment in fixed assets on the basis of the following major functions, which, in turn, can be allocated among customer groups: production, commodity and directly assigned (e.g. fire protection, general services, irrigation, industrial waste, administration, et

The Consultant may substitute terms or subdivide the functions listed above if the proposed use of such terms is fully explained. The allocation shall be applied to the gross investment in used and useful property, as follows :

- (a) Existing assets as valued
- (b) Additions proposed in the Master Plans prepared by the other consultants (Section 4.0)
- (c) Additions proposed by the Consultant under Section 5.3.8

Consultant shall apportion fixed charges including depreciation allowances on the basis of the above allocations.

#### 5.4.9 Allocation of Expenses for Rate Making Purposes

The Consultant shall also allocate expenses for each year, as determined in Section 5.4.6, to functions. These expenses shall be allocated to production expense, commodity expense, general expense, directly assigned expense, or such other functions as the Consultant may fully explain. The total amount allocated to each function shall in turn be allocated to customer classes on the basis of responsibility for such expense as determined from a customer analysis to be performed by the Consultant. All of the above will be fully explained by the Consultant so that future analysis will be facilitated.

#### 5.4.10 Evaluation of Existing Rate Schedules

Based on his review and analysis of the existing rate schedules and future revenue requirements the Consultant shall evaluate the adequacy of existing tariffs. Consultant shall also determine existing inadequacies in rates by comparing revenues from customer classes with assigned cost of service as determined by Consultant. Consultant shall also investigate and report on the adequacy of the existing rates, plus other income, to equal forecast revenue requirements.

5.4.11 Classification of Customers

The Consultant shall recommend an appropriate customer classification system which recognizes the various groupings useful for rate making purposes. The classification should include for example Residential, Commercial, Industrial, Institutional, Governmental, Public Fire Protection, Private Fire Protection, Fountain Service, Irrigation and others as may be found appropriate.

For at least one tariff schedule, the Consultant shall provide a classification of residential users by income group, or a reasonable surrogate. A classification based upon average rents within a given census area (shikaa) is illustrative of the type of classification that might be used. One that would require determinations of individual incomes would not be deemed appropriate.

The Consultant shall fully support and document any recommended revisions to or modification of the existing classification system.

5.4.12 Recommended Tariff Schedules

The Consultant shall recommend a comprehensive tariff system, covering all services, and including demand rates, services charges, use rates, special assessments and others, as appropriate; plus rules covering conditions of service with appropriate penalties for noncompliance. In preparing his recommendations, the Consultant shall set forth alternative tariff schedules (based upon service or value received, general income level, etc.) and provide justification for his recommended approach including an explanation of methods used to determine the level of rates recommended. He shall fully support regressive rates (if recommended), with the reasons for such rates. There may be adjustments to allocate government subsidies as required by law. At least one of the alternative tariff schedules shall, however, be based upon

uniform rates for both private and government users and uniform rates throughout each city for a given classification of users. All schedules shall be based upon the principle of fully satisfying the gross annual revenue requirement established in Section 5.4.6.

The Consultant shall investigate the feasibility and advisability of using a "cost adjustment" clause in tariff schedules, which would provide for automatic adjustment of rates by operation of a formula designed by the Consultant. It would be thus intended that changes in price of various cost factors, such as fuel or energy used for pumping water or wastewater, would result in a corresponding change in the rate for service to the utility's customers.

Rate schedules shall be so designed that they can be placed in effect in stages. The interim period would extend from 1979 through no later than 1983. Thus, by 1984, at the latest, gross revenue requirements would be fully met. The Consultant should discuss the implementation of such interim rates, including the possibility of increasing rates to some customer classes or groups, while holding other customer groups (i.e., low income groups as indicated in Section 5.4.11) at or near the present rate level.

The Consultant shall also set forth a policy for the recovery of wastewater collection, treatment and disposal costs. He shall recommend the level of surcharges to be applied to wastewater customers who discharge wastes into the sewers that require special treatment. He shall include in the tariff such rules as may be needed to require pre-treatment of sewage by the customers in specified situations.

5.4.13 Financial Analysis

Utilizing the data developed as specified in the preceding sections, the Consultant shall prepare pro-forma financial statements for the existing water and wastewater organizations for the years 1973 through 1977 and for each utility in the selected organizational structure (or transitional structure) for the next ten years plus 1990 and 2000. Pro-forma statements for future years shall be based upon the Consultant's recommended tariff schedules, including interim schedules where appropriate; except that statements shall also be prepared for one landmark year, using existing schedules in order to provide a comparison with the recommended schedules.

Pro-forma statements shall include statements of revenue accounts, cash flow statements (sources and applications) and balance sheets. These statements should adhere to accounting standards equal to those recommended in the Uniform System of Accounts for Class A Water and Sewer Utilities. The derivation of data used in the pro-forma statements shall be fully documented.

The Consultant shall obtain information on unaccounted-for water and the reasons for any excessive amounts of such water from the reports of the consultants engaged on the concurrent related studies. He shall consider the procedures set forth by others for reducing the volume of unaccounted-for water to reasonable levels and the pro-forma revenue statements should reflect the impact of such reductions upon estimated sales and estimated operating expenses.

5.4.14 Metering

The Consultant shall consider the water meter studies being conducted by the other consultants and their evaluation of installation, maintenance and control of these meters. The Consultant shall design a meter-testing program that is applicable to each utility and will assure metering of customer use. The Consultant shall investigate metering of individual apartments as opposed to

combined metering and, if found feasible, make recommendations for metering all customer units, such as apartments and small commercial units (which units shall be clearly defined). The Consultant shall, however, include in the rate schedules for general service a reasonable means of billing multiple units on one meter. These rates shall have the objective of equalizing the cost of service to each unit, when compared to metered service to a single dwelling or other unit, and with the further objective of encouraging conservation of water by means of prompt plumbing repairs and other measures. The Consultant shall fully explain how sewer service may be metered, including any recommendations based on the use of water meter readings as an approximate measure of sewage volume.

5.4.15 Interim Report on the Tariff Study (10 months)

The Consultant shall submit an "Interim Report on the Tariff Study". This report shall describe the work performed and the conclusions reached and shall include a proposed tariff schedule for each of the utilities. Where necessary, these tariff schedules shall include increases in rates at appropriate times in the future, as required to meet the debt service requirements of the proposed capital program. The implementation of these tariff schedules shall be discussed in the Report and an implementation plan shall be presented.

The Interim Report on the Tariff Study shall be submitted as prescribed in Section 6.5.

5.4.16 Draft Final Report on the Tariff Study (13 months)

Taking into account the comments received from MOHR and others on the Interim Report on the Tariff Study and the other consultant's reports, the Consultant shall submit a Draft Final Report, further refining the work included

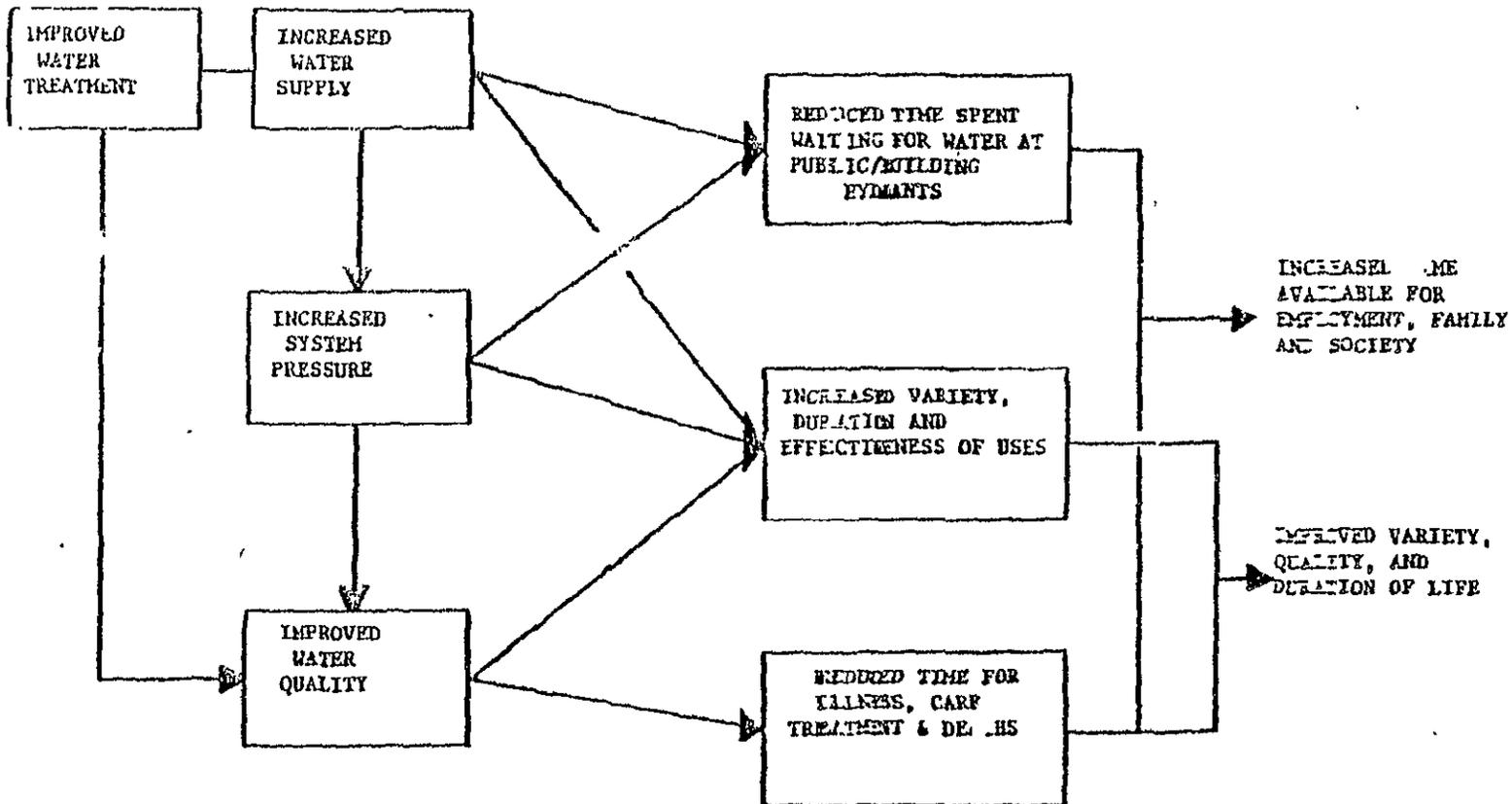
in the Interim Report. The Draft Final Report on the Tariff Study shall be submitted as prescribed in Section 6.6.

5.4.17 Final Report on the Tariff Study

Taking into account the comments received on the Draft Final Report, the Consultant shall submit a Final Report as prescribed in Section 6.7. The Consultant shall submit with this Report, the material developed for valuation used to establish the rate base for each utility, bound separately in suitable volumes as specified in Section 6.7.

This Final Report shall take into account the Final Reports of the other consultants.

RELATIONSHIPS OF WATER SUPPLY CHANGES TO SOCIAL CONDITIONS



BEST  
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## Areas Are Burden to Economy

# Egypt Slums: Squalor, Little Hope

By Thomas W. Lippman

CAIRO, July 23 (WP).—When the results of the Egyptian census were published recently, Khalil Ibrahim could not read them, but they only confirmed what he and millions like him already knew—the poor of Cairo in some of the world's most

densely populated and overcrowded neighborhoods.

He lives with his wife and two children in a single room. There used to be eight persons living there, he said, but four children have married and moved away. There is no kitchen, and all families in the building—perhaps 50 persons—share a single toilet.

In the streets near the tiny shop where Mr. Ibrahim makes his living by ironing other people's clothes, those circumstances are the rule, not the exception.

He lives in the district known as Rod al-Farag, according to the census the most densely populated community in this teeming city. Rod al-Farag, named for a Mother Mary man, has 26,000 residents in a square mile. Washington has 12,000 in a square mile, New York 26 1/2.

While Mr. Ibrahim put down his nose to talk about himself, the chaotic street life of Cairo swirled about him—children, pedicab vendors, goats, donkeys, buses in incredible profusion in the filthy streets and alleys.

Mr. Ibrahim, a toothless illiterate of 40, spoke without bitterness, perhaps because he has always been poor and knows no other life. He pays the equivalent of about \$2.50 a month for his room, he said, and the living conditions are not his greatest concern.

"When I was a boy," he said, "good food was cheap and plentiful. But children today cannot grow up as strong as I did."

His neighbor, Salah Hafez, who sells Mobil Oil Co. kerosene from a tank mounted on a cart, lives a bit better. He divorced his

wife, he said, and so he has only one son living with him in his \$1-a-month room. With an income of \$7.50 a month, he is not doing badly by Rod al-Farag standards, but he is worried that his business will fall off as more persons turn to butane gas for their cooking.

### Street Where You Live

Rod al-Farag, home to more than 250,000 persons such as these, is Cairo's most crowded district, but not its poorest, nor its most squalid. Built in this century, it at least has passable streets and substantial buildings.

The second-most crowded neighborhood, Bab el-Sharbia, inside the walls of the old city, is a medieval warren of narrow and shadowy streets that is perhaps more typical.

But the differences are marginal. Collectively, Cairo's poor, crowded neighborhoods of Cairo and those in Alexandria typify a crushing economic burden on the country and a political time bomb as well.

### Street of Dreams

President Anwar Sadat has set the construction of new housing as the country's principal domestic goal and has ordered a strategy of "invading the desert" with new cities to spread out the population. But the census results offer little encouragement.

They show that Egypt's total population of 38.2 million is now 44 per cent urban, an increase from 37 per cent in 1960.

Unlike the self-sustaining peasants and farmers, the city-dwellers consume billions of dollars in government-subsidized food every year, and have long since surpassed the government's capacity to provide them with adequate transportation, health care, water supply or schooling.

Egypt's population, jammed into the 3 per cent of the land that is habitable, is growing by 2.3 per cent a year. That is slower than in the 1960s, according to the census, but experts say the decrease in the growth rate is not nearly enough to allow Egypt to make any inroads into its problems.

Of the total population, more than 31 per cent are children under 12. Adult literacy is given as 56.5 per cent, a substantial decrease from the 70 per cent of 1960, but it is still 71 per cent among women, most of whom cannot read the birth control information that is made available to them.

NEW YORK TIMES

June 12, 1977

# Egypt's Burden Of Poverty Seen Shifting to City

By TIMOTHY M. PREPES

CAIRO, June 11—In Bulaq, a slum district of Cairo, the women are frequently possessed by devils, mischievous devils that want to play and dance and sing, or greedy devils that must be appeased by gold, jewelry and new dresses.

The devil talks through their mouths, writhes on the floor, tells them in their own voice what to do, a social worker related. "Devils have a certain authority with husbands, and they tolerate this strange behavior and buy the devil presents because they are afraid of it."

It is possible to tempt the devil out of the body at a ritual "zar" or exorcism, but it may be expensive, as the devil, speaking through the person possessed, is apt to demand gold or the slaughter of a sheep, which costs the average worker in Bulaq two months' pay.

### Excitement and Release

Such a life in the slums of Cairo that women, often not allowed to leave their tiny dwellings except to shop, consciously or unconsciously invent devils that provide excitement and release not otherwise available. There are also the material benefits of the gifts bought to appease the devil. Also, the social worker said, some women believe that if they keep their husbands poor they will not be able to take second wives.

Bulaq is an example, perhaps one of the worst, of the miserable urban condition in Egypt, which is fast becoming an urbanized country. Sociologists say that the greatest burden of poverty in the country has moved in recent years from the village to the city.

Six hundred years ago Egyptian princes had their palaces and orchards in Bulaq. Later it became a port and a center of light industry. Still the site of machine shops and other such enterprises, it is also a residential area where 456,000 people crammed into just two square miles live a poor, primitive and superstitious life.

The crowding, said to be as bad as the slums of Calcutta, is made worse by buildings, only three or four stories high, the ground floors of which are usually occupied by shops. A family of five and sometimes as many as 10 live in one room, with four rooms to a floor. One tinner, a pipe in the floor, serves the building, and there may be just one faucet for running water.

Two months' pay for a bed, which must be provided by the bride's family and costs \$125 (two months' salary for most), a cupboard, a table and benches with cushions, a kerosene stove and pots and pans. If the family has any chickens or animals, they live in the kitchen in the daytime and are tucked under the beds at night. The parents and the youngest child sleep in the bed, the others on the floor.

Narrow streets, walled through the material, with sewage flowing gelatinous for robes, sit in cafes puffing on hoses connected to water pipes. Women dressed in black and wearing thick black mascara about their eyes walk to markets, children sidesaddle on their shoulders, a pot or basket on their heads. Youngsters, in pajamas and barefoot, kick rag balls through the dirty streets.

Despite the crowding, the garbage and flies, Bulaq does not strike a visitor as repulsive, particularly if he is used to Egyptian poverty. Because of food subsidies people are seldom starving, and many are stocky if not fat. There is a strong sense of neighborhood and the binding force of Islam, in part because of the strength of religion. A stranger can walk through any area of Cairo late at night, a wad of money in his hand, with no fear of robbery. Any temptation to believe that the people are satisfied with their lives was extinguished by the riots in most major cities last January over a Government decision, later rescinded, to reduce food subsidies. In Cairo the rioters came from Bulaq, as well as other poor sections.

### Villagers Did Not React

The riots were strictly an urban phenomenon. The villages in the countryside did not react to the price increases, at least not violently. Sociologists say this points to a major trend in Egypt in recent years: the standard of living has been going down in urban areas while the rural populace has begun to enjoy relative prosperity. The improvement in rural life are largely attributed by the sociologists to increases in the prices the Government has paid farmers since Anwar el-Sadat became President in 1970 and also, to some extent, to the rural development programs begun by his predecessor, Gamal Abdel Nasser.

At the same time the cities have been marked by an influx of population and general decay. Virtually nothing has been spent in the last 10 years on urban maintenance; not only are no new facilities being installed, but the streets, sewers and buildings are falling apart. A traveler sees the same crowded, crumbling homes whether in Alexandria or Damietta in the north, in Cairo, or in many in the south.

The decay of the cities from the countryside, where the birth rate is too high for the productivity of the land, has helped a young man who stood a chance of leaving his location by leaving for the city a decade ago, is likely to do better now if he stays in the town.

Egypt, once a vast rural area, has about 45 percent of the population in the cities. In the next two decades, as the population will be in the cities, the rooms of the cities are likely to get more crowded.

BEST AVAILABLE



CAIRO House Connections  
Implementation Schedule

Activity	Month																														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
1. Project Start Up	█																														
2. Specifications & LFB	█																														
3. Advertise			█																												
4. Evaluate & Award			█																												
5. Procurement				█	█																										
6. Delivery					█	█	█	█	█																						
7. Training				█	█																										
8. Mobilize Field Teams			█	█																											
9. Field Engineering	█	█	█	█	█	█	█	█	█																						
10. Excavation						█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█
11. House Connections						█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█
12. Drainage Connections						█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█

HOUSE CONNECTION CREWS

<u>Job Classification</u>	<u>Number Required</u>	<u>Nationality</u>
Project Engineer & Superintendent	1	U.S.
Dep. Project Superintendent	1	U.S.
Area Supervisors (Field Engr.)	3	U.S.
Area Foreman	9	ARE
Pipe Tapping Crews, 3 men each	36	ARE
Meter & Service Crew, 3 men each	54	ARE
Drain Line Crew, 4 men each	62	ARE
Area Time Keepers	3	ARE
Dispatcher	1	ARE
Drivers	14	ARE
Mechanic	1	ARE
Interpreters	3	ARE
Typist	2	ARE
Office Manager	1	ARE
Accountant	2	ARE
Warehouseman	3	ARE
Messenger & Guard	<u>22</u>	ARE
Total Personnel	218	

1976 POPULATION AND WATER CONSUMPTION

Kism or District	Population	Annual Mean Consumption <sup>2/</sup> cu m/d
Ezbakeya	59 667	
Boulac	177 929	64 342
Camalla	166 699	27 895
Khalifa	186 963	30 043
Darb El Ahmar	146 589	23 951
Zeitoun	267 662	44 498
Sahel	438 753	
Rod El Farag	272 448	
Shoubra	128 782	
Shourabeya	443 741	177 515
Sayeda Zeinab	252 260	65 271
Zaher	104 153	14 504
Matareya	534 612	51 638
Maadi	267 056	22 823
Mousky	58 402	14 475
Wally	142 108	
Hadayek El Koba (Doubah)	314 705	137 683
Bab El Shereya	110 247	20 594
Abdeen	88 282	
Kasr El Nil	39 342	89 721
Heliopolis	127 131	
Nozha	101 625	146 621
Nasr City	65 347	32 081
Masr El Kadima (Old Cairo)	273 670	56 784
Helwan	282 597	
El Tebin	33 593	31 089*
Giza	208 621	68 988
El Ahram (Pyramids)	129 860	
Boulac El Dakroun	322 480	36 120
Dokki	101 564	
Agouza	146 686	
Embaba	323 443	90 122
Shoubra El Kheima	393 700	10 569
TOTALS	6 710 817	1 257 427

<sup>1/</sup> Kisms within the present COCCWS service area.

<sup>2/</sup> All metered, potable water. Figures from Taylor-Binnie except (\*) which are from COCCWS.