Interim Evaluation of the Alexandria Wastewater System Expansion Project

USAID Contract # 263-0100

Volume 1 of 2

Summary of Findings

December, 1991

BWA
BRILEY, WILD
AND ASSOCIATES

TABLE OF CONTENTS

Volume 1 of 2

TABLE OF CONTENTS (cont'd)

Volume 1 of 2

TABLE OF CONTENTS (cont'd)

Volume 1 of 2

TABLE OF CONTENTS (cont'd)

Volume 1 of 2

TABLES

MAPS

TABLE OF CONTENTS (cont'd)

Volume 1 of 2

FIGURES

Volume 1 of 2
APPENDICES (See Volume 2)

GLOSSARY

AGOSD:	Alexandria General Organization for Sanitary Drainage.
AGWA:	Alexandria General Water Authority.
AID or USAID:	United States Agency for International Development.
ARE:	Arab Republic of Egypt.
BODR:	Basis of Design Report.
BWA:	Briley, Wild & Associates, Inc.; Briley, Wild Evaluation Team.
CDM-MP:	Alexandria Wastewater Master Plan by CDM (1978).
CDM:	Camp Dresser & McKee Consulting Engineers.
CH2M HILL:	CH2M Hill Consulting Engineers.
ECG:	Egyptian Consulting Group.
GOE:	Government of Egypt.
GOFI:	General Organization for Industry.
GOSSD:	General Organizaton for Sewage and Sanitary Drainage.
ICS:	Inventory Control System.
IDWSSD:	International Drinking Water Supply and Sanitation Decade (conference).
IEIS:	Initial Environmental Impact Statement.
IG:	Inspector General or Regional Inspector General (USAID).
IMR:	Infant Mortality Rate.
LE:	Egyptian Pounds.
M & E:	Metcalf & Eddy.
MLD:	Million Liters Per Day.
NNMR:	Neonatal Mortality Rate.
O&M:	Operation & Maintenance.
PACD:	Project Assistance Completion Date.
PIP:	Phased Implementation Plan (1982).

PPNNMR:	Post Neonatal Mortality Rate
PPO:	Professional Plant Operations, Inc. (subsidiary of Briley, Wild & Associates, Inc.)
TRATIC:	Training Resources and Technical Information Center.
TUMMS:	Total Utility Maintenance Management System.
WHO:	World Health Organization.
WWCG:	Wastewater Consultants Group.

EXECUTIVE SUMMARY

The Alexandria Wastewater System Expansion Project was started in August 1979, and is planned to improve specific health conditions in Alexandria, Egypt by expanding and developing its wastewater collection, treatment, and disposal facilities.

As part of this Project, AID regulations and the Project Paper require the performance of project evaluations during the implementation of the Project and after its completion. In November 1990, the office of the Regional Inspector General/Audit, USAID, in their Report No. 6-263-9-01 requested an evaluation of the Project by an independent firm. On 26 March 1991, USAID/Egypt and Briley, Wild & Associates reached an agreement on the scope and terms of the evaluation. This report is intended to fulfill the requirements of the interim Project evaluation.

The four major elements contained in the scope of the Project are: overall social/environmental impact; physical progress of the Project; sustainability of the Project after its completion; and corrective measures or actions necessary to accomplish overall Project objectives.

To conduct the evaluation, Briley, Wild & Associates sent to Alexandria a five-member team of highly qualified individuals experienced in wastewater systems design, construction methods and management, operations training and maintenance procedures, and social and environmental analyses. The team was on-site in Alexandria for approximately one month (March-April-1991) gathering background data. This was accomplished by a detailed document review, personnel interviews and visits to a variety of Project facilities. In addition, an Egyptian sub-consultant was engaged to assist with the social/environmental portion of the evaluation. A subsequent meeting with the sub-consultant was held in Alexandria in June to review the progress of their effort. The data collected in-country was evaluated by both the team members and other experienced personnel of Briley, Wild & Associates. A compilation of this evaluation was used as the basis of this report.

The Alexandria Wastewater System Expansion Project (Phase I of the original Master Plan), when completed in 1994, will represent for the City of Alexandria an important and modern expansion of the City's wastewater system and management capabilities. It will also represent a facility which when operated and maintained by a trained Egyptian staff will contribute dramatically to the City's well-being.

The Project elements accomplished to date and under development were compared with the agreements between USAID and the GOE as evidenced by the original Agreement and its amendments. The amendments to the Agreement, and in particularly the Second Amendment, significantly redirected the specific goals and objectives of the Project. The objectives of the Agreement as amended through the sixth Amendment were used as a basis to evaluate the success of the Project at meeting Project objectives.

The purpose of the Project as established in Annex I to the Second Amendment states that the primary benefit of the Project is to address public health problems through elimination of raw sewage ponding in streets, elimination of disposal of raw sewage into swimming beaches, and the discontinuance of raw sewage disposal into Lake Maryout and irrigation canals. It further states that the primary beneficiaries of the Project are to be the permanent urban residents.

The collection system has been expanded to all targeted areas, and facilities completed have virtually eliminated sewage flooding of served residential streets. However, since this project is limited to the work elements of Phase I of the original Master Plan, treatment of the Central Zone generated wastewater will not be provided. Consequently, Central Zone raw sewage will continue to be discharged at the East Harbor and westward. When the East and West treatment plants are commissioned, raw sewage will no longer be discharged into Lake Maryout, the irrigation canals, or the beaches east of the East Harbor.

Our investigation has determined that USAID/Egypt is providing the direction necessary for WWCG to accomplish its mission. This, coupled with the efforts of a highly dedicated and professional staff at WWCG has led to the development of a Project, the facility components of which are well designed, functional and show an excellent quality of construction. There have been major delays in the Project, but we believe that they were mainly beyond the control of either USAID/Egypt or WWCG. Since the inception of the Program the incidence of water-borne diseases has significantly decreased in the Project area, and the everyday lives of those affected by the new sewerage system have been improved. The extent to which this can be attributed to the Project is not well defined, but certainly some of the decrease is due to the partial elimination of sewage flooding/ponding in the streets. For the system to function as planned, USAID and AGOSD must expedite completion of the missing elements of the wastewater collection and treatment network of Phase I, and AGOSD must develop an improved means of effluent disposal. Finally, the long range outcome of the Project will depend upon the ability of AGOSD to adapt to the requirements of the WWCG-prepared O&M program regarding sustainability.

CONCLUSIONS AND RECOMMENDATIONS

This Report assimilates all data evaluated and addresses the objectives of our scope of work. The results of the evaluation for each of the major elements and the more significant conclusions and recommendations are as follows:

Social/Environmental Impact

A. Conclusions:

1. The installation of laterals and collectors in over 90% of previously unsewered portions of the Project Area has come close to eliminating the problem of sewage flooding/ponding in the streets of the Project Area.

2. The incidence of water-borne diseases, in general, has decreased in the Project Area; to significant extent this can be attributed to the decrease of sewage flooding/ponding in the streets as a result of Project improvements.

3. Since sewage discharges along the Mediterranean beaches are reported to be reduced during the summer months as a result of the construction of the Collector General Relief Sewer, the water quality may improve during that period. Additional water quality enhancement is not likely to occur until all of the Phase 1 facilities become operational. Ultimate protection of the beaches from the effects of raw sewage discharge cannot, however, be assured until the current practice of raw sewage disposal through the Kait Bey outfall is discontinued.

4. The sewage collection system has been expanded to serve all targeted areas. Flooding of streets by raw sewage has been virtually eliminated in these newly served areas.

5. It is difficult to determine if there has been any improvement in the water quality of Lake Maryout for three reasons: (1) Domestic sewage flows are not yet being processed by the two primary-treatment plants, which are still under construction; (2) the Project does not provide for treatment of industrial wastes which, for the most part, are still being discharged without pretreatment into the lake and; (3) the impact of discharging the effluent has not been measured.

B. Recommendations:

1. The Egyptian authorities should expedite completion of the missing elements in the wastewater collection and treatment network of Phase I in order that a complete system is able to function as designed.

2. The Egyptian authorities should begin as soon as possible to implement an plan requiring the pretreatment of industrial wastes for those industries discharging into the sanitary sewer system, Lake Maryout, and the Mediterranean Sea.

3. In order to achieve a more analytical approach to the Project effectiveness of environmental goals, a formal testing plan should be implemented to monitor key parameters of water quality in Lake Maryout and the Mediterranean to allow trends in this area to be documented.

4. If the GOE wishes to pursue the goals established in the original Master Plan, a decision should be made on the issue of land disposal verses sea disposal of effluent from the City's wastewater system. Appropriate action should be taken by the GOE to begin attracting potential sources for funding the selected option so that the discharge of untreated sewage through the Kait Bey outfall can be eliminated.

Sustainability of the Project After Its Completion

A. Conclusions:

1. The entire success of the Alexandria Wastewater Project hinges on the ability of the WWCG O&M group in concert with AGOSD to achieve the goals and objectives regarding sustainability.

2. The observed and reported activities of the O&M team from WWCG appear to be moving toward their established goals in a timely fashion. Our evaluation of activities, however, is preliminary in nature since the 3-year Comprehensive Operations and Maintenance Program had begun only 8 months prior to our involvement. Much of our evaluation is based on preliminary undertakings by WWCG rather than observations of results. Consequently, much of the intended work lies ahead.

3. The task which lies ahead, however, is very complex and fraught with potential obstacles which are to some degree beyond the control of WWCG. In our opinion, the most difficult challenges which WWCG will face are the training and motivation of the AGOSD O&M staff and, of equal importance, promoting inroads to influence changes in the financial and management structure of AGOSD. USAID needs to accept a key role if the latter is to be achieved.

4. The AGOSD staff is presently larger than is necessary for efficient operation and maintenance of the Alexandria sewerage system. While we recognize the desirability of a low unemployment rate, the practice of over-staffing can have several potentially adverse effects.

5. There seems to be little doubt that the wastewater tariff is presently inadequate to meet the financial needs of AGOSD. The actual amount of income that must be generated to sustain AGOSD, however, has not yet been determined. WWCG has recently prepared a preliminary estimate and is presently making advances towards producing a realistic summation of AGOSD operating costs. This information will be utilized to develop a projection of required income.

6. AGOSD presently lacks the authority to independently levy and collect tariffs to meet its operating expenses. This situation has created an entity that must be supported by regular transfer of funds from the GOE. Under this mode of operation AGOSD has little incentive to be fiscally responsible for efficient operation of its organization.

B. Recommendations:

1. USAID should ensure that the O&M assistance program continues for at least one year beyond the completion of construction.

2. To ensure long-term sustainability, AGOSD must improve fiscal management in terms of both income and expenses and must become a self-sustaining entity with the ability to levy and collect tariffs to meet its financial obligations.

3. AGOSD should reduce the size of its staff to create a smaller, more efficient, and more manageable workforce.

4. Because of the complexity of WWCG's undertaking and the preliminary nature of this evaluation, we recommend one or more reviews of the O&M program be performed, when more substantial progress has been achieved.

Physical Progress

A. Conclusions:

1. In general, the Project has progressed well and the quality of the constructed work is high. USAID has funded six sub-project construction contracts, three of which have been completed. The remaining three are under contract and expected to be completed by the end of 1993. AGOSD has funded thirty project tasks; construction of these tasks is on-going, but the exact progress status has not been possible to determine since our requests for information were not answered by AGOSD.

2. The Project has undergone numerous changes throughout its duration. While the objectives of the Program have been somewhat reduced in scope, the issue of the ultimate disposal of both the treated wastewater and the wastewater sludge has required several redirections of the Project. The contracted completion date for the total Project is now 31 December 1994, with completion of construction scheduled for 31 December 1993, some six years after the baseline date of 1988.

3. We have determined that there were two major factors contributing to Project delays. First, unforeseen and extremely difficult-to-manage soils and groundwater conditions required the redesign of previously completed work and development of innovative, yet very time-consuming, construction methods that had to be implemented for some of the Project elements. Secondly, AGOSD did not take timely action in making decisions regarding selection of effluent discharge location, site selection of the sludge disposal, sludge dewatering method, as well as the selection of contractors, the award of contracts, and the administration of the WWCG contract. These factors resulted in substantial delays.

4. We believe that the Project delays have, for the most part, been beyond the control of USAID and WWCG. The primary impact of these delays is the postponement of the beneficial use of the sewerage system improvements, the associated Project cost increases and the potential for degradation of installed equipment.

B. Recommendations:

1. USAID should, in coordination with AGOSD, continue its efforts to complete the remaining U.S. and LE-funded construction contracts by the end of 1993. They should also continue with the O&M assistance for one additional year after the completion of the Project facilities.

2. USAID and WWCG should continue efforts to influence AGOSD to develop and implement effective Project management procedures such that future Project construction delays will not recur. Specifically, AGOSD contractor selection, contract award and change order approval procedures require extensive streamlining.

3. A preventive maintenance program, including a schedule for exercising idle equipment, should be continued and expanded to protect all completed Project equipment until full operation is begun.

SECTION 1.0

INTRODUCTION

SECTION 1.0
INTRODUCTION

1.10 Background

Alexandria's Wastewater program began on November 4, 1976. On that date, the Ministry of Housing and Reconstruction (MOHR) contracted with U.S. consulting engineer Camp Dresser and McKee, Inc. (CDM) to prepare a Master Plan for the Alexandria Wastewater Facilities Development Program.

The scope of Master Plan project included the following principal elements:

- Assess existing systems and sanitation conditions.
- Determine factors which should govern system improvements and new developments.
- Conduct marine studies and other necessary field work.
- Develop a recommended construction program based on a full evaluation of alternative plans.
- Establish a set of top priority projects for immediate implementation.
- Prepare conceptual designs and cost estimates for a staged development program.
- Propose a sound plan to implement and manage the program.

AID financial assistance to the Alexandria Wastewater Program was initiated on 29 September 1977 with the signing of Loan Agreement 263-K-044. Loan 263-K-044 provided $15 million to the General Organization for Sewerage and Sanitary Drainage (GOSSD) to finance preparation of the Master Plan, to provide immediate technical assistance in sewer system operations and to identify construction and rehabilitation projects that would provide immediate relief while Master Plan components were being designed. The immediate interventions were named the Top Priority Projects (TPP). Master Plan was completed in May 1978.

According to USAID personnel involved in the Project, the recommendations in the Master Plan caused a great deal of political turmoil between the GOE Ministries in Cairo, the Alexandria Governorate and a certain vocal academic group from the University of Alexandria. A spirited, at times disruptive, public debate ensued over the advantages and disadvantages of the two major disposal options presented in the Master Plan, i.e., Sea Outfall disposal or Land Application disposal.

Consequently, the GOE would not choose either option. Instead, they decided to 1) Commission a review and update of the Master Plan Study and 2) Proceed with implementation of the Top Priority Projects (TPP). The TPP were funded using the remaining money of Loan K-044.

Despite this controversy concerning the ultimate method of wastewater disposal, the Government of Egypt (GOE) and United States Agency for International Development (USAID) recognized the benefits to the population of the greater Alexandria area that could be realized from such a Project, and entered into an agreement in 1979 to provide for the construction and start-up of the first stage facilities. Through the upgrading of these facilities, the governments intend to benefit Alexandria's permanent urban residents by providing sewerage service to previously unsewered areas, thereby decreasing the incidence of water-borne disease. The initial authorization provided for a USAID grant not to exceed sixty million dollars with an expected completion date of 31 August 1985. Later in 1979, the First Amendment increased the grant funds to $87,321,045.

In 1979, the Second Amendment to the Grant Agreement was executed. It further increased the USAID grant fund cap to $166,045,721 and changed the Project Scope from the original Master Plan Scope to provide for only those project elements associated with Phase I of the Plan. The purpose of the Project as established in Annex I to the Second Amendment states that the primary benefit of the Project is to address public health problems through elimination of raw sewage ponding in streets, elimination of disposal of raw sewage into swimming beaches, and the discontinuance of raw sewage disposal into Lake Maryout and irrigation canals. It further states that the primary beneficiaries of the Project are to be the permanent urban residents. Amendment number three followed in 1983 and increased grant funding to a maximum of $198,621,045. Amendments four through six were executed in 1987 and 1989, respectively, with a final maximum authorization of $318,458,045.

The 1978 Master Plan was subsequently updated by the Wastewater Consultants Group (WWCG) in 1982. This Master Plan Update resulted in a WWCG-authored follow-up report entitled "Phased Implementation Plan" (PIP). The PIP provided an implementation plan for the key elements contained in the updated Plan. Phase I of the PIP represents the present Alexandria Wastewater System Expansion Project (263-0100), subject to this evaluation.

In 1990, the Phased Implementation Plan was updated by WWCG. This report focused on those Project elements beyond Phase I which were considered necessary to fully achieve the originally envisioned overall objectives of the Program.

Funding of this Project has not been accomplished solely through the provision of USAID grant monies. In fact, the Agreement requires a substantial contribution by the GOE, amounting to some 299 million Egyptian pounds (LE).

The 1990 WWCG Implementation Plan update suggests that in order to meet the original Project objectives, the Project will require the completion of Phases I and II. Most recent estimates obtained by the Briley, Wild & Associates Evaluation Team indicate that all currently authorized activities should be completed by late 1994. USAID has indicated that funding for Phase II work will have to come from sources other than USAID.

In November, 1990 the Office of the Regional Inspector General/Audit of USAID, in their Report No. 6-263-9-01 requested an evaluation of the Project by an independent firm.

1.20 Objectives of This Evaluation

Appendices 1 and 2 provide detailed descriptions of the Scope of Work to be accomplished through this Interim Report Evaluation. In summary, these objectives may be stated as follows:

1. Analyze and assess the physical progress of the Project, identifying obstacles to Project development. Provide recommendations for corrective actions to enable attainment of Project objectives.

2. Analyze and assess the overall social and environmental impact of Project improvements financed by USAID. Determine if sewage contamination has been reduced, and evaluate the extent of system expansions. This element is to include rapid, low-cost studies to develop the requested information, and to assist in formulating recommendations.

3. Analyze and assess the sustainability by AGOSD of the Project-constructed facilities after completion. This evaluation is to include a review of operation and maintenance needs and plans, staffing requirements, and revenues and expenses.

4. Identify overall problems and constraints facing the Project, and provide recommendations for corrective measures.

1.30 Authorization

On 26 March 1991, USAID/Egypt and Briley, Wild & Associates, Inc. entered into an agreement whereby Briley Wild is to provide the requested services.

SECTION 2.0

SOCIAL/ENVIRONMENTAL ELEMENT

SECTION 2.0
SOCIAL/ENVIRONMENTAL ELEMENT

2.10 Specific Objectives of This Social/Environmental Evaluation

The overall objective of the Social/Environmental Element of this investigation was to determine the extent to which the Alexandria Wastewater System Improvement Project has impacted the social characteristics and environmental health of the community.

Briley Wild was tasked to:

1. Identify and measure the extent to which the reduction in street and basement flooding by wastewater has imported the social fabric and environmental health of the economy.

2. Determine whether the contamination of coastal areas and water bodies has been reduced.

3. Evaluate community knowledge and attitudes towards the improvements in the sewer system and identify the impact of these improvements on the daily lives of the citizens; and

4. Identify the extent to which sewer services have increased within the Project Area.

The requirements of this Social and Environmental Element of the Project evaluation are further defined by a USAID paper entitled "Purpose of Evaluation", a copy of which is contained in Appendix 2.

That document instructs us to analyze and address the overall social and environmental impact of improvements to the wastewater infrastructure in Alexandria, financed both by USAID and the local government since the inception of the Project. We are further instructed to assess whether the improvements have changed access to sewerage services by locality and income group; and affected women as a group.

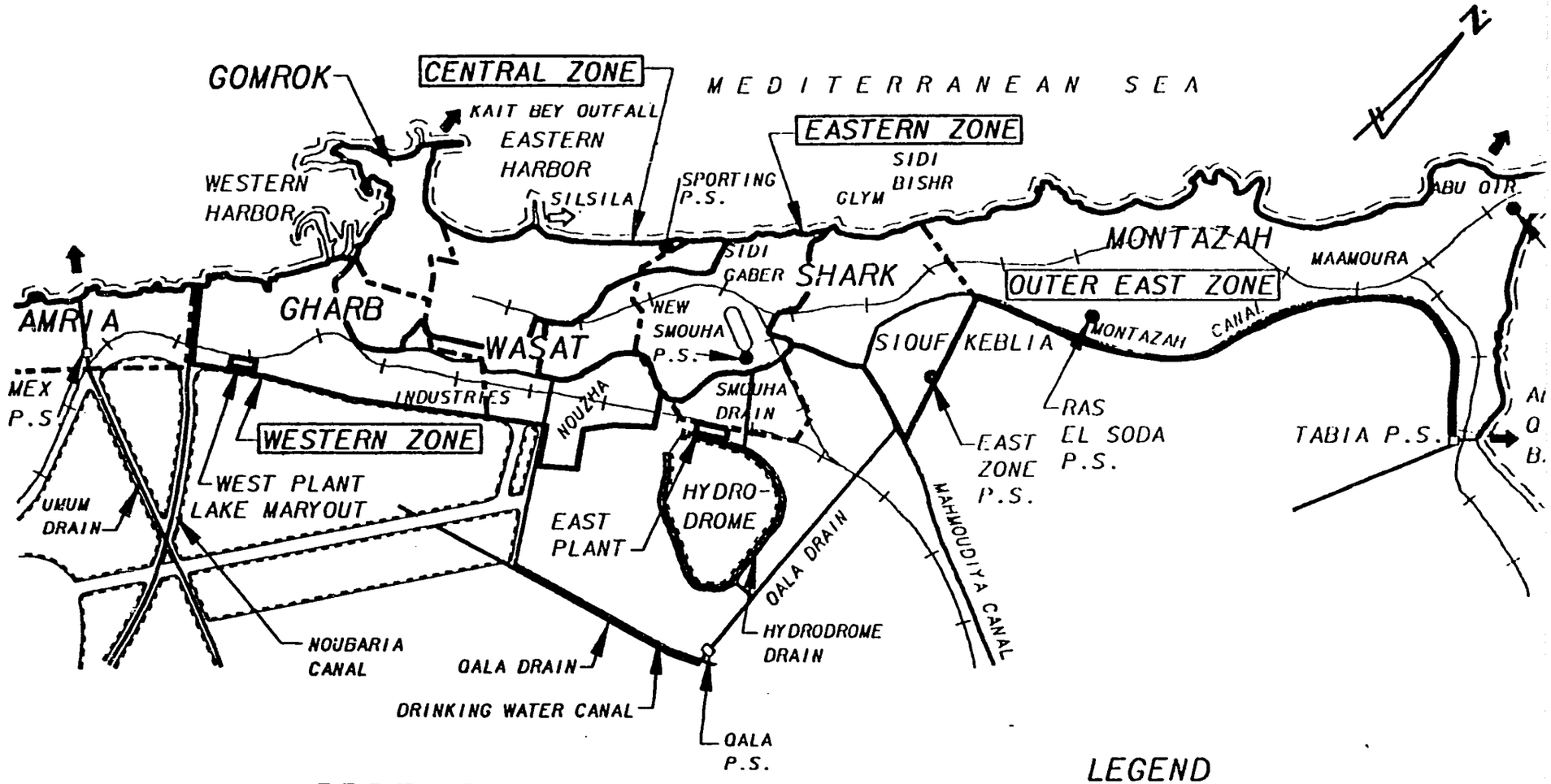
We are to address these issues by using the following techniques: compiling baseline social and environmental data from original Project-design documents; conducting rapid, low-cost studies to assess current and end-of-Project environmental status and differential access to wastewater facilities; and analyzing data from AGOSD information systems on trends in connections and the number of hookups by area and type of user.

It was our purpose to address these issues, recognizing that the sundry Project improvements were begun at various points in time during the past decade or so and that while most Phase I facilities are complete, certain key elements (e.g. undercrossings and treatment plants) are still under construction and not yet operational. Thus we have evaluated a wastewater system which is neither a complete network nor fully operational, especially in the sense that the raw sewage collected is not being processed by treatment facilities before discharge to the receiving water bodies of Lake Maryout and the Mediterranean. The impact of the Project at this juncture is significantly different compared to what it will be after the remaining tunnels/undercrossings and the two treatment plants are placed into service.

2.20 Baseline Data

2.21 Basic Description of Service Areas

In general, the Project Area for Phase I of the Phased Implementation Plan (1982) encompasses most of the developed area of the City of Alexandria, from the Noubaria Canal on the southwest to Abou Qir Bay on the northeast, and from the Mediterranean Sea on the west and north to Lake Maryout, the Hydrodrome, a portion of the Mahmoudia Canal, and a segment of the Montazah Canal on the east and south side. Technically, it consists of the following sewer service areas: Western Zone (not including the Outer West Zone), and the following parts of the Eastern and Outer East Zones: Nouzha, Smouha, Siouf Keblia, Sidi Bishr, Ras El Soda, Maamoura and Abu Qir. Map 2-1 shows the Project area divided into sewer service areas. (The map labelled as Figure A, USAID-FUNDED PROJECTS, in the Final Report of the Egyptian Consulting Group, Appendix 9, also shows the outline of the Project Area.) The Project Area also includes those locations where Top Priority Projects were constructed by CDM (the Collector General Relief Sewer, and the Sporting Pump Station and force main in the Central Zone, and Ras El Soda Pump Station and collector in the Outer East Zone).



MAP 2-1

SEWERAGE SERVICE AREAS

ALEXANDRIA WASTEWATER SYSTEM EXPANSION PROJECT

LEGEND

——— SEWERAGE ZONE BOUNDARIES

- - - - - ALEXANDRIA DISTRICT BOUNDARIES (FOR DEMOGRAPHIC & SURVEY DATA)

In terms of land use, much of the Project Area consists of intensively inhabited urban development. This is particularly true of the Eastern Zone which is characterized by a variety of residential uses interspersed with small markets and businesses. Heavy industrial uses tend to be located on the edge of the urbanized area in two main concentrations: along the Mahmoudia Canal between Mex-Dekheila on the west and the Hydrodrome on the east; and to the northeast along the Abu Qir shoreline between the Tabia pump station and Lake Idku. Downtown commercial activity is found in the Central Zone. Shipping, boating, port, and fishing - related activities are located along the shorelines of the Eastern and Western Harbors. Beach, shoreline recreation, and resort/vacation uses extend along the Mediterranean Coast from the Eastern Harbor northeastward to Abu Qir. Though still important in the Montazah District, agricultural land within the Project Area constitutes a relatively small and diminishing percentage among the land uses. Land uses change over time, often in response to the pressures of population growth. The older, heavily built-up areas of Alexandria experience more limited population growth than the fringe areas, where residential uses gradually expand and encroach upon adjacent agricultural lands.

With respect to the six Alexandria Districts as such, some additional descriptive information follows. The Central Zone contains the entire Gomrok District, most of the Wasat District and a small part of the Shark District. The Gomrok District is the smallest district in area, with about 250,000 residents contained in 3 square kilometers. It covers much of the Central Business District and includes Kait Bey and portions of Mansheya, Labban, and Anfoushi. The Wasat District contains the heavily populated areas of Hadarra, Sporting and Romleh Station; it also includes Nouzha in the south.

Although the Amria District (unsewered) is the largest district in area with more than 2,000 square kilometers, it contains the smallest population, about 230,000. It is extensively industrialized and has great growth potential. Within its boundaries are the rapidly growing areas of Agamy and Hannoville.

The Western Zone, with a population of about 500,000 is comprised of most of the Gharb District and the southern one-third of the Wasat District. Within its 20 square kilometers are found a portion of the Central Business District, much of the warehouse area, and the areas of Moharrem Bey and Hahata Misr. It extends to the shores of Lake Maryout, where much of the City's chemical industry is located.

The Eastern Zone includes much of the Shark District and a small part of east-central Wasat. It also contains the Sidi Gaber and Smouha areas.

The Outer East Zone includes all of the Montazah District and part of the Shark District. It covers Siouf Keblia, Ras El Soda, Sidi Bishr, Montazah, Maamoura and Abu Qir. The Siouf area contains major textile factories. The Montazah District is very large and encompasses about 110 square kilometers.The population of this district is about 676,000 and retains significant agricultural land.

Although the Governate of Alexandria has expanded geographically in the past decade and encompasses an area which extends much beyond the Project Area and the built-up city, the bulk of the population of the Governate (estimated to be approximately 3,250,000 persons in 1990, not including the seasonal tourist influx of about 500,000) resides within the Project Area. According to the 1987 Census, the population of the Governate may be broken down by district as follows: Montazah, 20.8% (1990 estimate: 676,000); Shark, 26.4% (1990 estimate: 898,000); Wasat, 21% (1990 estimate: 682,500); Gomrok, 7.7% (1990 estimate: 250,250); Gharb, 17% (1990 estimate: 552,500); Amria, 7.1% (1990 estimate: 230,750). Since Amria is not presently within the Project area, approximately 93% of the population of the Governate resides within the Project area. This percentage is likely to decrease somewhat over the years because Amria has a higher growth rate than the rest of the Governate.

Significant and continuing population growth within the Project Area has been the principal pressure behind the need for the expansion and upgrading of the sewage disposal and treatment system. Government planners anticipate that a relatively high rate of population growth within the Project Area will continue for the foreseeable future—e.g. the Year 2000 population (excluding Amria) is projected to range between 3.7 million and 4.0 million persons.

2.22 Extent of Pre-Project Sewer Service

Prior to the Project, the sewer system served only the older core area of the City from Gabbary in the west to Maamoura in the east and from the Mediterranean Sea on the north and west to a variable line roughly running along the Industrial Highway to the south. This area was divided into three zones: West, Central and East. Approximately 90% of the population of the City lived in these zones and potentially had access to sewer service, though many of the dwelling units were

not actually connected to the system. The area covered approximately 43,000 square kilometers. Alexandria Districts covered in whole or in part were: Gomrok (central core), Gharb (west), Wasat (near east), Shark (mid-east), and Montazah (far east); the map series accompanying the ECG Final Report (Appendix 9) shows the Project Area as subdivided into those districts.

The unsewered areas contained about 300,000 people or 10% of the City's population. They encompassed the Outer East Zone (Abu Qir), portions of the East Zone (Ras El Soda, part of Siouf Keblia, part of Smouha, and part of Maamoura), a portion of the West Zone (Nouzha), and the Outer West Zone (Mex-Dekheila, Agamy, and Amria).

It should be noted that many households in the served areas were not connected to the sanitary sewerage system. USAID recently estimated that in 1978 only 40% of the City's population of about 2,426,000 was connected to it. At that time, the sewerage collection system was limited to a portion of the City's Central Zone.

2.23 Wastewater Flows

According to the 1978 Master Plan, wastewater flows in the Alexandria system could not be measured directly, due to absence of metering devices; therefore, they had to be estimated based upon population projections and water flows. On this basis, the wastewater flows were estimated by CDM as follows:

TABLE 2-1

WASTEWATER FLOWS IN MILLIONS OF LITERS PER DAY (MLD)

(1977)

YEAR	1977	%
Domestic		
Sewered	238	
Unsewered	42	
Total:	280	49.8

TABLE 2-1 (Cont'd)

YEAR	1977	%
Industrial		
To sewers	89	
To drains-canals-sea	137	
Total:	226	40.2
Infiltration	56	10.0
Total:	562	100.0
Average Dry-Weather Flow		
Sewered	383	68.1
Unsewered	179	31.9
Total:	562	100.0

2.24 Public Health Statistics

Selected comparative public health statistics can be particularly revealing, and some of that data bears a significant relationship to the adequacy of the sanitary sewerage system. Public health experts agree that there is some positive correlation between indices such as infant mortality rates and the incidence of water-borne diseases, on the one hand, and the adequacy of the sanitary sewerage system on the other hand.

The pre-Project Initial Environmental Impact Statement (IEIS) prepared by CDM made particular reference to the incidence of infant mortality (IMR) and water-borne diseases. It showed that in the early 1970's Egypt had a relatively high infant mortality rate. Among all countries in the world in 1973 it was the 7th worst at 97.9 deaths per 1000 live births. In comparison, for the period 1963-1972 Cairo's rate was 148 and that of Alexandria was 131. It is clear that the IMR of Alexandria was relatively high at that time.

As concerns water-borne diseases, the IEIS compared Egypt, Cairo, and Alexandria for the period of 1970 to 1974, as follows:

TABLE 2-2

COMPARATIVE INCIDENCE OF WATER-BORNE DISEASES

(1970-1974)

Disease	Egypt	Cairo	Alexandria
	(average number of cases per 100,000 pop./year)		
Typhoid & paratyphoid	35	99	110
Infectious hepatitis	61	50	118
Dysentery	0.9	0.5	9.2
Cholera (1970 only)	16.5	25.2	100.3

It is clear from this data that at least during the early 1970's, Alexandria had a much higher incidence of these water-related diseases than either Cairo or Egypt as a whole.

2.25 Street Flooding

We have researched information contained in various available historical documents and gathered other data through an Egyptian sub-consultant. We find that prior to the Project sewage flooding occurred in the following unsewered areas of the City:

1. Ras El Soda (in the Montazah District): A document entitled "Proposed Improvements for Ras El Soda-I", dated March, 1981 states: "It was, therefore, decided to proceed with the installation of sanitary sewers in the Ras El Soda Area in order to remove the sewage flowing in the streets and accumulating in the lower-lying areas." The same document also states: "Drainage of surface water in Ras El Soda up to the start of construction of sanitary sewers in RES-I was practically non-existent."

In a Working Paper (WSSP/12) of the World Health Organization (WHO) Conference for the International Drinking Water Supply and Sanitation Decade (IDWSSD) held during April, 1985 in Alexandria, there appears the following statement concerning the Ras El Soda area: "With no public sewerage system, house owners have installed private septic tanks, but these have not been successful due to the high water table. The resultant flooding is seen as the reason for a high incidence of water-borne diseases."

2. Abu Qir-Maamoura (in the Montazah District): A document entitled "Basis of Design Report, Abu Qir-Maamoura Lateral Sanitary Sewers and Storm Drains", dated February, 1982 states: "The existing sewage disposal systems [Abu Qir]...consist of septic tanks and wells...Many of the septic tanks have failed some time ago and are overflowing. This has resulted in accumulation and ponding of sewage in many streets and low points."

   A document entitled "Special Report #4 (Top Priority Projects), Alexandria Wastewater Facilities Development Program, CDM, Inc., 15 August 1977" provides personal observations of the writer based upon experiences during his stay of several months in Alexandria: "...sewage overflowing manholes in a residential-industrial area due to overloaded conditions. The sewage flowed across the street and directly into the Montazah Canal which not only serves as the raw water supply for the Maamoura Water Treatment Plant...but serves as the bathing, dishwashing, laundry...for many squatters (and)...Traffic splashed through the flooded street and sprayed this raw sewage over cars and pedestrians (and)...Evidence at the site indicated that this flooding is a regular occurrence."

3. Siouf Keblia (in Montazah District): A document entitled "Special Report #4 (Top Priority Projects), Alexandria Wastewater Facilities Development Program, CDM, Inc., 15 August 1977" provides personal observations of the writer based upon experiences during his stay of several months in Alexandria: "Great ponds of wastewater lie in the low lands surrounding housing areas in Siouf Keblia and Ras El Soda. In the former area [Siouf Keblia] inhabitants have constructed earthen walkways above the level of the water to gain access to their homes."

4. Smouha (in Shark District): It is clear from available documentation that sewage flooding occurred at places like the Smouha Square and the Cleopatra railway bridge. There is also evidence of stormwater flooding at Mohammed Ali Square as well as at the underpasses of Ibrahimaya, Cleopatra, Moustafa Pasha, and Moustafa Kamel. Oftentimes stormwater and sewage flooding were a combined phenomenon.

5. Findings of May-June, 1991 Survey by the Egyptian Consulting Group (ECG) (see Appendix 9 for complete ECG Final Report):

In mid-1991 the ECG Consultants were engaged to provide selected research data for this evaluation effort. Their work focused on the following tasks: verifying both pre-Project and current flooding/ponding conditions in the Project Area; surveying a sample of Project Area residents, professionals and government officials to ascertain their perceptions of area conditions and the impact of the Project and their attitudes towards it; obtaining recent public health data with respect to Infant Mortality Rates and the incidence of water-borne diseases; updating demographic data; and providing maps of the sewered and unsewered areas. Their survey of residents covered the sewered areas in the five Alexandria Districts of Gharb, Gomrok, Wasat, Shark and Montazah; they also surveyed the Amria District, which is unsewered and served as a control group. The ECG Final Report consists of a volume of findings, a volume of pictures, and a set of maps. The Table of Contents of their Final Report consists of the following sections: Executive Summary, Introduction, Methodology, Demographic Change, Social Characteristics of the Served Areas, Social Characteristics of the Unserved Area, Health Changes, Interview Results, Comparison Between Served and Unserved Communities, Suggested Further Studies, References, and Annexes.

In the May-June, 1991 period the ECG conducted a 75-family survey of residents in those areas which are presently served in order to obtain observations concerning pre-Project and post-Project conditions. All families had resided in the area for at least 10 years. As regards past sewage flooding conditions and pre-Project impacts, the following briefly summarizes their major findings:

a. 73.3% of the families indicated that they had been affected by sewage problems in their residential neighborhoods.

b. 73% of the families indicated that sewage flooding had reached the first floor of their dwellings.

c. 42.8% of the families indicated that sewage flooding had caused odor problems.

d. 42% of the families indicated that sewage flooding had been at a high level, while another 28% of families indicated a medium level of flooding. Thus a total of 70% of the families indicated that the flooding had been at either a high or medium level, leaving only 30% who could indicate that the flooding had been low or almost non-existent.

e. 73.3% of the families indicated that the sewage flooding interfered with members' ability to get to places of work.

f. 73.3% of the families indicated that the sewage flooding interfered with their children's ability to get to school.

g. 69.3% of the families indicated that the sewage flooding decreased the availability of transportation.

h. 53.3% of the families indicated that the sewage flooding interfered with their ability to communicate with relatives and friends.

i. 77.3% of the families indicated that the sewage flooding caused problems for living conditions in their dwelling units.

j. 74.7% of the families indicated that the sewage flooding damaged the foundations of their dwelling units.

k. 50.7% of the families indicated that the sewage flooding caused deterioration of the paint in their dwelling units.

l. 85.3% of the families indicated that the sewage flooding contributed to the spread of insects in their dwelling areas.

m. 69.3% of the families indicated that the sewage flooding inhibited their opening the windows in their homes for the purpose of allowing the entry of fresh air.

n. 37.7% of the families indicated that the sewage flooding necessitated using chemical spraying to combat insects.

2.2.6 Surface Water Quality

The concern about surface water quality focuses upon its effects on the human population which uses and/or is otherwise affected by local bodies of water. It is a well-documented fact that pollutants from certain key sources have been contaminating Lake Maryout and the Mediterranean Sea at Alexandria for many years. Principal among these sources are effluent from the City's sewerage system and industrial discharges.

It is clear that the natural absorptive and treatment capabilities of these surface waters have been overwhelmed by the immense volume of pollutants dumped into them over the years. To the extent that these waters have deteriorated, the negative impact on the human population using them has increased. Poor water quality manifests itself in a variety of indicators. Among the most notable are diseases contracted by persons swimming along the beaches or drinking the water; declining fish catches; tests showing pollutants in fish; tests showing the presence of harmful chemicals, heavy metals or other substances in the waters themselves; and offensive odors.

Prior to the initiation and in the early stages of this Project, a large amount of background data was collected and incorporated into the Initial Environmental Impact Statement (IEIS) of the 1978 Alexandria Wastewater Master Plan Study. These studies covered the water quality in the Mediterranean, both offshore and in the surf zone. The Alexandria High Institute of Public Health had done research which indicated a significantly higher incidence of health complaints among bathers relative to non-bathers on the Alexandria beaches.

Also during this time frame some data on freshwater lake fish production was collected. In 1977, a sample of fresh fish was obtained from a Lake Maryout commercial fishery and analyzed for heavy metals. This baseline data is available for comparison with current data, even though the latter either does not exist or was not available at the time of our investigation. Generally, the baseline data shows that prior to the Project, the surface waters in and around the City of Alexandria were in a very stressed state due in large part to the direct discharge of both untreated domestic and industrial waste.

The IEIS included extensive studies on the impacts of industrial discharges to surface waters in the Alexandria area as well as some recommendations to reduce the waste loadings and heavy metal constituency generated by these industries. Overall, the initial baseline data in these areas showed a long-term decline in water quality in Lake Maryout due to domestic and industrial wastewater discharges. A general conclusion in the IEIS states that initial evidence suggests that the pollution of the lake had become somewhat more intense and widespread over the prior 10 to 15 years (between the mid-1960's and 1978).

The IEIS made recommendations for a monitoring program for surface water quality and suggested parameters to be tested. Recommendations were also made for the pretreatment of industrial waste to at least reduce the heavy metals discharged into the surface waters. According to available documentation, some monitoring of surface water quality was performed in the early 1980's, but very little, if any, industrial waste pretreatment has been initiated.

2.30 Most Recent Available Data and Impacts

2.31 Extent of Service

Currently the Project has resulted in extending sanitary sewer service through a system of collectors and laterals to virtually every part of the Project Area which had previously been unsewered, though some of that work was still in progress in March/April, 1991 when the BWA Evaluation Team toured the Project Areas. Specifically, sewer service has been extended into Abu Qir-Maamoura, Ras El Soda, Smouha, and Siouf Keblia, leaving unsewered a portion of Nouzha plus the Outer West Zone. The Project also has improved sewage drainage for the existing system in portions of the Shark District (Glymonoplo and Sarwat) and the Montazah District (El Saraya and Sidi Bishr).

The engineers from either WWCG or USAID who accompanied us were quite familiar with the status of AGOSD's collector and lateral work. It was clear to the Team observers that sewer installation work had recently been done in certain locations—e.g. El Nasr Village (laterals completed in 1987-88) in Siouf Keblia and Abu Qir-Maamoura; in fact, work connecting laterals to collectors was observed in progress along the principal street (next to the railroad track) in the urban center of Abu Qir. The engineers accompanying us pointed out that the lateral work undertaken by AGOSD was close to completion in all of the pre-Project unsewered areas where Phase I work was to be accomplished, including 100% complete in the Ras El Soda and Smouha Districts, more than 90% complete in Siouf Keblia, and 50% complete in Abu Qir. We were advised that the portion of the Nouzha District on the south side of the railroad tracks was the only remaining unsewered residential area among those covered by the Project; however, work in that district is a Phase II item, which means that several years may pass before the area can be sewered. Map 2-2, Status of Drainage Improvements, shows the different areas in relation to the status of drainage improvements.

We requested from AGOSD both current and historical data on the number of service connections to the Alexandria Wastewater System; however, to date that information has not been provided, requiring the use of other sources. USAID recently estimated that each residential connection accounted for 15 people; assuming that the 1991 population of Alexandria is about 3,335,000, that ratio would give a potential for 222,333 non-industrial connections. But they also have estimated that only about 50% of the population is actually connected, which would result in 111,166 non-industrial connections. Their estimate of industrial connections is about 1,000.

Based upon information discussed above, Table 2-3 below compares the extent of service between 1978 and 1991.

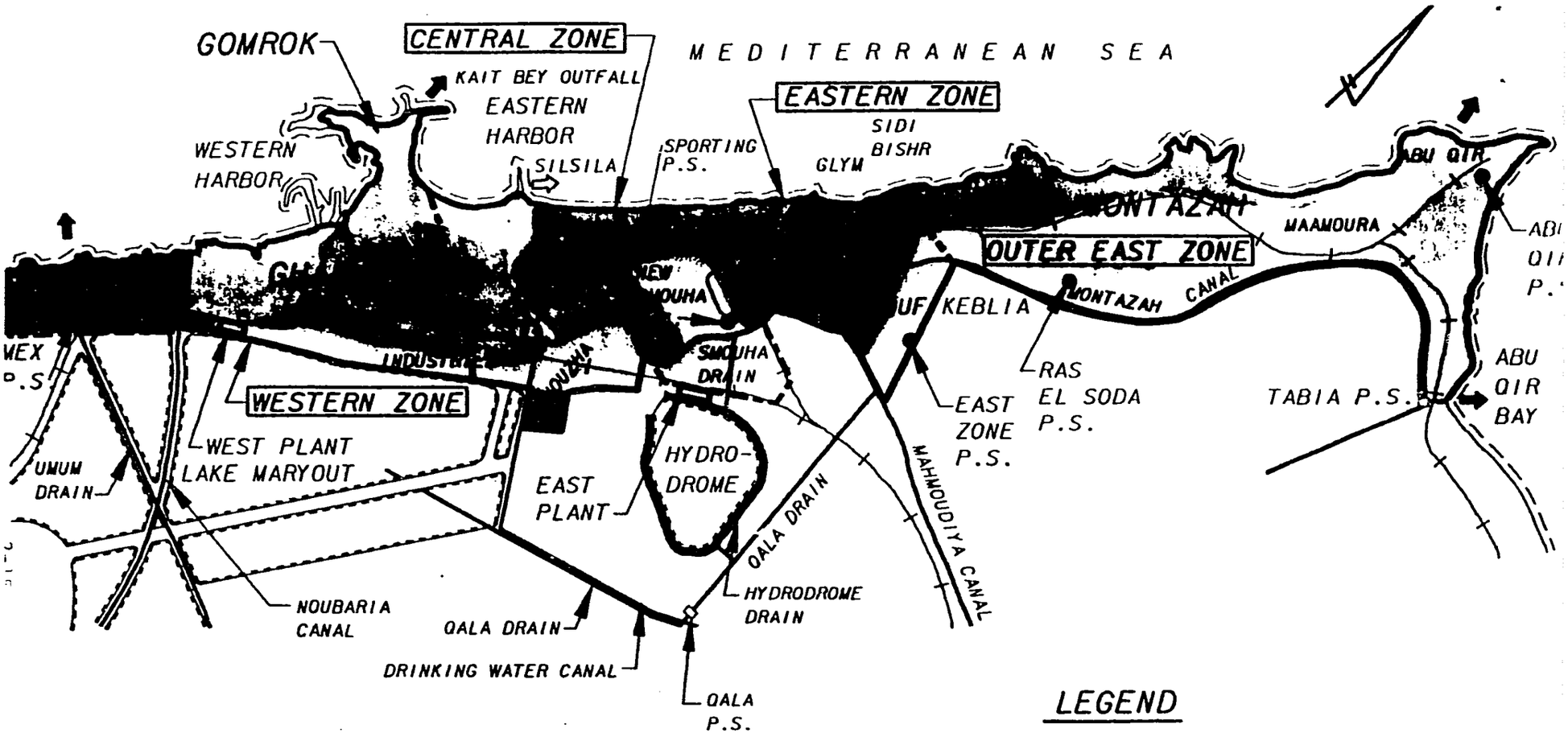
TABLE 2-3

CHANGES IN EXTENT OF SANITARY SEWER SERVICE

City of Alexandria---1978 vs. 1991

(based upon estimates of connections)

	1978	1991	% Chg.
Percent of Population Served	40%	50%	+25%
Non-Industrial Connections	64,693	111,166	+71.8%
Industrial Connections	200	1,000	+400%



MAP 2-2

STATUS OF DRAINAGE IMPROVEMENTS

ALEXANDRIA WASTEWATER SYSTEM EXPANSION PROJECT 1991

LEGEND

- SEWERAGE ZONE BOUNDARIES
- ALEXANDRIA DISTRICT BOUNDARIES (FOR DEMOGRAPHIC & SURVEY DATA)
- AREAS NEWLY SERVED BY PROJECT
- EXISTING DRAINAGE ALREADY IMPROVED BY PROJECT
- EXISTING DRAINAGE
- UNSEWERED AREAS

As the City increases in population and industrialized area, there is a tendency to increase the amount of unsewered area needing to be added to the collection system. Given this factor and the chronic problem of lack of funding, for the foreseeable future, it is neither likely that construction can keep pace with the need nor that the entire population of the City can be served.

2.32 Public Health Statistics

The ECG examined two types of indices which are said by public health experts to bear a positive relationship to sewage drainage: (1) mortality (death) indices, and (2) morbidity (disease) indices (See Chapter V of the ECG Report).

With reference to mortality, they compiled rate data for infant mortality (IMR), neonatal mortality (NNMR), and postneonatal mortality (PNNMR) for the entire City of Alexandria covering the period between 1980 and 1990. The key assumption is that the PNNMR generally reflects death due to environmental causes while the NNMR generally reflects death due to biological causes. They then developed a ratio between the NNMR and the PNNMR, which reflects environmental risks in relation to biological risks. They state: "The hazards from contamination by wastewater are part of the environmental risks." (See Section 2.0, page 8 of ECG Report.) Table II-3 in their Report depicts this data. It shows that the NNMR:PNNMR ratio declined from 1:2.1 in 1980 to 1:1.4 in 1990, which is a drop of 0.7, or 33.3% over a 10-year period. Their conclusion about the decline is: "This drop....might reflect the improvement in the environment." (See Section 2.0, page 8 of ECG Report.) This implies that since the Project has had a positive environmental impact, the decline in the ratio could partially be attributed to the improvements provided by the Project.

While the Infant Mortality Rate (IMR) for Alexandria between 1963 and 1972 averaged 131 per annum, there has been a subsequent, dramatic and constant improvement in the IMR for the City ranging from 131 in 1972 to 69.51 in 1980, to 38.06 in 1985, and to 25.95 in 1990. This represents a decline in the IMR for the City of over 60 percent during the decade of the 1980's alone, and a decline of over 80 percent since 1972. The decline in the IMR reflects a number of factors and cannot be exclusively linked to improvements in the sanitary sewerage system, but we believe that the evidence shows that the Project played an important role in this decline.

With regard to morbidity, the ECG compiled data on five types of diseases that are known to be caused by unsanitary conditions involving water and wastewater: hepatitis, typhoid, paratyphoid, dysentery, and polio. Data was derived from records of the Alexandria Fevers Hospital and covered the 5-year period between 1986 and 1990, inclusive. (See Tables V-1 thru V-7 in Chapter V of the ECG Report.) The data is available for the 6 districts studied in their survey, e.g., the 5 districts served by the Project plus the control group, the unsewered Amria District. Table 2-4, below, consolidates this raw data:

TABLE 2-4

REPORTED WATER-BORNE DISEASES PER 100,000 POPULATION ALEXANDRIA FEVERS HOSPITAL 1986-1990 BY SELECTED DISTRICT

District		Hepatitis	Typhoid	Paratyphoid	Dysentery	Polio
	1986	55.2	13.5	2.6	0	0
	1987	43.3	9.4	0.7	0.5	0
GOMROK	1988	40.8	8.1	0.4	0.4	0
(served)	1989	27.7	5.1	0.2	0.2	0
	1990	31.4	8.1	0.8	0.4	0
percent change '86-'90:		-43.1%	-40%	-69.2%	up	zero
	1986	166.0	31.7	8.7	0	0
	1987	129.7	30.2	1.0	0.5	0
GHARB	1988	141.6	29.7	2.2	0.4	0
(served)	1989	89.0	18.4	0.9	0.2	0
	1990	98.8	21.5	1.8	0.4	0
percent change '86-'90:		-40.5%	-32.2%	-79.3%	up	zero
	1986	107.2	26.6	5.5	0.8	0
	1987	75.8	26.8	2.9	0.8	0
WASAT	1988	85.3	15.4	2.0	1.2	0.2
(served)	1989	56.0	10.8	0.3	1.5	0
	1990	59.1	12.8	1.2	2.0	0
percent change '86-'90:		-44.9%	-51.9%	-78.2%	+150%	no chg

TABLE 2-4 (Cont'd)

District		Hepatitis	Typhoid	Paratyphoid	Dysentery	Polio
	1986	72.0	33.8	5.9	1.5	0
	1987	51.2	33.9	4.1	0.3	0.2
MONTAZAH	1988	62.3	18.0	1.3	0.9	0.2
(served)	1989	39.4	10.6	1.9	0.3	0
	1990	51.9	10.7	0.6	0.7	0.3
percent change '86-'90:		-27.9%	-68.3%	-89.8%	-53.3%	up
	1986	73.1	22.2	4.0	0.4	0
	1987	56.1	26.2	2.3	1.0	0.2
SHARK	1988	65.8	16.1	1.2	0.6	0.1
(served)	1989	49.3	10.3	0.4	0.8	0.1
	1990	46.7	13.3	0.7	0.7	0
percent change '86-'90:		-36.1%	-40%	-82.5%	+75%	no chg
	1986	76.2	13.4	1.9	0.5	0.5
	1987	60.6	11.2	1.7	1.4	0.9
AMRIA	1988	61.2	11.8	0	0.9	0.5
(control district-	1989	57.8	13.2	1.4	1.3	0
unserved)	1990	63.9	14.6	0.4	0	3.9
percent change '86-'90:		-16.1%	+8.9%	-78.9%	down	+680%
	1986	87.5	24.7	4.9	1.4	0.03
	1987	56.3	28.2	2.4	0.8	0.20
GOVERNATE	1988	73.0	16.4	1.3	0.9	0.10
(as a whole)	1989	50.2	10.9	0.5	0.9	0.03
	1990	54.9	12.9	0.9	0.9	0.40
percent change '86-'90:		-32.6%	-47.8%	-81.6%	-35.7%	+1233%

An analysis of the data depicted above develops the following points:

1. When the five diseases are considered individually, it cannot conclusively be said that the incidence of each seems to consistently correlate with the Project improvements. As noted above, for example, the incidence of dysentery actually increased in 4 of the 5 served districts, while decreasing in the unserved control district. On the other hand, the overall incidence of the five diseases tends to be lower in the served districts, thus lending support to the concept that the Project improvements have a positive impact.

2. The incidence of hepatitis, typhoid and paratyphoid decreased significantly in all five served districts. In comparison, the incidence of hepatitis and paratyphoid also declined in the control district, but the rate of typhoid increased in that district. We view the significant declines for the three diseases in the served districts coupled with the increase of typhoid in Amria to be persuasive indicators that the Project improvements have played a positive role.

3. For the incidence of paratyphoid, the rate of decline was substantial and was about the same for both the served districts and the control district. The incidence of dysentery increased somewhat in all districts except for Montazah (down 53%) and the control district (down slightly). Thus for the 1986-1990 period these two parameters (paratyphoid and dysentery) cannot demonstrate a positive correlation with the Project improvements.

4. The incidence of polio was zero in two of the served districts, but it was up slightly in the other three. In contrast, the control district showed a sharp increase (680%). The number of polio cases per 100,000 is still very low, though the 3.9 for Amria (the control district) is much higher than any of the other districts, where 0.3 was the highest (Montazah). Thus this parameter does not demonstrate a positive correlation with the Project improvements.

In comparison with the early 1970's, for the City of Alexandria as a whole, the incidence per 100,000 population for hepatitis (118 in 1974 versus 54.9 in 1990), typhoid/paratyphoid (110 in 1974 versus 13.8 in 1990) and dysentery (9.2 in 1974 versus 0.9 in 1990) all showed large declines. We believe that the Project improvements were at least partially responsible for these declines in the incidence of water-borne disease.

2.33 Wastewater Flows

We attempted to obtain both current and historic wastewater system flow data from AGOSD. Since that data has not been made available, we have used other methods to prepare estimates.

The 1981 Master Plan Update by WWCG based its wastewater flow projections for the years 1990 and 2000 upon population and water flow projections. At that time, the population of Alexandria was projected to be 3,540,000 for 1990 and 4,660,000 for 2000, an increase of 31.6% over the ten-year period. In comparison the wastewater flows were projected to increase from 1115 MLD to 1476 MLD, an increase of 32.4% over the same period (thus the percentage increases in population and wastewater flows were nearly equal). These wastewater flow projections are shown in Table 2-5 below (taken from the Master Plan Update of May, 1981).

TABLE 2-5

Wastewater Flows in Millions of Liters Per Day (MLD)

City of Alexandria

TYPE	YEAR: 1990 FLOW, MLD	%	YEAR: 2000 FLOW, MLD	%
Domestic	458	41.1	633	42.9
Industrial	552	49.5	725	49.1
Infiltration	95	8.5	108	7.3
Special	10	0.9	10	0.7
Total:	**1115**	100.0	**1476**	100.0

In comparison with the early 1970's, for the City of Alexandria as a whole, the incidence per 100,000 population for hepatitis (118 in 1974 versus 54.9 in 1990), typhoid/paratyphoid (110 in 1974 versus 13.8 in 1990) and dysentery (9.2 in 1974 versus 0.9 in 1990) all showed large declines. We believe that the Project improvements were at least partially responsible for these declines in the incidence of water-borne disease.

2.33 Wastewater Flows

We attempted to obtain both current and historic wastewater system flow data from AGOSD. Since that data has not been made available, we have used other methods to prepare estimates.

The 1981 Master Plan Update by WWCG based its wastewater flow projections for the years 1990 and 2000 upon population and water flow projections. At that time, the population of Alexandria was projected to be 3,540,000 for 1990 and 4,660,000 for 2000, an increase of 31.6% over the ten-year period. In comparison the wastewater flows were projected to increase from 1115 MLD to 1476 MLD, an increase of 32.4% over the same period (thus the percentage increases in population and wastewater flows were nearly equal). These wastewater flow projections are shown in Table 2-5 below (taken from the Master Plan Update of May, 1981).

TABLE 2-5

Wastewater Flows in Millions of Liters Per Day (MLD)

City of Alexandria

TYPE	YEAR: 1990 FLOW, MLD	%	YEAR: 2000 FLOW, MLD	%
Domestic	458	41.1	633	42.9
Industrial	552	49.5	725	49.1
Infiltration	95	8.5	108	7.3
Special	10	0.9	10	0.7
Total:	**1115**	100.0	**1476**	100.0

One method for updating and adjusting the total wastewater flow figures for 1990 and 2000 is to start with an updated population estimate for the City of Alexandria from the 1990 Annual Statistical Report of the Department of Health of the Alexandria Governate: 3,246,490. This figure is 8.3% less than the WWCG population estimate for 1990 made in 1981 (3,540,000). Assuming, as noted above, that there is a very close correlation between population changes and wastewater flow changes, we can reduce the previously projected total wastewater flows for 1990 and 2000 by the same percentage (8.3%), giving the following results (Table 2-6):

TABLE 2-6

Updated Wastewater Flows in Millions of Liters Per Day (MLD)

City of Alexandria

(adjusted for updated 1990 population estimate)

YEAR	1990	2000
Total:	**1023**	**1354**

Table 2-7 below traces the changes in wastewater flows for the City of Alexandria for the years 1977, 1990 and 2000. The 1977 data is taken from the Master Plan Update; the data for years 1990 and 2000 are based upon Table 2-5 as adjusted by Table 2-6.

TABLE 2-7

Comparative Wastewater Flows in Millions of Liters Per Day (MLD)

City of Alexandria

(1977-1990-2000)

TYPE	1977	%	Δ%	1990	%	Δ%	2000	%
Domestic	280	49.8	50	420	41.1	38	580	42.8
Industrial	226	40.2	124	506	49.5	31	665	49.1
Infiltration	56	10.0	55	87	8.5	14	99	7.3
Special	0	0.0	0	10	0.9	0	10	0.8
Total:	**562**	100.0	82	**1023**	100.0	32	**1354**	100.0

Table 2-7 shows that the wastewater flow has increased and will continue to increase substantially over the next decade in line with expected population growth. One impact of this on the sanitary sewer system is that the system will have to expand to meet the need, and pressures to find an acceptable solution to the disposal of the effluent will become more severe.

2.34 Street Flooding

In order to ascertain current environmental conditions in the Project areas, we carried out such in-country activities as: site visits to the newly sewered districts covered in Phase I (e.g. Smouha, Siouf Keblia, Ras El Soda, and Abu Qir-Maamoura); discussions with local engineers and other professionals familiar with the Project improvements in these areas; review of Project records pertaining to construction progress; evaluation team visits to Nouzha, Lake Maryout, the Hydrodrome, and the beach areas along the Mediterranean; and review of documentation on surface water quality.

While touring the Project areas, we did not personally observe any flooding or ponding in the previously unsewered neighborhoods now served by the Project (except for a small and temporary ponding condition at a location in Abu Qir which was caused by construction involving the installation and connection of laterals with collectors). However, this brief glimpse of conditions in itself is a relatively narrow perspective because the visits were limited in number, of short duration, and conducted during a period of no rainfall. We were accompanied by engineers from WWCG and USAID who were familiar with Project activities in the areas.

As one of its tasks the ECG worked with us to verify locations of sewerage flooding and ponding on both a pre-Project and current basis. According to their recent field survey, only a few isolated pockets of sewage flooding/ponding were found in the Project Area, e.g.: Ezbett Nadi El Seide of the Gharb District (due to sewer lines being unconnected at certain buildings); and Ezbett El Mattar of the Wasat District (due to non-existence of laterals in area behind the airport).

The album of photographs in the appended ECG Report contains 38 photos (taken in mid-1991) of existing environmental conditions relating to flooding/ponding of sewage in the streets of Alexandria. Thirty of the photos are from the served areas, and 8 are from the unserved area of Amria. All of the photos from the Amria District (unserved) and 5 from the other districts (served) depict sewage flooding/ponding problems. The remaining 25 photos are from served districts and show the elimination of flooding/ponding and resultant environmental improvement. The photos

support the conclusion that the Project has resulted in the elimination of most flooding/ponding problems from the Project Area. Map 2-3 shows the locations where these photos were taken. A listing of the photos is contained in Table 2-8 below:

TABLE 2-8

ECG Photographs of Flooding/Ponding In Streets

(Mid-1991)

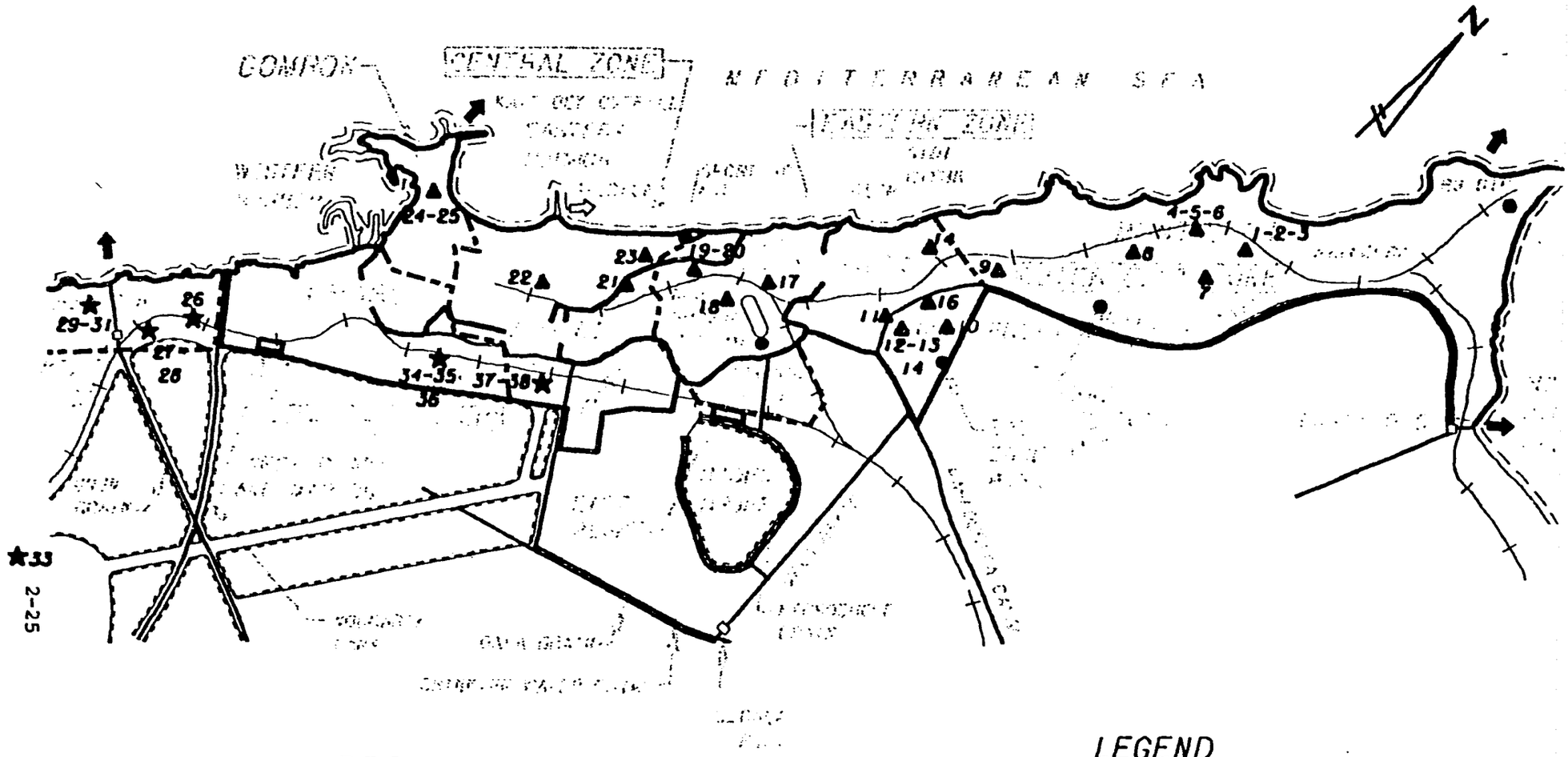
#	District	Location	Album Page	Served Area	Condition
PHOTOS OF SEWERED AREAS:					
1.	Montazah-A	Esbett El Haramine	1.1	Yes	No flooding/improvement
2.	Montazah-A	Esbett El Haramine	1.2	Yes	No flooding/improvement
3.	Montazah-A	Esbett El Haramine	1.3	Yes	No flooding/improvement
4.	Montazah-A	Gamea El Saida St.	2.1	Yes	No flooding/improvement
5.	Montazah-A	Gamea El Saida St.	2.2	Yes	No flooding/improvement
6.	Montazah-A	Gamea El Saida St.	2.3	Yes	No flooding/improvement
7.	Montazah-A	Ras El Soda	3	Yes	No flooding/improvement
8.	Montazah-A	Sixty-Fourth St.	4	Yes	No flooding/improvement
9.	Montazah-A	Malek Hefni Nassef	5	Yes	No flooding/improvement
10.	Montazah-A	Siouf Keblia	6	Yes	No flooding/improvement
11.	Shark-B	El Kosaai	1	Yes	No flooding/improvement
12.	Shark-B	Maamal El Katakit	2.1	Yes	No flooding/improvement
13.	Shark-B	Maamal El Katakit	2.2	Yes	No flooding/improvement
14.	Shark-B	Victoria Coll. Square	3	Yes	No flooding/improvement
15.	Shark-B	Danna	4	Yes	No flooding/improvement
16.	Shark-B	Abu Soliman	5	Yes	No flooding/improvement
17.	Shark-B	Smouha Bridge	6	Yes	No flooding/improvement
18.	Shark-B	Smouha Square	7	Yes	No flooding/improvement
19.	Shark-B	Cleopatra Bridge	8.1	Yes	No flooding/improvement
20.	Shark-B	Cleopatra Bridge	8.2	Yes	No flooding/improvement
21.	Wasat-C	El Ibrahimia Brdg.	1	Yes	No flooding/improvement
22.	Wasat-C	Moharem Bey Brdg.	2	Yes	No flooding/improvement
23.	Wasat-C	Sporting Club	3	Yes	No flooding/improvement
24.	Gomrok-D	Zawia Kattab	1	Yes	No flooding/improvement
25.	Gomrok-D	Main St.	2	Yes	No flooding/improvement

TABLE 2-8 (Cont'd)

#	District	Location	Album Page	Served Area	Condition
PHOTOS OF UNSERVED AREAS:					
26.	Amria-A	El Mex	1	No	Flooding
27.	Amria-A	Wadi El Kammar	2	No	Flooding
28.	Amria-A	Dekheila	3	No	Flooding
29.	Amria-A	Dekheila Chemical	4	No	Flooding
30.	Amria-A	Leather Co.	5	No	Flooding
31.	Amria-A	Old El Agami	6	No	Flooding
32.	Amria-A	El Agami Water Co.	7	No	Flooding
33.	Amria-A	New Housing	8	No	Flooding
PHOTOS OF PARTIALLY SERVED AREAS:					
34.	Gharb	Ezbett Naid El Seide	1.1	Yes	Flooding
35.	Gharb	Ezbett Nadi El Seide	1.2	Yes	Flooding
36.	Gharb	Ezbett Nadi El Seide	1.3	Yes	Flooding
37.	Wasat	Ezbett El Mattar	2.1	Yes	Flooding
38.	Wasat	Ezbett El Mattar	2.2	Yes	Flooding

The ECG also conducted an opinion survey of families in the Project Area to obtain their perceptions about existing conditions; selected results follow (see also the succeeding paragraphs on "Social Fabric" and "Service Access by Subgroup"):

1. 72% noted improvement in sewage disposal.
2. 57.3% noted less humidity at home.
3. 44% indicated that insect problems had become less severe.
4. 41.3% noted reduced moisture damage to walls and furniture.
5. 41.3% indicated a decrease in intestinal diseases.
6. 40% noted an increase in land prices.



MAP 2-3

ECG PHOTO LOCATIONS
FLOODING/PONDING CONDITIONS
ALEXANDRIA WASTEWATER SYSTEM
EXPANSION PROJECT
MID-1991

LEGEND

——— SEWERAGE ZONE BOUNDARIES

- - - - - ALEXANDRIA DISTRICT BOUNDARIES (FOR DEMOGRAPHIC & SURVEY DATA)

★ FLOODING

▲ NO FLOODING

NOTE: LOCATION NUMBERS CORRESPOND TO PHOTOS LISTED IN SECTION 3.34 OF REPORT

It is clear from the surveys of residents and observations of professionals that the installation of laterals and collectors in previously unsewered areas according to the Phase I Plan has come close to eliminating the problem of sewage flooding in those areas. Fortunately, over 90% of the Phase-I lateral work is complete. However, street flooding due to sewerage still occurs in unsewered areas, particularly outside of the Project area. Since the City continues to grow, extension of service to additional unsewered areas will be an on-going need.

An important factor affecting the functionality of the system of laterals and collectors is the degree to which material unsuited for the sanitary sewerage system is deposited in it. There is both historical and current evidence that people sometimes try to dispose of garbage, trash, cow manure, etc. through this system. Such actions tend to cause line blockages and backups. If the system is to function properly, at least two efforts are needed: education of the public as to what should and should not be disposed of in the system; and adequate maintenance by AGOSD. There is evidence that improvement is needed in both respects.

2.35 Surface Water Quality

We could locate only a very limited amount of recent surface-water-quality data generated for the vicinity of Alexandria with which to compare against baseline data generated prior to initiation of this Project. From 1981 to 1985, some studies were conducted in the Alexandria area and Egypt as a whole, which contain information that can be correlated against initial data of the mid-1970's. There is a general trend towards the improvement of the waters in the surf zone and beaches of the Mediterranean, but that positive aspect has been compromised by the increased loading of sewage into Lake Maryout. During the early 1980's, the Project improvements enabled more effective collection and conveyance of wastewater away from the beaches through open conveyance channels ("drains") to Lake Maryout.

In March of 1982, R. Vander Schaef conducted a study on waste loadings and limitations for Lake Maryout. His report contains large quantities of test data which gives a good indication of the water quality in certain parts of Lake Maryout at that time. Another study was published in April, 1983, the "Lake Maryout Task Data Report No. 1", which contains the results from a large number of sampling sites in the entire sub-basin of the lake, several of the drains which discharge to it, and a discharge at the Mex Pump Station. Unfortunately, more recent data is not available to compare with these figures for determining a trend and the degree of improvement or degradation of the water quality in the lake.

In July, 1981, a "Report on the Extent of Safety of Alexandria Beaches Being Affected by the Wastewater" was prepared jointly by Professor Hassan Mitwally (while head of the Environmental Health Department of the University of Alexandria) and Dr. Samia Galal (then Associate Professor of Environmental Health at the same institution). This document examines water samples collected in July of 1981 and shows a substantial improvement in the water quality of the beach areas along the coast as compared to similar tests made in 1978.

We met with many individuals interested in the environment who are currently associated with the on-going Project. Their opinions vary greatly on the degree to which the Project is effectively attaining its original goals; we believe that this is due largely to the lack of current water quality data. In a recent meeting with us, Professor Mitwally stated that little has changed in the surface water quality along the beaches since his 1981 report. That report gives the following characterization of the conditions of the majority of the beaches in the Alexandria area: "Water of the beaches matches with the international standard specifications for beaches, suitable for bathing and swimming, as it is totally free of any contamination."

This evaluation of the current conditions at the beaches was not shared by all of the knowledgeable people we contacted. Some made comments which would indicate that during the winter months when the beaches are little used by tourists, domestic wastewater is allowed to travel through existing outfalls into the surf zone along much of the Alexandria coastline. Sources also indicated that during periods of high rainfall, the existing combined sewerage systems become surcharged and discharge raw sewage into the Mediterranean. It now appears that the City's wastewater collection system has the ability to route the bulk of the domestic wastewaters to locations where treatment plants are currently under construction. The beaches can be maintained in a fairly safe manner during the summer months for the benefit of the tourist industry, but this system may lack the ability during the rainy periods of the winter months or high wastewater flow periods to control raw sewage discharges into the Mediterranean.

An article published in "Cairo Today" Magazine, dated August, 1990 echoed some of the same findings. Even though the beaches in Alexandria were represented by official spokesmen to be 100% safe, clean and free of pollution, wastewater discharge from the Silsila outfall could be seen. During our stay in Alexandria in April, 1991 we saw wastewater flow from this outfall and detected odors at many other beach areas along the Corniche. As the period of Ramadan came to an end and the tourist season in Alexandria started, we noted a reduction in the wastewater odors which were earlier observed along most areas of the Corniche except for the area near the Silsila

outfall. Some local sources stated that the water quality in Lake Maryout has progressively deteriorated over the last thirty years and that the lake, which was at one time valued for its fishing, is now unusable for that purpose due to contamination. The law prohibits public sale of fish taken from the lake. The current dilemma of the lake is compounded by the large amount of industrial waste discharged directly into it with very little, if any, pretreatment. The "Cairo Today" article also stated: "An intense repulsive odor emanates from the eastern portion of the main basin of Lake Maryout along the Alexandria-to-Cairo road." This odor, which we also observed, comes from an area which is heavily industrialized and may well be generated by the industrial discharges entering this portion of the lake.

Another point made by the same magazine article is that the City's beaches are being protected at the expense of Lake Maryout. This derives from the fact that in the 1970's and early 1980's bathers frequently complained of rashes, irritation and nausea, which was tarnishing the reputation of the City of Alexandria as a pristine beach resort, thus jeopardizing tourism's boost to the local economy during the summer months.

In the short run, there has been water quality improvement to the beach areas during the tourist season, but clearly at the expense of Lake Maryout. Raw sewage conveyed from the coastal areas bypasses treatment facilities which are not yet completed and subsequently discharges directly into the lake. Even after the primary-treatment plants begin operations, the stress on Lake Maryout will continue. While the organic loading to the Lake will initially be decreased by the treatment process, the volume of flow will continue to increase.

Water quality parameters of Lake Maryout can only improve when an ultimate disposal method for primary effluent is constructed. Either secondary treatment should be pursued for land application or an ultimate ocean outfall should be constructed. Lake Maryout cannot recover while receiving current volumes of sewage, even after primary treatment, or if the raw industrial wastes continue to be discharged into the lake.

This Project has achieved, in a limited way, success in providing for conveyance of the bulk of the domestic sewage away from those areas which most directly affect the general public. However, one issue which appears to have been given a low priority by local officials, but remains one of our primary concerns, is that of industrial waste disposal. This must be addressed before any hope of improving Lake Maryout can be realized.

2.36 Level of Treatment

To date, the Project has not resulted in any improvement in the level of treatment because the construction of the two primary-wastewater treatment plants is still underway. At this time, the plants are scheduled for completion in 1993, and after they are operational, the level of treatment should improve significantly. However, the level of treatment provided by the Phase I improvements will still be primary. Subsequent Phases, if persued by AGOSD should consider upgrading the level of treatment to secondary.

2.37 Social Fabric

The ECG survey of Project area residents posed some questions which relate to the impact of the improvements upon social conditions; the answers revealed the following:

1. 62.7% of families indicated that there had been a positive effect upon their ability to reach their place of work on time.

2. 60% of families indicated that there had been a positive effect on the availability of certain other services such as potable water and telephone.

3. 54.7% of families indicated that there had been a positive effect on the ease with which their children were able to get to school.

4. 44% of families indicated that there had been a positive effect on the availability of transportation in their neighborhood.

5. 41.3% of families noted an increase in food-selling businesses.

6. 40% of families found that it was easier to attend religious services.

2.38 Service Access by Subgroup

The ECG survey work provides important data concerning service access by subgroup. As indicated in their Final Report (see Appendix 9) the survey team covered five districts served by the Project and compared them to one district, Amria, which remains unsewered.

One of the main objectives of our Study is to determine whether areas containing a high proportion of needy families have benefitted from the Project. Within the five served districts, there was a total sample of 38 families which turned out to fall within the Very Low and Low Standard categories. Of this total, 21 (55.3%) were found to reside in the two districts, Montazah and the East Zone, which contained significant areas unsewered on a pre-Project basis that now have become extensively sewered by the Project. In contrast, of the 24 families sampled who fell into the High and High Medium categories, only 5 (20.8%) were found to reside in these same two districts. Since social standard classification was not a criterion for the selection of the sample of families, these results may be considered to be reasonably random and thus fairly representative of the social standard cross-section of the population in the areas surveyed. Therefore, these results tend to support the concept that areas containing a high proportion of needy families have benefitted from the Project.

Another objective of this Study is to determine how access to sewer service has affected women. The ECG survey revealed that 32% of families indicated that the Project made it easier for wives to carry out their domestic duties. We previously noted that residents surveyed indicated certain other positive results from the Project, for example: more stores and supermarkets opened up; easier for children to get to school; easier for people to get to work; better transportation; better availability of water and telephone service. It can be argued that any such improvement could be particularly beneficial to women---for example, if women do most of the shopping for food and clothing on behalf of the family, then having more stores in their neighborhood should make it easier for them to complete those tasks.

The ECG survey made a point of asking the wives in the families of the newly-served areas certain questions, which resulted in the following responses:

1. 46.7% of the wives wanted steps to be taken to keep stormwater out of the sewage system.

2. 44% of the wives wanted homes inspected to make sure that the sewage disposal facilities were installed and functioning properly.

3. 41.3% of the wives wanted the sewage pumping system to be maintained on a continuous basis.

4. 77.3% of the wives wanted surrounding districts to be sprayed for insects.

One conclusion that one might draw from reviewing these recommendations is that they reflect the wives feelings about the fact that now that there is a functioning sewer system which has improved their living conditions, efforts must be made to assure that it continues to function properly.

2.40 Community Awareness of and Attitudes Towards the Project

The survey work conducted by the ECG during May-June, 1991 attempted to measure community awareness and attitudes relative to the Project. The surveys focused upon two separate groups: the same residents who answered survey questions regarding sewage flooding; and government officials and professionals.

1. Residents:

   Since most of the 75 resident families surveyed in the served areas indicated that the Project had at least some positive impact on sewage flooding and ponding, they must have been aware of the Project, at least in a minimal sense. The survey information does not reveal to what extent they were aware of specific details of the Project, such as the fact that the Project was jointly funded by USAID and the GOE. It is to be expected that the "average citizen" would think that whatever was being done with the sewer system was somehow a government project. It is a positive fact that the survey results showed that 54.7% of the responding families indicated that the Project had attained its aims, while an additional 33.3% indicated that Project aims had been achieved to a certain extent; thus a total of 88% gave the opinion that Project aims had been achieved either completely or partially.

Residents of the unserved district of Amria also revealed their awareness of the Project through the survey. 65% of the men and 56% of the women indicated that the Project should be extended to their neighborhoods.

2. Leaders (District Council Heads, Members of the Governate Council, Professional/Technical Persons):

The results of these interviews may be summarized as follows:

a. Sewage Disposal in the Served Areas before the Project.
   1. Traditional methods of sewage disposal were unsatisfactory, and this became more noticeable with population growth and increased production of sewage. This caused problems for housing, sanitary and social aspects of living, which in turn led to disturbed human and social relations, as well as increased spread of disease.
   2. Sewage in the streets made it difficult to properly pave streets.
   3. The construction of high-rise apartment buildings also increased pressure on the old sewer system, which could not handle the demand adequately. Thus the old sewer system had to be upgraded, and disposal techniques had to be updated.

b. The Impact of the Project.
   1. There is a definite improvement in sewage disposal both in areas previously served and those newly served.
   2. Increased drainage capacity has minimized flooding, with positive social and health consequences.
   3. Sewage system deficiencies in served areas are due to: residents causing line blockages by putting garbage into the sewers; businesses causing line blockages by putting garbage into the sewers; inadequate sewer systems in old buildings.

c. The Need to Complete the Present Project.
   1. The unserved areas of El Mex, El Dekheila, and El Agami need to be served by both sanitary and storm sewers.
   2. El Agami is presently using septic tanks which might not be able to handle the summertime demand caused by tourism.

d. The Need for Safe Sewage Disposal.
   1. The policy decision-makers must decide upon the ultimate disposal of the effluent because it is needed to enhance Project effectiveness.
   2. The issue of sludge disposal must be decided; this could affect agriculture in the Montazah area.

e. Beneficial Side-Effects of the Project.
   1. Increased land values in the newly-served areas attract higher socio-economic groups, which in turn leads to increased property tax revenue for the community.
   2. Environmental improvement has facilitated provision of public services, water supply pipes, electricity, security services, and crime control.
   3. There is better garbage collection and avoidance of bad effects from poor garbage collection.
   4. Less water-logging of foundations leads to more durable buildings.
   5. More interest in opening shops and businesses, thus promoting economic activity.

f. Getting Community Participation in Sewage Disposal.
   1. Need continuous sanitary health education for the public to discourage abuse of the sewer system, e.g. putting solid waste into sewer thus causing blockages.
   2. Need to train sewer maintenance workers to do a better job.
   3. Need to extend sewers to unsewered areas and to allow the local residents to help pay part of the cost.
   4. Need to make better use of sludge.
   5. Need quick-response sewer maintenance equipment.
   6. Need to address problem of industrial waste disposal because in some areas of the City it is major source of contamination and bad odor.

2.50 Review of Project Objectives and Priorities

1. These comments address the question: To what extent have the Project objectives set forth in the 1979 USAID/GOE Grant Agreement been achieved? Below we list those objectives and our opinion concerning this question.

   a. "The primary benefit...is to improve the...public health problems resulting from water-borne diseases incidental to sewage ponding in streets...":

      We have examined the issues of street flooding/ponding and the incidence of water-borne diseases. The extension of the sewage collection network into previously unsewered areas and improvements to the existing lines have already resulted in a dramatic reduction in sewage flooding on the streets of those areas. This collection network is between 90% and 100% complete, and construction is continuing, so that all of the Phase I areas should be completely sewered in the course of the next twelve months or so. At that time, the sewage flooding/ponding problem in those areas has the potential for near elimination. However, unless the final elements of the collection system are completed and that system is properly maintained by AGOSD, sewer back-ups and flooding will still occur in some portions of the Project Area.

      Our examination of the public health problems incidental to sewage flooding/ponding focused on two sources of information: questionnaire results from local residents and public health statistics. The questionnaire responses showed that many people found that Project improvements had such positive health-related effects as: reducing insect problems and reducing intestinal diseases. The public health data showed: an improvement of 33.3% in the NNMR:PNNMR ratio for the City of Alexandria between 1980 and 1990; significant declines in the incidence of typhoid/paratyphoid and hepatitis between 1986 and 1990 in the sewered districts; and dramatic declines in the incidence of typhoid/paratyphoid and hepatitis between 1974 and 1990 in those

districts. Although it is impossible to find a 100% correlation between each index and the Project improvements, the weight of the indices as a whole tends to support the concept that a significant relationship exists between the Project improvements and the reduction in overall incidence of selected health problems.

b. "The primary benefit...is to improve the...public health problems resulting from water-borne diseases incidental to...disposal of raw sewage into the swimming beach areas along the Mediterranean shoreline...and into Lake Maryout and irrigation canals":

We have determined that the disposal of raw sewage into the beach swimming areas has been significantly reduced, but could not confirm that is has been totally stopped. In an article entitled "Troubled Waters" (Aug. 1990 issue of "Cairo Today"), the reporter states: "I was told (by AGOSD officials) that sewage overflow points from the Shatby District...until Montazah, the strip of coast along which most of the inner city beaches lie, had been blocked off with concrete." The same article goes on to point out that Dr. Yusuf Halim, Professor of Marine Biology at Alexandria University admitted that the problem of sewage getting onto the beaches in the east of the City had been much improved with the recent work. But he also is quoted as saying that the marine environment around Alexandria is in a state of "multiple degradation" due to both domestic and industrial discharges.

Despite Project activities to date, raw sewage continues to discharge into Lake Maryout. This will continue to be the case until the construction of the East and West Treatment Plants is completed and they become operational, now projected for 1993. After that, primary-treated effluent will continue to flow into the lake for some time until a final sea or land disposal system has been built. Even then, a significant amount of industrial sewage will still be discharged into the lake, and while that occurs, significant improvements in the water quality of the lake may be impossible to achieve.

The statistics on the incidence of water-borne diseases compiled by the ECG tend to demonstrate that Project activities have contributed to a decline in the incidence of most such diseases.

c. "The primary beneficiaries being the permanent urban poor residents":

This Report has previously noted that the Project activities involving installation of sewage collectors and laterals have been located in the poorer areas of the City. This was supported by the findings of the ECG survey of Project Area residents. It is those people who have benefitted the most from the elimination of sewage flooding and ponding in the streets. Therefore, we believe that the program was well conceived and that the primary beneficiaries are the urban poor residents.

2.60 Conclusions

1. The installation of laterals and collectors in over 90% of previously unsewered portions of the Project Area and improvements to existing lines have resulted in a dramatic reduction in the problem of sewage flooding/ponding in the streets of that Area.

2. The incidence of water-borne diseases, in general, has decreased in the Project Area; to a significant extent this can be attributed to the decrease of sewage flooding/ponding in the streets as a result of Project improvements.

3. Between 1980 and 1990, the Infant Mortality Rate for the City of Alexandria decreased by 60% from 69.51/1000 to 25.95/1000. Local environmental health experts are convinced that this dramatic decline is at least partly due to the impact of Project activities.

4. Since sewage discharges along the Mediterranean beaches are reported to be reduced during the summer months, the water quality there may improve during that period. However, until the two primary-treatment plants are operational and a new site for effluent disposal becomes a reality, the overall water quality of the Mediterranean in the vicinity of the City is not likely to improve.

5. It is difficult to determine whether there has been any improvement in the water quality of Lake Maryout for three reasons: (1) domestic sewage flows are not yet being processed by the two primary-treatment plants, which are still under construction; (2) the Project does not provide for treatment of industrial wastes which, for the most part, are still being discharged without pretreatment into the lake and; (3) the impact of discharging the effluent has not been measured.

2.70 Recommendations

1. The Egyptian authorities should expedite completion of the missing elements of the wastewater collection and treatment network of Phase I in order that a complete system is able to function. These unfinished facilities are: expansion of the pumping capacity of the Kalaa pump station, completion of the Smouha and East Zone undercrossings, surge control facilities for the New Smouha and East Zone pump stations, West Plant mechanical sludge dewatering system, sludge disposal at Site 9N, standby generators for the treatment plants and the East Zone pump station, completion of secondary and lateral sewers in the West Zone, completion of laterals in Smouha, resolution of defects and blockages in the Siouf area system, and completion of start-up tasks for various collectors throughout the network. Addtionally, AGOSD should pursue planned improvements to the Smouha and Hydrodrome drain systems to alleviate occasional overloading caused by sporadic heavy-rain storm events.

2. The Egyptian authorities should begin as soon as possible to implement a plan requiring the pretreatment of industrial wastes for those industries discharging into the sanitary sewerage system, Lake Maryout, and the Mediterranean Sea.

3. In order to achieve a more analytical approach to the Project effectiveness of environmental goals, a formal testing plan should be implemented to monitor key parameters of water quality in Lake Maryout and the Mediterranean to allow trends in this area to be documented.

4. If the GOE wishes to pursue obtaining the goals established in the original Master Plan, a decision should be made on the issue of land disposal vs. sea disposal of effluent from the City's wastewater system, and appropriate action should be taken by the GOE to attract potential funding sources for the selected option.

SECTION 3.0

PHYSICAL PROGRESS ELEMENT

SECTION 3.0
PHYSICAL PROGRESS ELEMENT

3.10 Introduction

3.11 Scope

The overall goals and objectives of the Alexandria Wastewater System Expansion Project can only be achieved if all the physical components of the Project are constructed properly and integrated into an overall treatment and disposal network. This portion of our investigation was directed toward evaluating the extent to which the Project goals and objectives relating to physical progress are being achieved. We were asked to answer the following questions:

1. How many projects are completed?
2. What projects are on-going, and when are they likely to be completed?
3. What sub-projects are on-going, and when are they likely to be completed?
4. What is the quality of the work completed and on-going?
5. Does it meet Project and GOE Standards?

We were also asked to assess the implementation schedule of activities and determine the implications for timely completion relative to achievement of Project goals and objectives; identify activities implementated behind schedule; note the degree to which difficulties have compromised the goals and objectives; and review the present program management structure to determine whether roles and responsibilities are properly defined.

3.12 Methodology

Appendix 3 discusses the manner in which we approached this task.

3.20 Observations

The Project includes six USAID-funded Sub-Project construction contracts. Three of these contracts are completed, and the remaining three are expected to be completed by the end of 1993. The six Sub-Projects include 18 identified project tasks controlled by WWCG and its predecessor, CDM. AGOSD funded 30 additional construction project tasks.

Of the 17 identified proejct tasks associated with this Project (see attached tabulation), 11 are known to be completed, and 7 are known to be ongoing. Nine of the known completed project tasks finished behind the original schedule, and 4 of the known ongoing project tasks are behind the original schedule. Although attempts were made to determine the status of the 30 AGOSD-controlled project tasks, this information was not forthcoming form AGOSD.

3.21 Schedule vs. Actual Start and Completion Dates

Table 3-1 - WWCG Controlled Projects and Table 3-2 - AGOSD Controlled Projects presents a listing of all sub-projects and their start and finish dates. Many of the AGOSD-supervised and/or controlled sub-project start and finish dates are not presented since their status was not provided by AGOSD. USAID provided dates associated with the contracts administered by CDM. All other projected completion dates were provided by WWCG staff, and are estimates only.

3.22 Quality of Construction

We visited each of the Project construction sites during our review and found the overall quality of the constructed sub-projects designed and supervised by WWCG to be excellent. The quality of the concrete work at the East and West treatment plant sites is among the best we have seen. The mechanical and electrical equipment is of high quality and well-installed.

We believe that the WWCG Project design effort was well executed and managed. The WWCG design team carefully considered the aspects of operability and maintainability of the finished facilities.

Table 3-1 - WWCG Controlled Projects

Task Name	Original Start Date	Actual Start Date	Original Finish Date	Actual Finish Date
Contract N/A (Administered by CDM)				
Sporting Pump Station and Force Main	Apr-83	Sep-84	Feb-86	Feb-87
Ras El Soda Pump Station	Apr-83	Sep-84	Feb-86	Feb-87
Collector General Relief Sewer	Apr-83	Sep-84	Feb-86	Feb-87
Contract 01-AID-83/84				
Abu Qir Pump Station	Apr-83	Jul-85	Feb-85	(1)
Maamoura Pump Station	Apr-83	Jul-85	Feb-85	Jan-89
Sidi Bishr Pump Station	Mar-83	Jul-85	Apr-85	Jun-89
New Smouha Pump Station	May-83	Jul-85	Jun-85	Jun-89
East Zone Pump Station	Apr-83	Jul-85	Dec-85	Jun-89
Contract 02-AID-83/84				
Smouha Combined Collectors	Nov-85	Nov-85	Nov-88	Jul-88
Sioul Keblia Collectors	Nov-85	Nov-85	Nov-88	Nov-88
West Zone Collector	Nov-85	Nov-85	Nov-88	Jun-90
East Sludge Conveyance	Nov-85	Nov-85	Nov-88	Jun-90
Contract 03-AID-83/84				
East Plant Upgrade	Jul-83	May-87	Jul-85	Feb-92
West Plant Upgrade	Aug-84	May-87	Sep-85	Feb-92
Contract 04-AID-83/84				
Mechanical Sludge Dewatering	(2)	(2)	Jul-91	Jul-93
Site 9N Sludge Disposal System	(2)	(2)	Jul-91	Jul-93
Stand-By Power	(3)	(3)	(3)	(3)
Contract 07-AID-83/84				
Smouha & East Zone Undercrossings	(2)	(2)	Jul-91	Oct-93

Notes:

(1) Project transferred to AGOSD/status unknown
(2) Major project concept change/therefore no early start or finish available
(3) New sub-project/expected to be added to Contract #4

Table 3-2 - AGOSD Controlled Projects

Task Name	Original Start Date	Actual Start Date	Original Finish Date	Actual Finish Date
Contract 09-84/85				
East Zone Force Main	Apr-83	[1]	Dec-85	[1]
Contract 08-84/85				
Smouha Force Main	Apr-83	[1]	Jun-85	[1]
Smouha Drain Improvements	May-82	[1]	Oct-85	[1]
Contract 06-84/85				
Hydrodrome Drain Improvements	[1]	[1]	[1]	[1]
Contract 17-81/82				
Abu Qir Force Main	Jul-82		Feb-85	Complete
Contract 34-81/82				
Smouha Collectors	[1]	[1]	[1]	Complete
Contract 02/03-82/83				
Existing Pump Station Rehabilitation	[1]	[1]	[1]	[1]
Contract 41-82/83				
Force Main Pump Station 6E,7E & 8E	[1]	[1]	[1]	Complete
Contract 39-82/83				
Blower Installation	[1]	[1]	[1]	Complete
Contract 45-82/83				
Sidi Bishr Collector	Aug-82	[1]	Apr-85	Complete
Contract 31-82/83				
Force Main Pump Station 11E	[1]	[1]	[1]	[1]
Contract 08-82/83				
Abu Qir Force Main & Collector	Aug-82	[1]	Feb-85	Complete
Contract 07-82/83				
Smouha Laterals	Jun-85	[1]	Nov-85	Complete
Contract 55-82/83				
Sidi Bishr Conveyance	[1]	[1]	[1]	Complete
Contract 08-83/84				
Abu Qir/Maamoura Laterals	Jun-83	[1]	Jun-87	[1]
Contract 22-83/84				
WTP Surcharge & Fill	[1]	[1]	[1]	Complete
Contract 09-83/84R				
Sioui Keblia PH 3&4	[1]	[1]	[1]	90-95%
Contract N/A				

Task Name	Original Start Date	Actual Start Date	Original Finish Date	Actual Finish Date
Sporting & Ras El Soda P.S.	{1}	{1}	{1}	Complete
Contract N/A				
Abu Qir P.S.	{1}	{1}	{1}	{1}
Contract N/A				
Abu Qir P.S.	Apr-83	{1}	Feb-85	{1}
Contract N/A				
Abu Soliman Collector	{1}	{1}	{1}	{1}
Contract N/A				
Ras El Soda I,II,III (Collectors)	May-82	{1}	May-85	{1}
Contract N/A				
Ras El Soda IV (Collector)	Aug-82	{1}	Aug-84	{1}
Contract N/A				
Madras	{1}	{1}	{1}	{1}
Contract N/A				
M.Kamir	{1}	{1}	{1}	{1}
Contract N/A				
El Bassara	{1}	{1}	{1}	{1}
Contract N/A				
West Harbor Relief Sewer	{1}	{1}	{1}	{1}
Contract N/A				
General Relief Sewer	{1}	{1}	{1}	{1}
Contract N/A				
Misc. Related Work	{1}	{1}	{1}	{1}
Contract N/A				
Other P.S. Modifications	{1}	{1}	{1}	{1}
Contract N/A				
AGOSD Urgent Projects	{1}	{1}	{1}	{1}

Notes:

{1} Status unknown - no Information provided by AGOSD when requested during project review

Although we tried to gain access to AGOSD supervised facilities, we were not given permission to visit them during our 4-6 week stay in Egypt. However, we stopped by the Abu Qir Pump Station as we were traveling to another site. Although the concrete and mechanical/electrical work on this station is not complete, we judge the construction to be of lesser quality than the WWCG-supervised facilities we visited. However, the visit to the Abu Qir pump station was very cursory and non-scheduled, and we were not able to complete a thorough technical review of the facility.

3.30 Analysis

This Project is very complex with very many interdependent sub-tasks; therefore, it is not surprising that the schedule has changed many times throughout the life of the Project. As the scope changed due to technical problems or administrative complications, the schedule was adjusted to reflect the time needed to take corrective action.

The first rough, estimated schedule for the completion of the Project was proposed in the CDM Master Plan in 1979. At that time, with the scope of work then envisioned, the schedule called for completion of Phase I of the Project in 1983 with Phase II being completed in 1988 and Phase III in 2000. These dates were only an estimate of the time needed to complete each phase of the Project (as they were then defined), and each was subject to change when more detailed analysis of the Project needs was addressed.

In 1979, the USAID/Arab Republic of Egypt Grant Agreement updated the Phase I estimated completion date to 1985 (an addition of approximately 2 years over previous estimates). This estimated completion date must also be considered very preliminary since no well-defined planning for the Project had taken place by that time. Future analyses would greatly change the schedule dates.

In 1982, WWCG presented the first estimate of completion dates based on a detailed evaluation of the Project requirements in their report entitled "Phased Implementation Plan for the Rehabilitation and Expansion of the Alexandria Wastewater System" (PIP). This report presented

estimates of the completion dates for each of the major elements of the proposed Project. Basically, the PIP estimated completion of Phase I work by 1988 (an addition of 3 years over previous estimates). This time difference can be attributed to making realistic estimates of the conditions which would be encountered, multi-agency coordination to be performed, and logistical demands to be overcome.

Since the 1982 WWCG Phased Implementation Plan presents the first estimates of completion dates based on a detailed analysis of realistic conditions, we have selected these estimates as the basis for our review of physical progress. Therefore, based on our research and discussions with WWCG and USAID/Egypt, we chose the 1988 completion date as the baseline date for comparison of scheduled versus actual completion of Project activities.

From 1983 through 1989, the Second through Sixth Amendments to the Grant Agreement changed the scope of the Project by removing some elements and adding others (based on additional study and political decisions). These changes caused the estimated completion dates for the Project to be modified numerous times. Currently, the 1987 Fourth Amendment to the Agreement provides for a completion-of-construction date of 31 December 1992.

In 1990, WWCG prepared a report entitled "Phased Implementation Plan Update for the Rehabilitation of the Alexandria Wastewater System". This report stated that the work to be completed under Phase I would not meet the total objectives for the Project as originally specified. This report also gave updated estimates of completion dates based on current conditions and anticipated Project requirements needed to meet all the original Project objectives. The schedule basically stated that if all the original objectives of the Project were to be met, the completion date would be 1997 for both Phases I and II. However, the Second Amendment to the Project adopted in 1983 limited USAID overall Project objectives to Phase I components.

Table 3-1, USAID Funded Projects, presents a listing of the start and finish dates for each of the WWCG controlled sub-projects that make-up the Alexandria Wastewater System Expansion Project. Table 3-2, AGOSD-Funded Projects, presents a similar listing of the 30 AGOSD sub-projects. Considering the magnitude and complexity of this Project, and the coordination required between the funding agencies of two different countries, it is not surprising that scheduling slippage would occur.

The latest estimated date for completion of Phase I construction is 31 December 1993, with total Project completion estimated for the end of 1994. This is not a firm date, but one based on contract award and construction-time requirement estimates. Our evaluation of the Project schedule on this basis indicates that there is a 5-year difference in the baseline date of Phase I completion and the current estimate for actual completion of construction, and a one-year difference between the current amended Agreeement date and the estimate for completion of construction.

We believe that the principal factors contributing to delays stem from the following:

- Untimely decision-making on the part of AGOSD concerning major project components, the selection of contractors, slow award of contracts, and delays in approving necessary change orders. These factors accounted for years of delay on the sludge handling facility contracts and the wastewater conveyance tunnels.

- Soils and groundwater conditions were vastly different and considerably more difficult to deal with than those anticipated at Project inception thereby causing major delays in the construction of some of key facilities such as the East and West treatment plants.

- There were numerous delays encountered by WWCG involving administrative contractual disputes between AGOSD and WWCG prior to the effort being changed to a USAID-direct contract.

3.40 Obstacles

Below we present a series of major program deficiencies that require prompt corrective measures to assure Project success. These deficiencies were identified by reviewing Project records, interviewing WWCG and USAID/Egypt Staff and inspecting the constructed facilities.

Several facilities/tasks that were to be completed by AGOSD as part of Phase I of the Project have not been completed and may limit the constructed works from achieving the full intent of the Project goals and objectives. Construction of secondary and lateral sewers and building connections in the West Zone for Fisherman's Village, Nouzha Village, El Matar, and similar locations are not complete. Some portions of the Smouha Area are not as yet served by the sewerage system. Many tasks associated with the start-up of various collectors—making flow diversions, removing temporary plugs, making necessary final connections and the like—have not been completed. These items were reported in WWCG's April, 1990 Implementation Plan Update and to the best of our knowledge have still not been addressed by Egyptian officials.

A number of the Phase I components have not been completed at this time. If they are not completed prior to the end of construction of the other major elements of the Project, the entire system will not function as planned.

The more notable shortfalls are:

1. Smouha and East Zone Under-crossings construction was delayed and will cause the delay of the effective use of the East Plant until 1993, at the earliest.

2. West Plant Sludge Dewatering and Site 9N Sludge Disposal Facilities will not be completed until 1993. Since these facilities must be operational prior to the start-up of the upgraded wastewater treatment plants, the entire Project will likely not be fully operational until the end of 1993.

3. Stand-by power is needed at the New Smouha and Sidi Bishr pump stations. Although the stand-by generators are not required to begin operation of the total Project, they are needed to insure the long-term successful operation of the system.]

4. Surge Control (East Zone and New Smouha Pump Stations) must be added to the East Zone and New Smouha Pump Stations prior to their being put permanently on-line.

Several important components of the system are not being constructed as part of Phase I and were deferred to Phase II of this Project. The lack of these facilities will prevent the constructed works from achieving the full intent and objectives as originally specified and restated in the 1981 Master Plan Review and Update.

A safe and permanent long-term means of disposing of the East and West Plant effluent must be designed and installed for the Project to fully meet all the original goals and objectives. In 1993, when the Phase I facilities go on-line, the primary effluent from the East and West Plants will be discharged to Lake Maryout since no long-term means of disposing of the effluent has been constructed as part of Phase I. This interim solution to the effluent disposal problem is not suitable as a long-term solution. We believe that Lake Maryout is not capable of assimilating the plant effluent for a long period without further degradation. Also, we question whether the discharge of primary effluent to Lake Maryout will meet the Project goal of protecting the health of the citizens of Alexandria.

Phase I construction of the Project did not include the provision of a wastewater collection and conveyance system for the densely populated Central Zone of the City. Presently, the untreated wastewater from this district is discharged, untreated, into the East Harbor during at least part of each year. This problem will remain unaddressed after the completion of Phase I construction in 1993. This problem must be corrected by GOE if the total health and environmental goals of the Project are to be met.

The Smouha and Hydrodrome drains have capacity limitations which result in overloading of these components during sporadic heavy rainfall storm events. In order for the system to function as intended on a continuous year-round basis, improvements to these facilities is necessary.

Expansion and enhancement of the wastewater treatment and sludge management facilities that will eventually serve the Central Zone must be completed by the GOE if the goals and objectives are to be met. This work is required because the Phase I facilities were not designed or constructed to accommodate the Central Zone wastewater flows. Also, depending on the method chosen for long term disposal of treated wastewater, the East and West Plants may both need to be upgraded from primary treatment to a higher level of treatment.

Presently, industrial wastes (much of which is reported to be toxic) are discharged to the Mediterranean Sea, Lake Maryout, or the sewage collection system. This method of industrial waste disposal is not acceptable from an environmental or human health standpoint and must be corrected. Biological methods of wastewater treatment are not compatible with many of these toxic wastes; continued discharge of such wastes into the sewerage system may have a profound effect on the future cost of upgrading the East and West plants to provide secondary treatment.

3.50 Impact of Schedule Deviations

The impact of schedule slippage on the Project is very difficult to quantify. However, we believe that the effects have been the following:

a. An increased cost to complete the Project.

b. A loss in the use of the system during the period from the original baseline completion date until actual beneficial use at the end of 1993.

c. The potential for future operations and maintenance problems due to equipment sitting idle for long periods. Also, the manufacturer's warranties will have expired before some of the major Project facilities are finally put into service.

3.60 Management Evaluation

The Scope of Work description in the Evaluation Contract which addresses the Physical Progress element requires that Briley, Wild & Associates evaluate the management of the Project. Specifically, the Scope states:

> "Review and present overall management structure of the Project to determine whether roles and responsibilities are well-defined."

In order to assess the overall management of the Alexandria Wastewater Systems Improvement Project, we initially looked at how USAID administers its programs in Egypt. We met first with Mr. Dan Vincent, P.E., at the WWCG offices in Alexandria, and were introduced to the Alexandria USAID liaison officer, Mr. Sayed Hassaan. This was followed by a visit to the Cairo office of USAID to meet Mr. Mike Gould, the Director of the Office of Urban Administration and Development, and other USAID staff personnel.

Once an understanding of the USAID organizational, structure, and procedures was achieved, we evaluated the management structure of the WWCG organization as it impacts the Alexandria Project.

3.61 Methodology

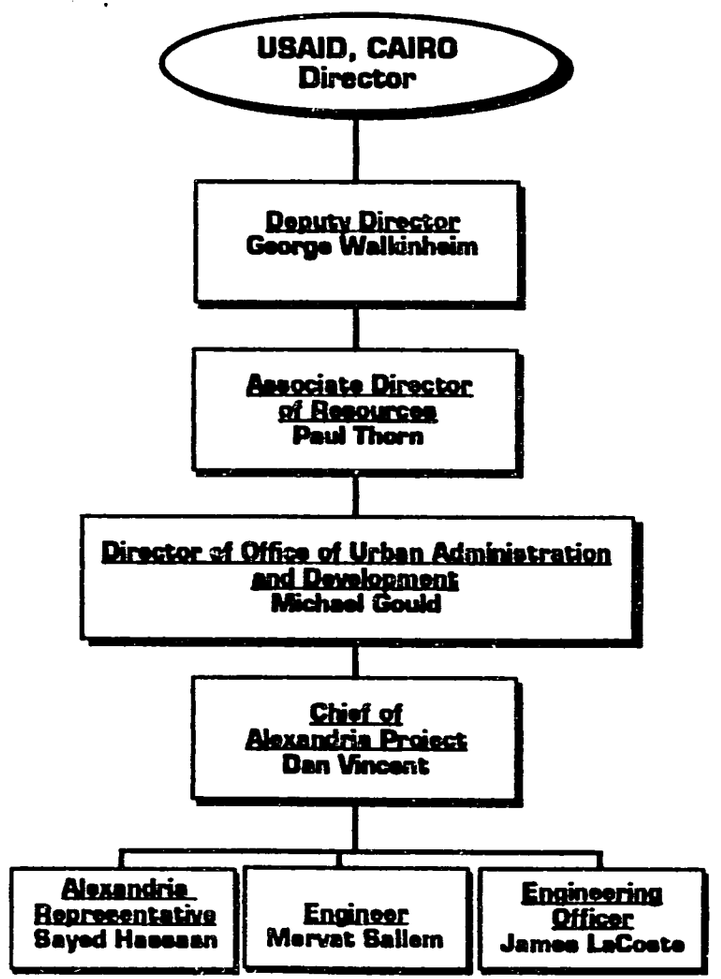
The methodology we devised to evaluate the management structure is contained in Appendix 3.

3.62 USAID Cairo Management Structure

All USAID activities in Egypt are administered from the Cairo office, which, has a staff of approximately 100. The organization of this office is depicted in Figure 3-1. During the investigation stage of our work effort, the Cairo office was under the direction of Mr. Marshall Brown, assisted by the Deputy Director, Mr. George Wachtenheim. The actual management of construction projects is administered through the Office of Urban Administration and Development, directed by Mr. Mike Gould. Each USAID-funded Project in the country is assigned to a Project Chief. In the case of the Alexandria Project, the Project Chief is Mr. Dan Vincent, P.E. Supporting him are Ms. Mervat Sallem, in the Cairo office and Mr. Sayed Hassan, who is based at the U.S. Consulate building in Alexandria.

USAID provides day-to-day liaison with WWCG and AGOSD through Mr. Sayed Hassaan in Alexandria. Additionally, Mr. Vincent frequently visits the Alexandria area on a routine basis to coordinate the complex activities of this Project. These visits, which generally cover a two-day period, are usually on an every-other-week basis, supplemented by additional trips as Project activities warrant.

ORGANIZATION OF USAID, CAIRO
(Relative to Alexandria Project)



PREPARED BY
BRILEY, WILD & ASSOCIATES, INC.
CONSULTING ENGINEERS & PLANNERS

FIGURE 3-1

Close communication between USAID and WWCG is essential to execute a complex Project such as this. There were no indications of unsatisfactory communications between the two organizations. Given the circumstance and limitations that both organizations must work with in Egypt, it is believed that USAID is providing the guidance and direction necessary for WWCG to accomplish its mission.

3.63 The Current WWCG Management System

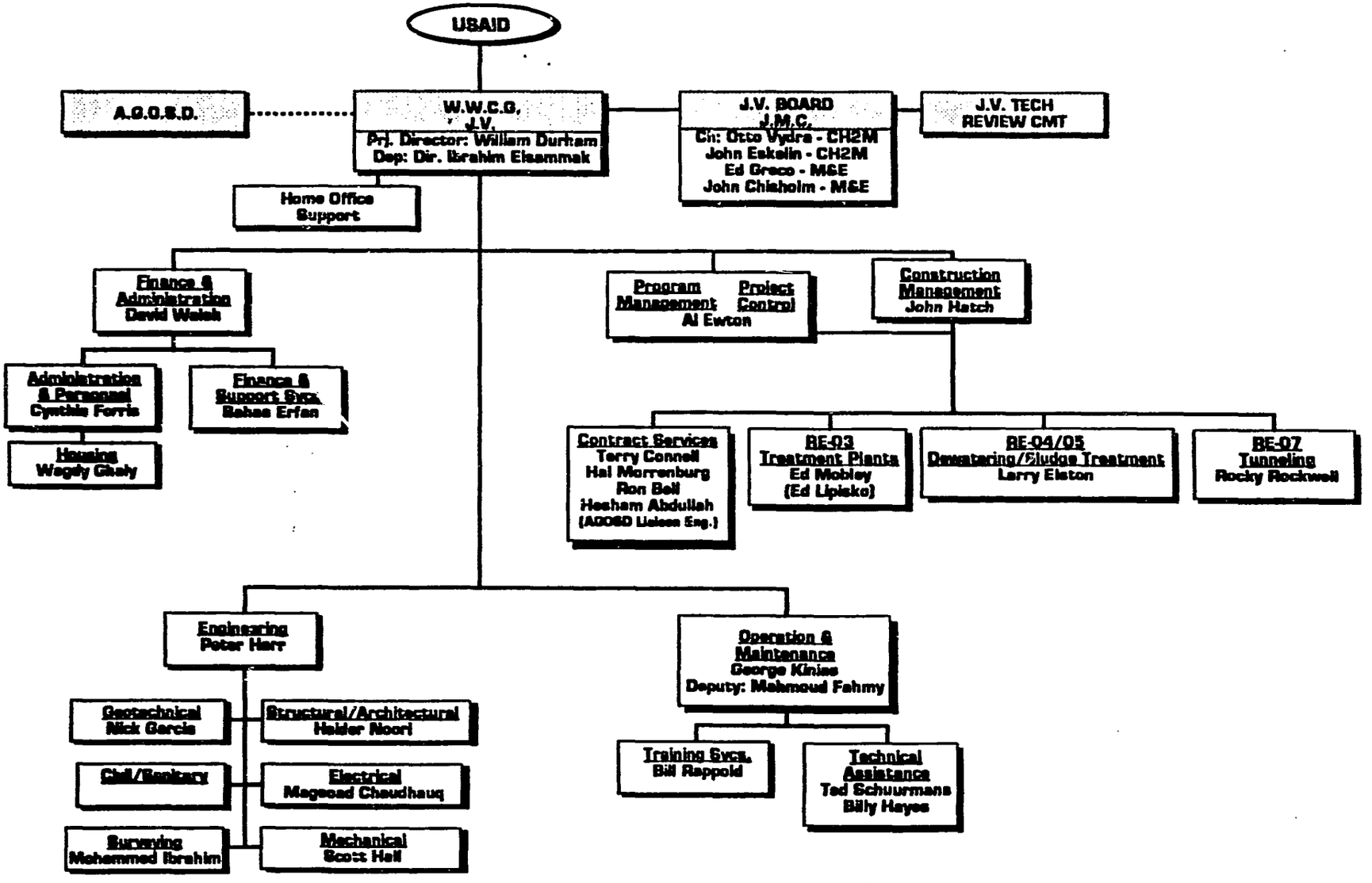
The Alexandria office of the Wastewater Consultants Group is operated under the concept of a strong Project Director who is tasked with the ultimate responsibility for the successful performance of that office. The current Project Director, as previously identified, is Mr. William Durham, an employee of the Metcalf & Eddy half of the joint venture.

Parenthetically, two covenants of the joint venture are that each of the two firms will provide approximately half the work effort, and senior managerial positions will be divided between them through routine rotation of these positions between employees of each firm.

Reporting directly to Mr. Durham are Mr. David Walsh - Director of Finance and Administration, Mr. John Hatch - Director of Construction Management, Mr. Peter Harr - Director of Engineering and Technical Support, and Mr. George Kinias - Director of Operations and Maintenance. Mr. Al Ewton, who provides Program Management and Project Control support, has dual reporting responsibilities to Mr. Durham and Mr. Hatch.

While the organization chart depicted in Figure 3-2 represents the current management structure of the Alexandria office, the organizational structure of the WWCG group has historically been a dynamic one, evolving since Project inception. It became apparent in our conversations with the management staff that organizational obstacles to the efficient operation of staff functions are under constant evaluation. Such evaluations are necessary for several reasons. First, much of the Alexandria staff is on a rotation basis, with a minimum assignment duration of two years. Secondly, individual strengths can be optimally utilized by varying responsibilities to take advantages of those strengths; and thirdly, the dynamic nature of the Project requires differing staffing levels to meet changes in Project phase and construction challenges.

ORGANIZATION OF W.W.C.G.



PREPARED BY
BAILEY, WILD & ASSOCIATES, INC.
CONSULTING ENGINEERS & PLANNERS

FIGURE 3-2

As in any organization, good communication among the various departments enables the Project team to focus on the overall Project objectives, as opposed to pursuing single-purpose individual department objectives. WWCG addresses this elusive goal through weekly management staff meetings. At these meetings each department head provides a summary of the current work being accomplished, and reviews achievements, schedules and potential obstacles. These briefings enable the Project Director to address goal conflicts in a timely manner.

3.64 Interview Comments

The outline used in the interviews with the WWCG Department Managers is shown in Appendix 5. The seven elements were intended to provide some uniformity to the discussions so that responses could be correlated.

3.65 General Discussion of Management Organization

The WWCG Project Team management system provides that a single person be responsible for the overall execution of the Project. This type of management system requires that the Project Director maintain a detailed knowledge of the various Project elements and that he be involved in much of the Project Team decision-making process. The Project Director also maintains the relationship among the three major Project participants, e.g.: USAID, AGOSD, and WWCG.

The Department Managers generally agreed that the WWCG organization functions basically within the framework that the organization chart portrays. Although the chain-of-command generally follows the organizational chart network, communications among various team members frequently follow more informal lines for reasons of expediency. Normally this method provides for efficient Project execution, although occasionally failure to inform affected parties can create minor annoyances.

The WWCG organization chart does depict a rather unusual arrangement with respect to the Program Management/Project Control section, in that two lines of command appear to address this section. We questioned this arrangement, and understand that this group of staff members actually provides support scheduling and cost estimating data services to the other three departments of the WWCG organization. Consequently, some of their activities are provided on a direct line basis with the other departments, while at other times they function as an extension of the Construction Department.

Any joint venture between two companies has many obvious obstacles to overcome. However, the joint venture between Metcalf & Eddy and CH2M Hill appears to be working well. The goal of any joint venture is to use the specific talents of the associated firms to best serve a client. It would be unusual during the long term of this Project that problems did not develop as a result of the joint venture. However, in our relatively short investigation, there were no major problems that could be clearly attributed to such an arrangement.

During the discussions with the WWCG management staff we solicited comments regarding how the organization might be improved and also asked if there were any organizational needs that should be addressed in this report. Two issues emerged. The first was that communication among the various departments and team members needs continued vigilance to avoid pursuit of individual goals without consideration of how they might affect the overall Project goals. The second issue showed a need to clarify the Management/Project Control section in relation to the rest of the organization. We believe that the organization is well structured and suited to the personalities and capabilities of assigned Project staff.

A major measure of a management organization is how well the organization is accomplishing its mission. There are certain examples of where an organization can perform well in spite of its management structure. This is not believed to be the case with WWCG. While working on a very large Project, subject to many obstacles and changes that are most often beyond WWCG's control, the mission is being accomplished. This is due to a functional management organization that is staffed with a highly dedicated and professional staff.

3.70 Conclusions

We offer the following conclusions relative to the physical progress review of the Project:

1. Phase I of the Alexandria Wastewater System Project when completed in 1994 will provide the City of Alexandria with a modern expansion of the City's wastewater systems supported by a trained staff with the facilities necessary to operate and maintain the upgraded system. The expanded collection and treatment systems maintain significantly contribute to the health and well-being of the citizens of Alexandria.

2. Phase I of the Project, however, will not meet the total original program goals and objectives until additional components (scheduled for Phase II or later) are completed by the GOE.

3. Phase I completion and full utilization of the Project may be initially limited if AGOSD-funded components are not completed when the USAID-funded elements are finished.

4. The majority of the USAID-funded Project elements are well on their way to being completed, and the works completed to date are of high quality.

5. The schedule slip, amounting to 5 or more years beyond the Project baseline date, is largely due to soil and groundwater conditions that varied greatly from those anticipated, and from lack of timely response and decision-making by AGOSD. In 1987 most of this slip was recognized, and the Fourth Amendment revised the completion-of-construction date to 31 December 1992.

6. The overall management of the Project seems to function well, particularly considering the cultural differences between the two governments.

3.80 Recommendations

We offer the following recommendations relative to the physical progress review of the Project:

1. USAID should, in coordination with AGOSD, continue its efforts to complete the remaining U.S. and LE-funded construction contracts by the end of 1993 and should continue with the O&M assistance for one additional year after the completion of the Project facilities.

2. USAID and WWCG should continue efforts to influence AGOSD to develop and implement effective Project management procedures such that future Project construction delays will not recur. Specifically, AGOSD contractor selection, contract award and change order approval procedures require extensive streamlining.

3. A preventative maintenance program, including a schedule for exercising idle equipment, should be continued and expanded to protect all completed Project equipment until full operation is begun.

4. With respect to the management of the Project, we suggest that:

   a. The WWCG Project Director conduct a weekly meeting to include only department heads to discuss current Project issues.

   b. The management/Project control section reporting mechanism should be adjusted to effect a single line of command.

SECTION 4.0

SUSTAINABILITY OF PROJECT

SECTION 4.0
SUSTAINABILITY OF PROJECT

4.10 Introduction

4.11 Specific Objectives of this Investigation

This investigation was aimed at evaluating the extent to which the Project goals and objectives relating to sustainability are being achieved. More specifically, we were to examine the status of the existing USAID constructed facilities, the operations and maintenance provided at these facilities and the O&M assistance effort provided by O&M contractors. The culmination of our investigation is to draw conclusions relative to the sustainability of the Project and recommend corrective measures if necessary.

Our contract scope of work outlines several key steps to accomplish this evaluation. They are:

1. Analyze condition of facilities constructed under this Project.
2. Analyze condition of USAID facilities constructed prior to this Project.
3. Review O&M plans.
4. Review adequacy of training provided by WWCG.
5. Review staffing levels available for O&M activities.
6. Review adequacy of budgetary resources.
7. Review spare parts acquisition and availability.

8. Determine the extent to which the overall Project goals and objectives are being met.

9. Recommend any applicable corrective measures that may assure maximum benefit from USAID investments in the Project.

4.12 Specific Sustainability Objectives of USAID Alexandria Project

During our investigation we were tasked with evaluating the extent to which the goals and objectives of the Project were being met. The goal of the O&M Program, as conducted by WWCG, is:

> "To develop within AGOSD the capability to operate and maintain the pump stations and treatment facilities to ensure the maximum sustainability of the USAID-funded facilities constructed in Alexandria."

Specific objectives of the O&M program were developed by WWCG to achieve the Project goal. They are:

1. Provide tools, spare parts, and materials.

2. Provide skills training.

3.. Assist in the development of a Training and Technical Assistance Organization within AGOSD.

4. Develop Operations and Maintenance Management Programs, Procedures and Systems.

5. Provide Hands-On and Site-Specific Technical Assistance.

Secondary objectives of the WWCG program are aimed at influencing the methods and practices within AGOSD to improve its performance in several areas. These objectives are to motivate and instill professionalism in the O&M staff of AGOSD and to influence changes in its

financial and management structure. The ability of WWCG to achieve some degree of success regarding these secondary objectives may be crucial to achieving the overall success of the Project goals and objectives.

Operations and maintenance consulting services have been provided to some degree by the engineering consultants who performed engineering design services for the USAID-funded facilities. O&M services for the Ras El Soda Pump Station and the Sporting Pump Station were originally provided by Camp Dresser and McKee (CDM). The remainder of the USAID-funded facilities were provided O&M services by WWCG as part of its engineering contract. O&M services typically provided by engineering consultants are limited to O&M Manuals, start-up assistance, and limited operator training services.

4.13 Approach

In 1990, a "Comprehensive Operations and Maintenance Program" scope was added to the WWCG engineering and construction management contract. This additional work was incorporated into the existing contract as Contract Modification Number 5, effective 10 July 1990. This evaluation of WWCG's O&M activities is therefore somewhat preliminary since the 3-year Comprehensive Operations and Maintenance Program was initiated only 8 months prior to this evaluation.

The investigation was conducted by Professional Plant Operations, Inc., a utility management consultant subsidiary of Briley, Wild & Associates, Inc. The investigation consisted of reviews and evaluations of operation and maintenance activities of both AGOSD and the consulting services provided by WWCG. The methodology we developed to complete this element of the evaluation is described in Appendix 3.

4.20 Status of Existing Project Facilities

4.21 Physical Condition

The physical condition of the existing Project constructed facilities was evaluated to determine the effectiveness of the O&M procedures and practices of AGOSD. We reviewed WWCG equipment condition reports and physically examined several pump station facilities. The Maamoura Pump Station was examined most closely in the WWCG report.

The WWCG equipment condition investigative report of the Maamoura Pump Station identified several items needing corrective action. The most serious problem noted was severe corrosion of the mechanical bar screen. The carbon steel construction of the bar screens requires a high degree of maintenance effort on the part of staff to maintain the integrity of protective coatings due to both the corrosive nature of the sewage and the proximity of the Mediterranean Sea. The condition of the screens indicated that they were *not* receiving sufficient maintenance attention.

Sewage pumps and motors at the Maamoura Pump Station appeared to be in excellent condition with the exception of a grease slinging problem associated with the drive shafts. WWCG responded to an assistance request by the pump station personnel and recommended replacement of automatic grease units with simple mechanical fittings. That action had not been performed at the time of the our visit.

We found the housekeeping of the Maamoura pump station to be generally good. The pump and motor room , the motor control center room and the operators office were kept quite clean and orderly, in contrast with WWCG's findings since WWCG inspected the station in November, 1990. Perhaps this indicates that the pump station personnel are now giving housekeeping duties a higher priority.

While WWCG reported fair to very poor housekeeping at all the WWCG pump stations, we examined most of the other pump stations in a cursory fashion and determined that the physical appearance was generally good and comparable to that of the Maamoura Pump Station. The Sporting Pump Station, however, was an exception.

The appearance of the Sporting Pump Station was extremely poor during our visit. A serious lack of cleanliness was immediately apparent. Trash and debris littered the station both inside and out. The lack of good housekeeping is not the result of insufficient staffing since six operating personnel were on duty at the time of our visit. The WWCG inspection report also states that the exhaust fan in the wet well was inoperative because of a broken fan belt. This has created not only a corrosion problem but a safety hazard since hazardous gases can collect and also cause a severe oxygen deficiency. The flow meter at this station was also inoperative at the time of our visit. The WWCG technical assistance status report indicates specialists are currently investigating alternatives for its replacement with a more appropriate type of flow meter.

We believe that a major factor inhibiting adequate maintenance of this facility is the lack of debris removal devices in this pump station. Improvements to the physical plant will significantly enhance the sustainability of this facility.

Our physical condition investigation, due to time and personnel constraints, was limited to visual inspection of the condition of the facilities equipment. The WWCG investigation which was much more in depth, however, involved detailed analysis of equipment condition including specialized electronic testing equipment. This report indicated that the equipment condition of the older Project constructed stations (Sporting and Ras El Soda) was generally poor. The fact that no formal preventive maintenance program was in place leads us to believe that the relatively good condition of the WWCG constructed stations is due to their short operating life and not the result of maintenance efforts.

4.22 Procedures and Practices

During our visits to the pump stations, we observed ongoing O&M activities and talked with the operators about the procedures and practices at their facility and generally throughout AGOSD. When asked about standardized written procedures and practices, the foreman of the Maamoura Pump Station reported that none existed. We were also advised by the plant operators that, to their knowledge, preventive maintenance procedures, schedules and records did not exist.

Because the pump stations have been in service for a relatively short time, the limited operating history of the facilities made it difficult to draw accurate conclusions regarding adequacy of procedures and practices based on the physical condition of the facilities. The disparity between the condition of the pump stations, however, signifies a lack of strong centralized management of the facilities. This is borne out by WWCG, which reports that the Districts which make up AGOSD have a high degree of autonomy regarding the total care of facilities within their jurisdiction. Suggestions regarding centralization of O&M services have been made to AGOSD by WWCG on several occasions since the December, 1987 time frame.

The lack of standardized operations and maintenance procedures and practices and the absence of a preventive maintenance program can seriously impair the sustainability of the facilities. These areas should be a primary focus of future training and assistance efforts The preventive maintenance program should be given a high priority; otherwise, excessive equipment wear and tear will result in a shortened useful life of the pump station facilities.

78

All of the pump stations we visited were being operated in a manual mode even though the stations were designed and constructed for simple-level controlled automatic operation. The operators ostensibly were operating in the manual mode because of their distrust of automatic systems. While manually turning pumps on and off does not in itself pose a problem, it does create a situation in which a simple human error can cause damaging sewage overflows. The AGOSD operators must be trained to accept the principles behind and benefits of automated control systems.

The Maamoura Pump Station staff expressed difficulties communicating because no telephone was available at the pump station. In our opinion, telephones are necessary for prompt reporting of problems, ordering supplies, responding to emergency situations, and for other communication needs. We believe that a modern pump station facility with a staff of 18 people should be equipped with telephone communications.

4.30 AGOSD O&M Activities

4.31 Staffing

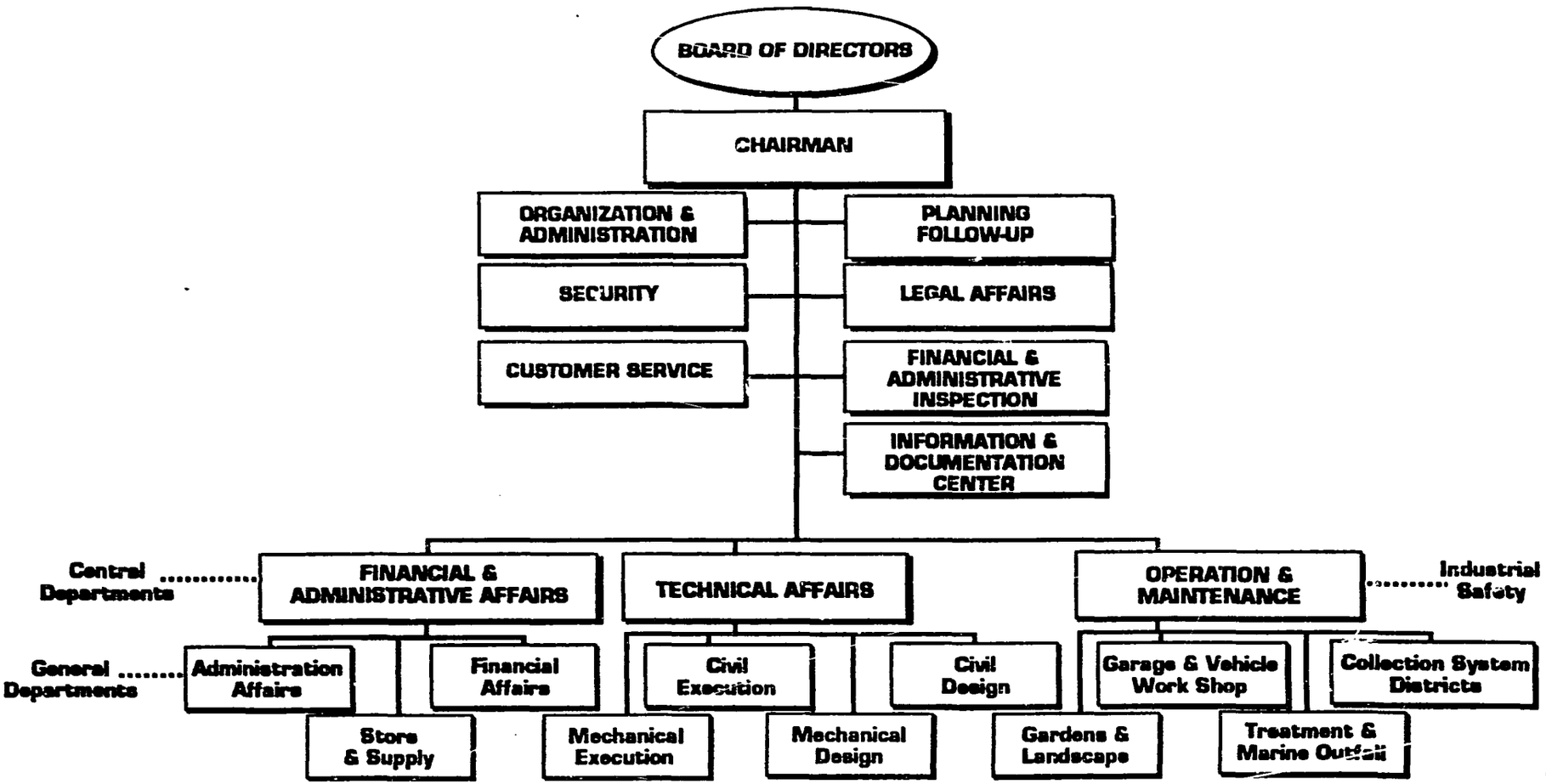
The AGOSD is the regional Egyptian governmental organization responsible for construction, operation, and maintenance of the entire Alexandria sanitary wastewater collection, treatment, and disposal activities. The organizational structure of AGOSD is diagrammed in Figure 4-1. AGOSD's chief executive officer is the Chairman who reports to the Board of Directors appointed by the Governor. The organization is subdivided into three central departments: Financial and Administrative Affairs, Technical Affairs, and Operations and Maintenance.

The Financial and Administrative Affairs Department is responsible for finances, administrative and personnel matters, purchasing, and stores and supplies. This division is also responsible for all budgeting and accounting activities for the entire AGOSD.

The Department of Technical Affairs oversees planning and design efforts of both in-house and contracted work. They also have responsibility for in-house and contracted construction activities.

WW 91097-2

AGOSD
Organizational Chart



PREPARED BY
BRILEY, WILD & ASSOCIATES, INC.
CONSULTING ENGINEERS & PLANNERS

FIGURE 4-1

The Operation and Maintenance Department (Figure 4-2) is the largest of the three AGOSD branches. The O&M Director manages the activities of six Sewer Districts, a Treatment and Marine Outfall Department, an Environmental Laboratory, and Garage & Vehicle Workshop. Additionally the O&M Director has direct responsibility for the Gardens and Landscape Department and an Industrial Safety Division.

The City of Alexandria sewer system is divided into six geographic districts that define areas of responsibility for each sewer district manager. The districts each have responsibility for sewer and pump station operation and maintenance within their district.

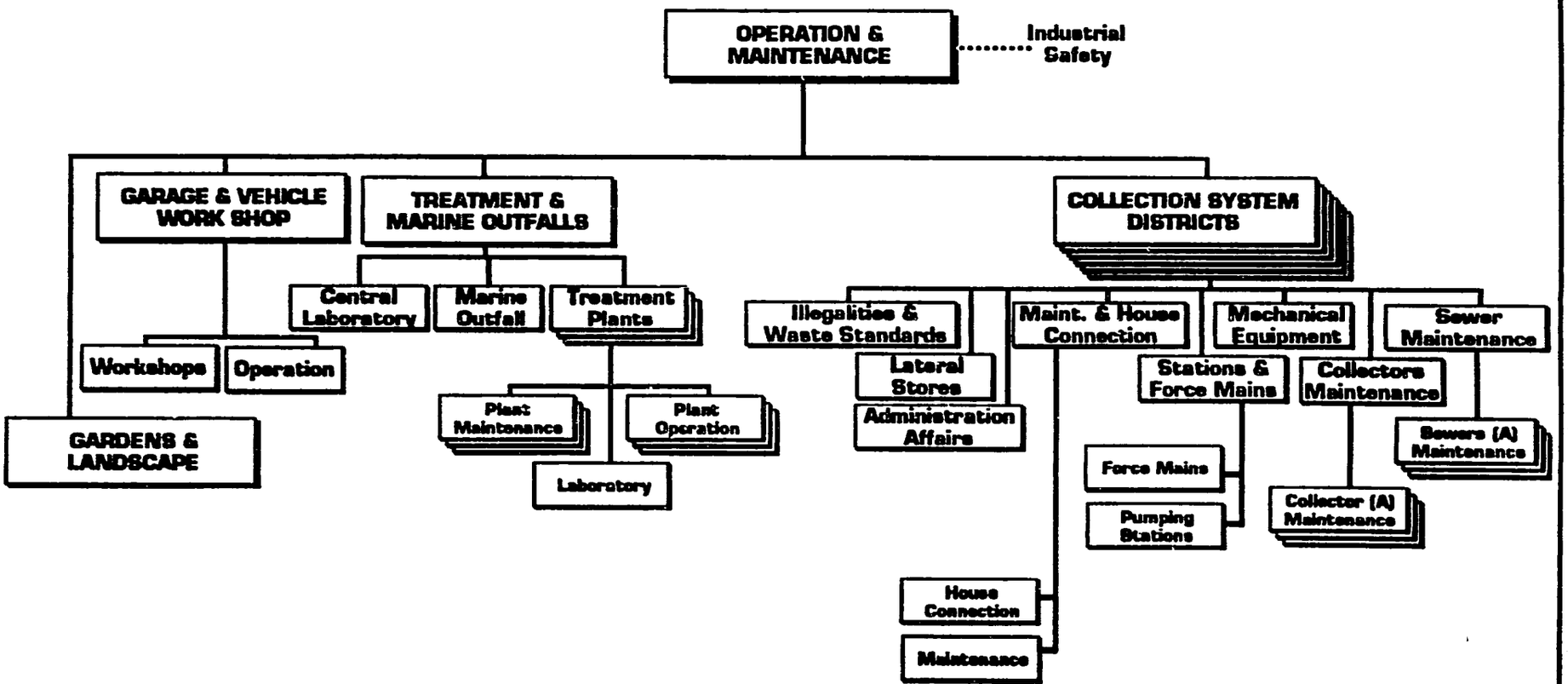
The organization of a typical pump station staff is shown in Figure 4-3. The Manager, usually a graduate engineer, is responsible for overall organization and performance of the pump station personnel. In larger stations the manager is assisted by a Clerk and Safety Officer, in addition to an Assistant Manager. The next level of supervision is provided by a Foreman assisted by an Electrical Engineer and a Mechanical Engineer. Actual operation and maintenance duties are performed by operators, technicians, assistants (trainees) and laborers. The staff size varies by the size of the station, but generally ranges from about 9 to 25 persons for a 7- day-week, 24-hours-per-day operation.

The AGOSD staffing plan relies heavily on maintaining specialized crafts and trades such as electricians and mechanics at each pump station instead of a centralized group of specialists to meet the needs of several pump stations. This staffing plan limits the exposure of the electrical and maintenance specialists to one pump station, which clearly impedes the rate at which their technical skills develop. Exposure to a wider variety of situations and problems would, in our view, provide a better breadth of experience enabling them to more rapidly become better skilled and efficient at their trades.

According to WWCG, in May, 1990 the total pump station operations staff, excluding the treatment plants, totaled 238 persons. Of these, 130 were assigned to the six USAID stations, and 108 personnel were assigned to 15 additional stations.

WW 81097-2

AGOSD
O&M Organization

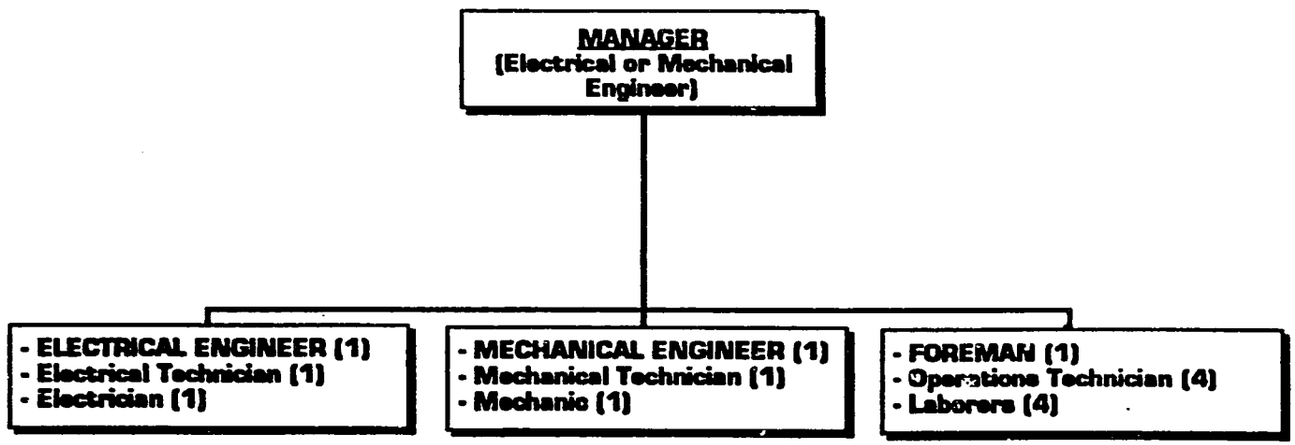


PREPARED BY
BAILEY, WILD & ASSOCIATES, INC.
CONSULTING ENGINEERS & PLANNERS

FIGURE 4-2

WW 81007.2

AGOSD
Typical Pump Station Staffing



PREPARED BY
BRILEY, WILD & ASSOCIATES, INC.
CONSULTING ENGINEERS & PLANNERS

FIGURE 4-3

Information regarding the staffing of AGOSD was very limited at the time of this writing. Discussions with knowledgeable WWCG staff, however, indicated an overall staff size in excess of 4,000 employees. This figure is substantiated by FY 1990 budget information and estimated average employee earnings. A December, 1988 report by WWCG identifies a total of 3,400 employees in the O&M Department alone. The Garage and Vehicles Workshop was reported to employ 415 workers which leaves a balance of 2,985 employees for the remainder of the O&M Department.

4.32 Adequacy of Personnel

A 1988 WWCG report summarizes the staffing needs of the proposed wastewater treatment plants and the Project-constructed pump stations as identified by both AGOSD and WWCG. For the wastewater treatment plants, AGOSD identified a need for 143 people; 62 at the East Plant and 81 at the West Plant. WWCG estimated, based on EPA guidelines and US operating experience, a total staff of 78, with 39 at each plant. WWCG estimated an additional staff of 110 people, including professional personnel, laborers and truck drivers for management of the proposed sludge treatment and disposal facilities.

WWCG has prepared detailed staffing plans for the Project-constructed pump stations, identifying the numbers and classifications of staff required for operation and maintenance. The recommended staff sizes range from 16 at the smaller stations to 27 at the New Smouha and East Zone Pump Stations. Actual staffing at the completed facilities seems to closely correspond to the WWCG recommendations.

Since USAID's involvement in Alexandria, several firms have analyzed the manpower and management needs of AGOSD. Black and Veatch International, Camp Dresser and McKee, and Boyle Engineering Corporation all provided some degree of commentary on the organizational, management, and staffing needs of AGOSD. The central theme of these reports, as well as that of a WWCG report, is the need for changes in the management and organizational structure of AGOSD, and an overall reduction and streamlining in the level of staffing.

While it might seem on the surface that a level of staffing in excess of the recommended standards would be satisfactory, several of the consultants have highlighted the disadvantages associated with an oversized staff. Some of these drawbacks are:

1. While the overall staffing size is larger than we would recommend, there appears to be an insufficient number of supervisory positions to successfully manage such a staff.

2. The collective personnel costs are high, making it difficult to increase staff salaries to the level necessary to attract and retain qualified personnel.

3. Over-staffing fosters a complacent, unmotivated work force and usually leads to a degradation in work quality.

WWCG is concerned whether AGOSD will be able to retain qualified personnel following the completion of training courses. Presently, there is an abundance of skilled workers in Egypt due to a mass exodus of Egyptian expatriate workers from the Persian Gulf region following the invasion of Kuwait and subsequent ouster of Iraq. Since these skilled workers can earn much larger salaries abroad, the rebuilding of oil production supplies and normalization of the employment situation in the Gulf States should be expected to draw heavily from AGOSD personnel. In order to attract and retain qualified workers, AGOSD must take steps to normalize salaries consistent with competitive industrial sectors.

We believe that AGOSD would be better served by a smaller, more efficient work force of skilled employees. A reduction in the size of the work force should enable AGOSD to establish a more competitive salary structure without an increase to current gross labor costs, and it would also promote employee retention.

We are sensitive to the fact that there is a high unemployment situation in Egypt and that the government agencies often reduce unemployment by employing more personnel than is actually required. This practice, however, encourages labor-intensive work methods and discourages improvements in procedures that result in greater efficiency.

We believe that of all the new Project-constructed pump stations are overstaffed. As we have said, the design of these stations is very basic with simple-level controls and constant speed pumps for automatic operation. The operation and maintenance requirements for stations such as these is very low and stations of similar complexity and size are seldom staffed with a full-time complement of operating and maintenance personnel in the United States. More typically, a small staff would be given a regional responsibility for several stations within reasonably close proximity.

4.33 Adequacy of Budgetary Resources

Budgetary and revenue information was requested from AGOSD but to date has not been received. We did, however, interview WWCG staff responsible for assisting AGOSD with budget preparation. The primary effort on the part of WWCG has been gathering financial information from AGOSD. They have been hampered by a lack of historical financial records and/or an inability to produce the necessary financial reports. WWCG staff did report that historical financial information is becoming more readily available as their working relationship with AGOSD develops.

The crux of the AGOSD problem appears to be the labor intensive method of accounting and financial control. The installation of computers and modern office machines would not only increase the efficiency of this department, but would make it possible to generate the financial reports which are necessary for the preparation of timely and accurate budgets.

The adequacy of the financial resources available to AGOSD to ensure sustainability has been the subject of much concern to USAID. The question of financial adequacy is two-fold, involving the level of resources available and the costs which are incurred by the operation.

AGOSD has six local revenue sources: sewer connections, septic tank pumping, administration and supervision, penalties, miscellaneous, and a wastewater surcharge on the potable water tariff. Virtually all of the funds collected locally, however, are remitted to the Government of Egypt (GOE) treasury, and AGOSD must compete with other governmental agencies for its allocation from the General Fund. GOE funding is often less than AGOSD's budget requests.

AGOSD's first attempt at collecting a service fee to defray wastewater O&M costs was the establishment of a wastewater surcharge by the GOE Supreme Committee of Policies and Economic Affairs, headed by Egypt's Prime Minister. The surcharge, collected by the Alexandria General Water Authority (AGWA), was established in 1985 as a 10% surcharge on the potable water tariff.

In an agreement between AGOSD and USAID, AGOSD formally agreed to exert its best efforts to increase the wastewater tariff to cover the costs of operating and maintaining the Alexandria wastewater system. The agreement implied that the goal was to increase the tariff to cover 50 percent of the costs by 1989 and 100 percent by the expected Project completion in December, 1992.

AGWA has increased the water tariff annually since 1986, but the 10% wastewater surcharge remained unchanged until recently. Effective April, 1991 the wastewater surcharge increased from 10% to 20% of the water tariff. Water tariffs increased 20% in January, 1991 and are scheduled to increase an additional 20% in July, 1991. The net effect of the water tariff increases and the wastewater surcharge increase is an overall increase in wastewater surcharge revenue of 288% from December, 1990 to July, 1991.

A 1984 Memorandum of Understanding between USAID and GOE included provisions not only to increase tariffs but to set up "autonomous local water and wastewater organizations, with the authority to retain service revenue for their own operating needs." The Supreme Committee recommended that authorities and governorates should open special accounts to collect income, and suggested that any shortfalls in operating funds would be furnished by the GOE. Information regarding the total revenue collected by AGOSD was requested by Briley, Wild on several occasions, but had not been provided at this writing.

WWCG has been working with AGOSD to determine the actual operating expenses for FY1989/90. WWCG has encountered great difficulty in obtaining reliable budget information, as did the Office of the Regional Inspector General (USAID).

WWCG's primary objective in reviewing AGOSD's budget procedure is to determine a basis for budget preparation and to determine the actual expenditures in various cost centers. WWCG reported that the budget examination process was complicated by the fact that funds are often transferred from one account to another to meet financial obligations. This makes it difficult to track actual expenditures by category without extensive investigation. WWCG reports that the budgeting process seems to be driven by available revenue. The budget often reflects what is available rather than what is required.

The "reconstruction" of a base year of cost information will be used by WWCG to assist AGOSD in projecting O&M costs for future years. WWCG is focusing on FY 1989/90 as its base year. The actual expenditures for FY 1989/90 as reported by WWCG are:

Total Salaries and Benefits	LE 2,713,917
Variable Wages and Salaries	LE 7,779,514
Non-Salary Expenses	LE 18,616,000
TOTAL FY 1989/90	LE 29,109,431

We also requested historical O&M cost information from AGOSD, but it has likewise not been provided. O&M cost information reported in the Inspector General Audit Report No. 6-263-91-01, dated November 29, 1990, included expenses which are recorded in the AGOSD budgets as "salaries" and "operating expenses." These figures were:

TOTAL FY 1987/88	LE 9,959481
TOTAL FY 1989/90	LE 10,968,000

The disparity between the figures reported by WWCG and the Inspector General (IG) illustrate the problem of extracting accurate and meaningful financial data from AGOSD. The "Variable Wages and Salaries" category reported by WWCG is apparently for bonuses and "overtime" payments that are *not* budgeted. The magnitude of the "variable wages" as compared to salaries, suggests that the payment of bonuses and overtime constitute the major constituent of the total wage of the average AGOSD employee. Because the variable wages are not budgeted, operation accounts are often tapped to meet salary expenses.

To ensure financial sustainability, AGOSD must have firm control of both its income and expenses. From our vantage point, all indications are that AGOSD does not have adequate control of either. This must be corrected. We feel that AGOSD must become a self-sustaining entity with the ability to levy and collect wastewater tariffs as necessary to meet its financial obligations.

4.34 Status of Spare Parts

AGOSD operations and maintenance staff told us that spare parts acquisition was an important issue to them. The lack of spare parts and serious delays in procurement have caused them great concern.

A disturbing item of note was brought to our attention by an operator at one of the pump stations. The operator asked us if we could get replacement fuses like the one he held in his hand. The fuse had been "repaired" with a piece of copper wire soldered from end to end. This is reportedly a procedure practiced at several AGOSD pump stations because of problems in obtaining the U.S. manufactured fuses. While this procedure did allow the fuse to be reused, it does not provide adequate overload protection. It is not only a dangerous practice in terms of potential personal injury and equipment damage, but brings to light a serious problem in the area of spare parts acquisition.

Operators reported that spare parts were not maintained at the pump stations, but were procured from the central Stores and Supply Division of AGOSD. Acquisition of spare parts from the AGOSD central division is reportedly very slow and largely ineffective. Operators are often not able to obtain spare parts that have been delivered to AGOSD because of inadequate inventory control procedures. Spare parts acquisition problems were reported at all pump stations visited. According to WWCG, spare parts supplied by contractors were turned over to AGOSD. Procedural methods for spare parts storage and acquisition is a problem that needs immediate attention.

To successfully implement the training program, WWCG provided AGOSD with tools, spare parts, and materials essential to the training program and to ensuring the sustainability of the USAID-constructed facilities. WWCG reported having supplied AGOSD with all the instruments and supplies specified in Task 4.10 of Contract Modification No. 5. WWCG is additionally providing repair parts and maintenance supplies on an as-needed basis in response to requests from AGOSD for direct technical assistance.

A related task is the assistance provided by WWCG to establish a valid inventory control system within AGOSD. Task 4.08 of Contract Modification No. 5 requires WWCG to assist AGOSD in the development of an inventory control system that will provide a mechanism for spare parts procurement. Because of a lack of available inventory control data, WWCG specialists prepared a spare parts and equipment inventory based on packing slips, shipping documentation and physical inspection of AGOSD stores.

At the time of this writing the inventory information was being entered into the COMP's ICS (Inventory Control System) prepared by CH_2M Hill. ICS is a computerized inventory management tool that tracks spare parts and supply stores, generates reports regarding usage of

inventory, and contains vendor information necessary for ordering and replacing inventory. The ICS program is part of a complete data management program that includes a maintenance management system. The TUMMS (Total Utility Maintenance Management System) program integrates with ICS to automatically adjust the inventory as supplies are used during maintenance operations and to generate purchase requisitions when stores are low.

4.40 WWCG Training Program

Based on a training needs assessment performed in 1988, WWCG developed a concept for a comprehensive training program that would address the specific needs of AGOSD. The key elements of this program include the development of instructional course materials, general knowledge training, instructional technology training, English language training, direct technical assistance and personnel exchange visitation with established utility operations.

The objective of the training program is to rapidly upgrade the technical skills of AGOSD field personnel while concurrently developing within AGOSD a training resource department that will eventually be able to sustain the required level of skills development without outside assistance.

4.41 Instructional Training Course Design

A meaningful and effective instructional program is key to the implementation of a self-sustaining AGOSD training capability. WWCG has recognized several principles which will guide their course design. WWCG recognizes that they must design a course that is specifically tailored to the needs of AGOSD and that course content and delivery must be carefully structured to the ability and skill levels of the trainees.

WWCG's approach to instructional design is highly structured and relies on the application of specialized talents in various stages of development. The initial stage of development is the preparation of a detailed job/task analysis for each of the various facilities. WWCG will be preparing a total of four job/task analyses for each of the pump stations, the wastewater treatment plants, the mechanical dewatering facilities, and the landfill/composting facility. The job/task analyses are the foundation for the preparation of the standard procedures.

Presently, only the pump station job/task analysis has been prepared. The job/task analysis prepared for the pump stations identifies tasks necessary to operate the pump stations and further identifies job positions and responsibilities.

An integral part of the curriculum design is the development of standard procedures to be used in the development of facility-specific training. The standard procedures which will be developed for operations, maintenance, and safety procedures are used as reference documents for preparation of facility-specific training. Standard procedures typically consist of operations, mechanical maintenance, electrical maintenance, and safety procedures.

At the time of our evaluation, the standard procedures for the pump stations were under development. Six standard operating procedures were essentially complete, and 4 mechanical maintenance procedures were in rough-draft form. The completed standard procedures for the pump stations will have 15 operating procedures, 14 maintenance procedures, 17 electrical maintenance procedures, and 2 safety procedures.

The standard procedures which we examined made extensive use of graphics with a limited amount of text to illustrate them. Based on our experience, this method of presentation is very effective for operations personnel.

4.42 General Knowledge Training

General knowledge training is now being provided to AGOSD personnel on an as-needed basis in response to existing skill deficiencies. These lessons are being delivered by both WWCG and AGOSD trainers at both USAID and existing AGOSD pump stations. Initially, much of the general knowledge training is being provided by WWCG trainers on a priority basis. As AGOSD trainers complete their instructional technology training, they will assume a more active role in lesson delivery and will eventually provide all the training themselves.

Lessons which have been provided to date include: Basic Wastewater Concepts, Confined Space Entry, Solvents and Surfaces, and Modern O&M Specialists.

4.43 Instructional Technology Training

One of the keys to the sustainability of the USAID-funded facilities is the creation of an independent O&M training organization within AGOSD that will continue to function following the completion of this Project. WWCG is developing this capability through a "Train-the-Trainer" program designed to develop selected AGOSD staff into capable O&M instructors. The Train-the-Trainer workshops focus on training methods and styles, effective use of audio/visual aids, and presentation skills. AGOSD personnel participating in this program will learn how to develop course materials as well as how to teach the course.

While in-country we visited a Train-the-Trainer workshop attended by approximately 12 AGOSD O&M personnel. The delivery style and methods used by WWCG staff seemed to be very effective in reaching and involving the AGOSD students. The level of active participation and enthusiasm exhibited by the students was quite good. Although often overlooked because of its intangible nature, the eagerness of the students should be recognized as a very essential element to the overall success of the training program.

WWCG was recently successful in having AGOSD provide space at the East Treatment Plant for the Training Resources and Technical Information Center (TRATIC). TRATIC will house the AGOSD training staff offices, production facilities, library, and records. WWCG will be supplying audio/visual equipment for delivery and production of training programs and textbooks, as well as an Apple Macintosh computer for Arabic production and editing of training materials.

The training curriculum proposed for the courses at the TRATIC consists of 6 modules: Introduction, Fundamental Maintenance Skills, General Maintenance, Equipment Operation and Maintenance, Record Keeping and Facilities Maintenance. The modules are comprised of a number of subject units which include from 3 to 10 lessons. Module 4, Equipment Operation and Maintenance, the largest module, contains units dealing with bar screens, sewage pumps, electrical systems and ancillary pump station equipment. This module also includes unit processes that are associated with primary treatment systems such as grit removal, scum pumping, sludge pumping and emergency generators. The training curriculum appears to have been thoughtfully prepared and well planned for the facilities presently under construction. It will, however, need to be expanded to include the Mechanical Dewatering Facility and the Landfill Facility as construction nears completion.

4.44 Direct Technical Assistance

Another integral part of the WWCG training program is Direct Technical Assistance. Technical assistance is provided "on-request" to any of the USAID-funded facilities. From the inception of this program to Mid-April 1991, WWCG's technical assistance staff has responded to 59 requests for assistance. Of these 59 requests for assistance, 48 have been resolved and 11 remain outstanding. Five of the outstanding requests were awaiting parts or vendor action while 2 were awaiting AGOSD action. The other 4 outstanding requests were in the early stages of response, averaging about 10 days of elapsed time from the date of the initial request.

Assistance requisitions range from requests for spare parts (such as fuses) to repairs of pumps and motors. A response to a request for assistance typically consists of an initial investigation or troubleshooting phase and action by WWCG's specialists, an outside vendor, or AGOSD personnel if it is determined that the action is within their capabilities.

Technical assistance training to date has been provided to AGOSD personnel primarily in the areas of mechanical and electrical maintenance. Electrical training has included resistor banks, secondary contactors, medium voltage switchgear, low and medium voltage motor control centers, high voltage transformers, instrumentation and controls, and emergency power generation systems. Mechanical training has included mechanical bar screens, ventilation systems, seal water systems, instrument air systems, sewage pumps, valves, gates, dewatering pumping systems, cranes, and emergency power equipment.

As part of the technical assistance program, WWCG staff conducted a visual condition inspection of all USAID pump stations and 17 AGOSD pump stations in September, 1990. The visual inspection included structural integrity, housekeeping, safety, lighting, electrical and mechanical systems.

In November, 1990 WWCG began an equipment condition evaluation using instrumentation to analyze equipment vibration, acoustic emissions, bearing temperatures, and current draw. The initial phase analyzed equipment at all 6 USAID pump stations and 2 AGOSD stations. During March, 1991 the investigation was continuing with the remaining AGOSD stations.

One of the most important aspects of the Direct Technical Assistance Program is the hands-on training that accompanies WWCG's responses. WWCG's specialists work with AGOSD personnel, showing them how to perform O&M tasks in actual situations and coaching them while they perform the tasks themselves. This type of training is invaluable as a reinforcement to classroom and textbook training.

4.45 English Language Training

English language training was identified as a priority need by a Training Needs Assessment Report prepared by WWCG in 1988. Although training materials and documentation produced under this Project are in Arabic, nearly all of the documentation submitted by equipment manufacturers including shop drawings, maintenance manuals, parts lists, etc., is available only in English. Additionally, identification and warning labels on equipment are nearly always in English.

The resolution of this problem can take one of two directions. One school of thought is to require all manufacturers to submit all documentation in Arabic; the other is to teach English to the Egyptians so they can use the English documentation.

Translation of all manufacturers' documentation into Arabic would seem to be a monumental task. Requiring U.S. manufacturers to produce Arabic documentation would likely severely reduce the number of equipment manufacturers interested in bidding a Project. It is also likely that the reduced number of competitive bidders among U.S. manufacturers would increase the cost of equipment purchases. In any event, some use of English would still be required for placing parts orders or requesting technical assistance from manufacturers.

English language training of AGOSD personnel, on the other hand, would enable them to use standard manufacturers' documentation and expedite both parts requisitions and requests for technical assistance. English language proficiency will also allow AGOSD personnel to use international technical publications which are produced in English. The twinning activities of the O&M program (described in the following section) require the participants to be fluent in English before travel to USA counterparts in the program.

Training of AGOSD personnel in English is being conducted by the American Cultural Center in Alexandria. The American Cultural Center has been identified as having the largest and most experienced English program in Alexandria. As of February 1991, nine AGOSD personnel

are completing their second term of training, and 8 other AGOSD O&M managers have been identified for English training.

4.46 Twinning

"Twinning" is a training concept that operates on the principle of matching institutions and personnel on exchange visits. The trainee facility and the host facility, in this case a USA utility organization, would select highly motivated individuals for participation in this program. The primary benefit is derived from the opportunity of allowing the trainee to observe the host counterparts work habits and methods. The host would also visit the trainee at his work place and assist in implementation of the new technology and methods.

The twinning concept for this Project has much merit, not only in providing training and knowledge transfer, but also in strengthening relationships and bonding between Egyptian and American technical people. While the potential benefit of closer ties between our countries is perhaps less important than the transfer of knowledge, we feel that the experience will be nonetheless important to the overall success of this Project.

WWCG is presently preparing a scope of work in preparation for obtaining a twinning subcontractor. When selected, the twinning subcontractor will work with WWCG to prepare a work plan detailing the selection criteria of AGOSD participants, instructional objectives and illustrative tasks.

4.50 Other USAID O&M Activities

4.51 Operation and Maintenance Documentation

In addition to training and related assistance provided by WWCG's O&M Group, the engineers on earlier USAID-funded projects were responsible for providing traditional operator assistance such as start-up assistance, operator training, and operation and maintenance manuals. These engineers were tasked with the preparation of O&M manuals for each facility and were required to present equipment O&M data supplied with each facility. We reviewed English versions of two engineer prepared O&M manuals for USAID-funded facilities: one prepared for the Ras El Soda Pump Station by Camp Dresser & McKee, and one for the Sidi Bishr Pump Station prepared by WWCG.

a5

The CDM manual, which was not dated, consisted of six chapters: Introduction, Equipment Description, Detailed Operation and Controls, Maintenance, Personnel, and Safety. The manual is brief and lacks presentation quality. The entire manual is less than 100 pages in length and includes only one table and four illustrations.

The manual quality is inferior in several respects. First, the text is written at a level far beyond the average AGOSD operator, and it does not adequately address with sufficient detail the concerns of most operators. The organization of its contents makes it difficult to use. Perhaps the most notable deficiency of the manual is that the reader gets the impression that the Ras El Soda Pump Station could just as easily be located in a U.S. suburb instead of Alexandria, Egypt. The writers obviously did not consider the cultural, organizational, and technical differences between the two countries in the preparation of the manual.

The WWCG-prepared manual for the Sidi Bishr Pump Station consists of over 220 pages, 5 tables, 32 figures, 22 photographs, and 5 sheets of engineering drawings. The manual contained 9 chapters: Introduction, Description of Sewage Pumping Facilities, Description of Utilities and Building Services, Operation of Sewage Pumping Facilities, Operation of Utilities and Building Services, Maintenance, Safety, Records and Record-Keeping, and Personnel.

This manual is well-prepared, blending a good mix of detailed text descriptions with figures and actual photographs of the installation. In contrast to the Ras El Soda Manual, the WWCG-prepared manual was obviously written by people familiar with the AGOSD organization and their personnel.

During our site visits, AGOSD operators were queried about their familiarity with the engineer-prepared O&M manuals and the manufacturers' submittals. The operators were supplied with an Operations and Maintenance Manual translated into Arabic, and manufacturers' bulletins in English only. The foreman and operators were not fluent in English, so the manufacturers' bulletins were of little use. The Arabic translation of the O&M Manual was reported as poor by the pump station staff and was not read or used by most of the staff. The foreman said that he had read the manual with some difficulty and was using it for reference on occasion.

We stated earlier in this chapter that several pump stations were experiencing mechanical and corrosion problems associated with bar screens. These reports prompted us to examine the O&M manuals with regard to their content on bar screen maintenance.

The CDM Ras El Soda manual provides 2 pages of text describing the general characteristics and operation of the station. There is no mention in the text of the maintenance requirements for the bar screening equipment. The only maintenance reference is an entry on the station maintenance schedule, which specifies intervals for chain lubrication and chain and sprocket wear inspections.

The WWCG Sidi Bishr Manual devotes approximately 18 pages to discussions of the mechanical bar screens, including two photographs and one cut-away illustration. The text presents a description of the screens, their operation, start-up and shut-down procedures, abnormal conditions, routine maintenance, troubleshooting, and safety considerations. The manual specifically provides maintenance advisories regarding lubrication and corrosion protection.

In both cases, however, the manufacturers' O&M submittals, which contain detailed maintenance instructions, spare parts listings and ordering information, were supplied only in English. These manuals were of limited benefit in that very few AGOSD operations personnel were sufficiently fluent in English to derive much value from them.

4.60 Review of Project Goals and Objectives

The goal of the WWCG O&M Program is:

> "To develop within AGOSD the capability to operate and maintain the pump stations and treatment facilities to ensure the maximum sustainability of the USAID-funded facilities constructed in Alexandria."

Specific objectives of the O&M program were developed by WWCG to achieve the Project goal. These objectives and their current status are as follows:

1. Provide tools, spare parts, and materials.

Spare parts acquisition has been and continues to be a major problem for AGOSD facilities. Inadequate inventory control practices contributes significantly to the problem of timely procurement of spare parts.

G1

WWCG has constructed an inventory of parts and supplies currently in AGOSD's possession based on shipping documentation and physical inspection of AGOSD stores. This information is presently being incorporated into a computerized maintenance management program.

WWCG is also supplying AGOSD directly with tools, spare parts, and materials. WWCG has supplied the tools referenced in Task 4.10 of Contract Modification No. 5 and is also supplying additional parts and supplies as needed in response to requests from AGOSD for technical assistance.

2. Provide skills training.

Skills training in the areas of general knowledge and instructional technology is being provided to AGOSD personnel by WWCG. Much preliminary work has been performed such as job and task analyses, which will be used to determine what skills the personnel need to know. The job and task analyses will be used in the preparation of course materials.

General knowledge training is provided to introduce AGOSD personnel to the purpose and interrelationship of collection systems, pump stations and treatment plants and basic safety. Skills training is also provided in response to specific requests for assistance from AGOSD. This assistance is generally a hands-on session during which WWCG technicians work side by side with AGOSD personnel to solve problems in the field.

An instructional technology course (Train-the-Trainer) was developed and initiated in February, 1991. Selected AGOSD managers, supervisors, and technical staff are scheduled to attend one day sessions every two weeks for a six-month period.

3. Assist in the development of a Training and Technical Assistance Organization within AGOSD.

Perhaps the most critical element pertinent to the sustainability of the Project is the development of a self-sustaining training and technical assistance organization within AGOSD. One of the keys to this was procurement of facilities for such an organization. WWCG successfully requested that AGOSD dedicate space at the East Treatment Plant for the Training and Technical Information Center (TRATIC). Plans and specifications were prepared by WWCG for renovation of the space and for acquisition of instructional materials and equipment.

AGOSD has assigned several engineers to work full time as counterparts to the WWCG O&M staff. Aside from the practicality and ease of information transfer afforded by this move, this type of integration of Egyptian and American staff will clearly serve to strengthen the AGOSD and WWCG partnership and be a positive factor toward Project sustainability.

The concept of twinning, or matching of institutions and personnel, also has a great potential for development of personnel through shared experiences. In the same spirit, WWCG is providing English language training to key O&M personnel at AGOSD. The ability to converse directly with English-speaking technical persons and to read technical publications will serve to ensure that the transfer of information will continue throughout the life of this Project.

4. Develop Operations and Maintenance Management Programs, Procedures and Systems.

WWCG is currently implementing O&M programs in several areas in response to the prioritized needs of AGOSD. Two key programs, previously discussed, are the Train-the-Trainer program and the maintenance management program. WWCG is also working with AGOSD personnel to prepare an O&M budget and is developing procedures for the procurement of materials and supplies.

Standard operating procedures are in the developmental stage. Standard procedures are being developed for operations, maintenance, and safety to be used as reference documents for preparation of facility-specific training materials. The standard procedures which we examined made extensive use of graphics with a limited amount of text to illustrate procedures. Based on our experience, this method of presentation is very effective for operations personnel.

5. Provide Hands-On and Site-Specific Technical Assistance.

Direct technical assistance is provided by O&M technicians of WWCG in response to problems with the USAID-funded facilities. Since the inception of this program, WWCG's technical assistance staff has responded to 59 requests for assistance, with the resolution time averaging about 10 days from the date of the initial request.

WWCG has also conducted equipment condition evaluation inspections with recommendations for corrective measures at all USAID facilities. Going beyond the initial scope of work, WWCG also provided equipment condition evaluation inspections at key AGOSD pump station facilities.

4.70 Conclusions

The success of the Alexandria Wastewater Project hinges on the ability of AGOSD to achieve the goals and objectives regarding sustainability. Even the best of facilities will not function when improperly operated and maintained.

The observed and reported activities of the O&M team from WWCG appear to be moving toward their established goals in a timely fashion. Our evaluation of activities, however, is preliminary in nature since the 3-year Comprehensive Operations and Maintenance Program had begun only 8 months prior to our involvement. Much of our evaluation is based on preliminary undertakings by WWCG rather than observations of results. Much work lies ahead.

The O & M program designed by WWCG is a comprehensive program designed to create a self sustaining, quality oriented, O&M presence within AGOSD. The complexity of the overall program in relation to the needs of the existing organization is immense. The smooth transition and implementation of the O&M program relies on a series of related tasks, the fruition of which will be in much greater evidence toward the latter stages of the program.

We feel that the O&M team at WWCG is an excellent assemblage of talent, blending a variety of skills such as instructional technologists, technical writers, translators, etc. with the practical skills of operations and maintenance specialists. The "team building" concepts espoused by the O&M group director of WWCG should continue to mold this recently assembled group into a very effective and cohesive force.

The task which lies ahead, however, is very complex and fraught with potential obstacles which are to some degree beyond the realm of WWCG's control. In our opinion, the most difficult challenges which WWCG will face are the training and motivation of the AGOSD O&M staff and, of equal importance, promoting inroads to influence changes in the financial and management structure of AGOSD. USAID needs to accept a key role if the latter is to be achieved.

100

Historically, AGOSD has reportedly been very resistant to suggestions which require a change in their organization or the way the organization functions. We sense, however, that USAID and WWCG are close to achieving very substantial reform measures by AGOSD. The sensitivity of WWCG management to cultural realities and the unique logistical problems which AGOSD faces has been and will continue to be critical for the sustainability of the Alexandria Project.

Specifically, our conclusions regarding the activities of WWCG and AGOSD as they pertain to the sustainability of the Alexandria wastewater Project are:

1. Several of the pump station O&M manuals prepared earlier in the Project are of poor quality with respect to the readability of Arabic translations and lack the information necessary for proper operation and maintenance of the facilities.

2. The practice of staffing each pump station with specialty trades is not cost-effective from a labor standpoint, nor is it practical to equip and train the multitude of personnel created by this system.

3. The AGOSD staff is presently larger than is necessary for efficient operation and maintenance of the Alexandria sewerage system. While we recognize the desirability of a low unemployment rate, the practice of over-staffing can have several potentially adverse effects:

   a. Effective management is difficult.

   b. Personnel costs are collectively high, making it difficult to maintain individual salaries at levels necessary to attract and maintain qualified personnel.

   c. The workforce can become complacent and unmotivated, which may adversely affect the quality of work.

4. O&M procedures and practices at the AGOSD facilities vary substantially from District to District and even from one pump station to another within the same District. The organization of a central training unit by WWCG should substantially improve this situation.

5. There seems to be little doubt that the wastewater tariff is presently inadequate to meet the financial needs of AGOSD. The actual amount of income that must be generated to sustain AGOSD, however, has been determined in a preliminary frame only. WWCG has very recently made significant advances towards producing a realistic summation of AGOSD operating costs, and we expect they will utilize this information to develop a projection of required income.

6. AGOSD presently lacks the authority to independently levy and collect tariffs to meet its operating expenses. This situation has created an entity that must be artificially kept solvent by regular transfer of funds from the GOE. Under this mode of operation AGOSD has little incentive to be fiscally responsible for efficient operation of its organization.

7. The acquisition of spare parts by the front line field personnel and the control of spare parts inventories are currently major problems in AGOSD's O&M Division.

4.80 Recommendations

Our recommendations for ensuring the long-term sustainability of the USAID-funded facilities in Alexandria follow:

1. USAID should ensure that the O&M assistance program continues to be funded from USAID funds and continues for at least one year after the physical completion and start-up of the facilities.

2. USAID should retain WWCG for the purpose of reviewing and updating the pump station O&M manuals prepared earlier in the Project to improve readability and usefulness to the operations staff.

3. Because of the complexity of WWCG's undertaking and the preliminary nature of this evaluation, we recommend that one or more reviews of the O&M program be prepared when more substantial progress has been achieved.

4. AGOSD's O&M Division should modify their organizational structure to provide centralization of specialty trades—e.g., electrical, instrumentation, mechanical, etc.—rather than staff each pump station with individuals representing each trade.

5. AGOSD should reduce the size of its staff to create a smaller, more efficient, and more manageable workforce.

6. O&M procedures and practices at the AGOSD facilities should be standardized throughout the organization.

7. To ensure long-term sustainability, AGOSD must improve fiscal management in terms of both income and expenses and must become a self-sustaining entity with the ability to levy and collect tariffs to meet its financial obligations.

8. AGOSD needs to improve both the transfer of spare parts to front line field personnel and the control of spare parts inventories.

9. The design of the Sporting Pump Station should be reviewed from an operations and maintenance viewpoint. Improvement to the station which will enhance O&M activities should be incorporated.

Interim Evaluation of the Alexandria Wastewater System Expansion Project

USAID Contract # 263-0100

Volume 2 of 2
Appendices

December, 1991

BRILEY, WILD AND ASSOCIATES

104

TABLE OF CONTENTS

Volume 2 of 2

APPENDICES

APPENDIX 1

SCOPE OF WORK
EXCERPT FROM CONTRACT BETWEEN WWCG
AND
BRILEY, WILD & ASSOCIATES, INC.

SCOPE OF WORK

I. SUBCONTRACTOR TASKS:

The Subcontractor shall provide a team of experts to address the following key questions:

a) Physical Progress of the Project: How many projects are completed? What projects are ongoing and when are they likely to be completed? What subprojects are ongoing and when are they likely to be completed? What is the quality of the work completed and ongoing? Does it meet project and GOE standards?

The Subcontractor shall:

1. Assess the implementation progress of project activities and analyze the implications for timely completion of the project and achievement of project goals and objectives.

2. Identify those project activities whose implementation progress is behind schedule and note the degree to which project goals and objectives may be compromised due to implementation difficulties.

3. Review and present overall management structure of the project to determine whether roles and responsibilities are well defined.

b) Overall Social and Environmental Impact:

Improvements and expansion of Alexandria Waste water Facilities have considerably reduced the dangers of street and basement flooding by waste water. To what extend this has impacted the social fabric and environmental health of the community is not clearly identified and measured. The Subcontractor shall examine the effects of USAID financed sewerage improvements as well as other locally financed waste water project to identify:

1. Community knowledge and attitudes toward the improvements in the sewer system and the impact of these improvements on their daily lives.

2. Identify the extent of the increase of sewer services in the city.

c) Sustainability of Project after its Completion

Are completed project facilities being appropriately operated and adequately maintained? What is the current condition of projects completed earlier in the project? Are adequate system for operating and maintaining in place and being followed? Has training under the project been effective in providing skilled personnel to operate and maintain facilities? Are O&M plans for project facilities adequate to assure maximum sustainability?

The Subcontractor shall:

1. Review ongoing operations and maintenance activities in existing facilities and evaluate the adequacy of procedures and practices.

2. Evaluate the current conditions of project facilities constructed earlier in the project and determine the degree to which operation and maintenance of these facilities has been appropriate and effective.

3. Review O&M plans for project-constructed facilities to determine whether adequate resources, personnel, and procedures will be in place to assure sustainability.

4. Review the adequacy of training provided under the project and the placement of trained employees to determine whether such training has contributed to adequate O&M.

5. What actions can be taken by USAID and the GOE to assure maximum sustainability of project-constructed facilities? Does the organization involved require additional staffing, training, or budgetary resources? Can project activities be altered to meet newly identified needs? Is the existing capital allocations to the waste water sector enough? How are spare parts procured previously being used? Are adequate provisions of spare parts being continuously procured?

The Subcontractor shall:

1. Review existing staffing levels available for conducting the O&M programs and determine whether or not such levels are sufficient.

2. Review available budget resources to operate and maintain.

3. Review the status of spare parts procured and determine whether they were well used and what are still remaining in the stores. Also determine the exact need for more spare parts to be procured to keep the project operating and well maintained.

4. Determine whether human and financial resources could be made available to operate and maintain completed facilities.

6. To what extent are project goals and objectives related to O&M, and sustainability being met? Have target urban populations benefitted form USAID investments in the sector? What is the degree to which the program in place ensure that populations are served by (and support) the system?

The Subcontractor shall:

1. Review project goals and objective an determine whether they are being met or not.

2. Recommend any future actions to be taken to assure getting the maximum benefit form USAID investments in the project whether they are ongoing or not yet started.

d) Corrective measures of actions necessary to accomplish overall project objects: Have technical, human, and financial resources been adequate? Have there been any managerial problems involving implementing agencies which have had adverse effects on projects implementation?

The Subcontractor shall:

1. Identify the problem and constraints affecting project implementation and achievement and recommend specific courses of action to remedy them.

2. Recommend any other actions that can be taken by USAID and the GOE to assure achievement of project goals and objectives.

METHODS AND PROCEDURES:

1. Prior to the commencement of, and during the evaluation, the contractor shall hold in depth discussions periodically with appropriate project managers and officers at USAID to review the progress of the evaluation.

2. The Subcontractor shall review project documents related to the

purpose of the evaluation available in USAID and in Alexandria.

3. The Subcontractor shall make site visits accompanied by appropriate AID personnel to the Project.

4. The Subcontractor shall conduct structured interviews with current management staff in Alexandria.

5. The Subcontractor shall prepare an evaluation report as specified in contract paragraph D, providing finding, conclusion and recommendations responsive to the questions in the Statement of Work, above, based on the analysis of information obtained through tasks 1 through 4 above.

D. REPORTING REQUIREMENTS:

The Subcontractor shall:

1. report directly to the USAID Project Officer

2. submit a work plan, including methodology and schedule of activities, within 10 days of the effective date of this contract.

3. conduct mid-way briefing to USAID on progress and initial findings.

4. submit draft report at approximately 90 percent project completion.

5. submit a final report which responds to questions posed in the statement of work, findings, conclusions, and recommendations, and outlines incorporates comments, USAID and GOE, on the draft report.

6. Give project briefing to USAID after USAID Review of draft report.

7. The final report shall adhere to the following format:

- Executive Summary

- Statement of Conclusions and Recommendations. Conclusions shall be short and succinct, with the topic identified by a short sub-heading related to the questions posed in the Statement of Work. Recommendations shall correspond to the conclusions; whenever possible, the recommendations should specify who, or what agency, should take the recommended action.

- Body of the Report. The report shall include a description of the context in which the project was developed and carried out, and provide the information (evidence and analysis) on which the conclusions and recommendations are

based. More detailed analysis shall be placed as an appendix.

- Appendices. These shall include at a minimum the following:

  - The evaluation Scope of Work;

  - A description of the methodology used in the evaluation (e.g., the research approach or design, the types of indicators used to measure change or the direction/trend of impacts, how external factors were treated in the analysis). Evaluation may offer methodological recommendation for future evaluations;

  - Full analysis of any topics which, due to space limitation in the body of the report should be summarized there; and

  - A bibliography of documents consulted.

7. The Subcontractor shall:

   Conduct a final debriefing for USAID

APPENDIX 2

PURPOSE OF EVALUATION STATEMENT BY USAID, CAIRO

ALEXANDRIA WASTEWATER SYSTEM EXPANSION
PROJECT (263-0100)
PROJECT EVALUATION

PURPOSE OF THE EVALUATION

1. This interim evaluation is focused on four aspects of the Project:

   a) Physical progress of the project.
   b) Overall social and environmental impact.
   c) Sustainability of project after its completion.
   d) Corrective measures or actions necessary to accomplish overall project objectives.

2. Within this focus, the purpose of this interim evaluation is to:

   a) Analyze and assess the physical progress of the project, identify obstacles to project development and comment on necessary corrective means to achieve objectives of the project.

   b) Analyze and assess the overall social and environmental impact of improvements to wastewater infrastructure in Alexandria, financed by USAID, since the inception of the project. The consultant, will examine the effects of USAID-financed sewerage improvements on:

      - the environment: has contamination of streets, coastal areas and water bodies been reduced?

      - access to wastewater services in the greater Alexandria area: how has access changed by locality and income group? How has this affected women as a group?

      Data collection methods and resources may include:

      - Compilation of baseline social and environmental data from original project design documents;

      - rapid low-cost studies to assess current and end-of-project environmental status and differential access to wastewater services;

      - analysis of data from AGOSD information systems to be developed under the project amendment, on trends in the number of hookups by area and type of user, and on consumption.

c. Analyze and assess the sustainability by AGOSD of the project after its completion.
The Consultant, in coordination with WWCG, will assess the data provided by WWCG in regard to the Operation and Maintenance needs and, in coordination with AGOSD, will assess the revenues collected and available for the operation and maintenance of the project. The consultant will also in coordination with WWCG, assess manpower requirements by skills and determine, in coordination with AGOSD, its availability. Identify problems and constrains regarding effective operation of action to remedy them. Evaluate the overall adequacy of operation and maintenance plans for facilities built and provide recommendations for improvements.

d. Identify overall problems and constraints facing the project and recommend corrective actions.

The evaluation should assist USAID and the implementing agency in making decisions about ongoing project activities, funding requirements, and overall implementation of project.

B. CONTRACTOR TASKS:

The Contractor shall provide a team of experts to address the following key questions:

a) Physical Progress of the Project: How many projects are completed? What projects are ongoing and when are they likely to be completed? What subprojects are ongoing and when are they likely to completed? What is the quality of the work completed and ongoing? Does it meet project and GOE standards?

The Contractor shall:

1. Assess the implementation progress of project activities and analyze the implications for timely completion of the project and achievement of project goals and objectives.

2. Identify those project activities whose implementation progress is behind schedule and note the degree to which project goals and objectives may be compromised due to implementation difficulties.

3. Review the present overall management structure of the project to determine whether roles and responsibilities are well defined.

b) Overall Social and Environmental Impact:

Improvements and expansion of Alexandria Wastewater Facilities have considerably reduced the dangers of street and basement flooding by wastewater. To what extent this has impacted the social fabric and environmental health of the community is not clearly identified and measured. The consultant shall examine the effects of USAID financed sewerage improvements as well as other locally financed wastewater project to identify:

1. Community knowledge and attitudes toward the improvements in the sewer system and the impact of these improvements on their daily lives.

2. Identify the extent of the increase of sewer services in the city.

c. Sustainability of project after its completion:

Are completed project facilities being appropriately operated and adequately maintained? What is the current condition of projects completed earlier in the project? Are adequate systems for operating and maintaining in place and being followed? Has training under the project been effective in providing skilled personnel to operate and maintain facilities? Are O&M plans for project facilities adequate to assure maximum sustainability?

The Contractor shall:

1. Review ongoing operation and maintenance activities in existing facilities and evaluate the adequacy of procedures and practices.

2. Evaluate the current condition of project facilities constructed earlier in the project and determine the degree to which operation and maintenance of these facilities has been appropriate and effective.

3. Review O&M plans for project-constructed facilities to determine whether adequate resources, personnel, and procedures will be in place to assure sustainability.

4. Review the adequacy of training provided under the project and the placement of trained employees to determine whether such training has contributed to adequate O&M.

5. <u>What actions can be taken by USAID and the GOE to assure maximum sustainability of project-constructed facilities?</u> Does the organization involved require additional staffing, training, or budgetary resources. Can project activities be altered to meet newly identified needs? Is the existing capital allocations to the wastewater sector enough? How are spare parts procured previously being used? Are adequate provisions of spare parts being continuously procured?

   The Contractor shall:

   1. Review existing staffing levels available for conducting the O&M programs and determine whether or not such levels are sufficient.

   2. Review available budget resources to operate and maintain.

   3. Review the status of spare parts procured and determine whether they were well used and what are still remaining in the stores. Also determine the exact need for more spare parts to be procured to keep the project operating and well maintained.

   4. Determine whether human and financial resources could be made available to operate and maintain completed facilities.

6. <u>To what extent are project goals and objectives related to O&M, and sustainability being met?</u> Have target urban populations benefitted from USAID investments in the sector? What is the degree to which the program in place ensure that populations are served by (and support) the systems?

   The Contractor shall:

   1. Review project goals and objectives and determine whether they are being met or not.

   2. Recommend any future actions to be taken to assure getting the maximum benefit from USAID investments in the project whether they are ongoing or not yet started.

d. <u>Corrective measures of actions necessary to accomplish overall project objects:</u> Have technical, human, and financial resources been adequate? Have there been any managerial problems involving implementing agencies which have had adverse effects on project implementation?

The Contractor shall:

1. Identify the problems and constraints affecting project implementation and achievement and recommend specific courses of action to remedy them.

2. Recommend any other actions that can be taken by USAID and the GOE to assure achievement of project goals and objectives.

C. METHODS AND PROCEDURES:

1. Prior to the commencement and during the evaluation, the contractor shall hold in depth discussions periodically with appropriate project managers and officers at USAID to review the progress of the evaluation.

2. The Contractor shall review project documents related to the purpose of the evaluation available in USAID and in Alexandria.

3. The Contr or shall make site visits accompanied by appropriate AID personnel to the Project.

4. The Contractor shall conduct structured interviews with current management staff in Alexandria.

5. The Contractor shall prepare an evaluation report as specified in contract paragraph D. providing findings, conclusions and recommendations responsive to the questions in the Statement of Work, above, based on the analysis of information obtained through tasks 1 through 4 above.

D. REPORTING REQUIREMENTS:

The Contractor shall:

1. report directly to the USAID Project Officer

2. submit a work plan, including methodology and schedule of activities, within 10 days of the effective date of this contract.

3. conduct mid-way briefing to USAID and AGOSD on progress and initial findings.

4. submit draft report.

5. submit a final report which responds to questions posed in the statement of work, findings, conclusions, and recommendations, and outlines incorporates comments, USAID and GOE, on the draft report.

6. The final report shall adhere to the following format:

   - Executive Summary.

   - Statement of Conclusions and Recommendations. Conclusions shall be short and succinct, with the top identified by a short sub-heading related to the questions posed in the Statement of Work; Recommendations shall correspond to the conclusions; whenever possible, the recommendations should specify who, or what agency, should take the recommended acti

   - Body of the Report. The report shall include a description of the context in which the project was developed and carried out, and provide the informatio (evidence and analysis) on which the conclusions and recommendations are based. More detailed analysis sh be placed as an appendix.

   - Appendices. These shall include at a minimum the following:

     . The evaluation Scope of Work;

     . A description of the methodology used in the evaluation (e.g., the research approach or design, the types of indicators used to measure change or t direction/trend of impacts, how external factors we treated in the analysis). Evaluation may offer methodological recommendations for future evaluatic

     . full analysis of any topics which, due to space limitation in the body of the report should be summarized there; and

     . A bibliography of documents consulted.

7. The Contractor shall:

   conduct a final debriefing for USAID and AGOSD officials.

DR/UAD:Draft:DVincent:nk:10/21/90:Doc#:PEDV:PG1-6:DVINCENT7

APPENDIX 3

METHODOLOGIES

APPENDIX 3
METHODOLOGIES

Individual methodologies for each of the three major Project elements plus the Project management element were developed specifically to address the requirements of the respective evaluation. The methodologies used by the Briley, Wild Evaluation Team are described in the paragraphs which follow:

Methodology - Physical Progress

1. Project records and data were reviewed and meetings with the USAID/Egypt and WWCG staff were held to obtain the historical background and current status of the Project.

2. Site visits were made to all Project sites to physically inspect the quality and condition of the works.

3. We requested (and were not granted) information from AGOSD relative to the status and condition of the projects they are directly constructing.

4. Data was analyzed and tabulated as appropriate and this Report was written.

Methodology - Management Evaluation

In order to get a general understanding of the WWCG method of managing the Alexandria Project, the Briley Wild team discussed the management program with the WWCG Project Director, Mr. William Durham. We received a copy of the WWCG organization chart, which is shown as Figure 2-2. Extensive informal interviews with the WWCG Alexandria-based department managers were then held by Briley, Wild's Executive Vice-President, Mr. Clark Levanger. Once the initial impressions from these conversations were coalesced, a list of questions regarding the function of the organization was developed.

Briley, Wild's Project Manager, Mr. J.R. Sloane, then conducted a second set of interviews with the department managers, addressing the questions previously developed.

Methodology - Social/Environmental

a. Team members made site visits to Project areas in order to personally observe area conditions.

b. The Team obtained and reviewed a variety of Project-related background documents which were available in the offices of WWCG.

c. The team discussed pre-Project and current Project area conditions with selected engineers and other professionals familiar with those conditions.

d. The services of an Egyptian Sub-Consultant (ESC) were used to verify flooding/ponding conditions, to gather selected public health statistics, and to survey a sample of Project area residents, public officials, and selected professionals for their views on the Project and its impacts.

e. For purposes of this evaluation the Project Area encompasses those sewer service districts where Phase-I and Phase-II Project activities were designated in the Phased Implementation Plan (PIP) of 1982 (i.e., the West Zone, the Central Zone, and the East Zone).

f. For purposes of this evaluation, the Team is defining social/environmental impacts in a rather narrow sense as specified by the criteria in the scope-of-work, i.e.: changed access to wastewater services by locality and income group; the effect of changed access on women as a group; community knowledge and attitudes toward the Project improvements; the perceived effect of the facility improvements on the daily lives of the affected residents; the extent of increased sewer services; change in contamination of streets, coastal areas, and water bodies; and the impact of changed contamination levels upon the social fabric and environmental health of the community.

Methodology - Sustainability

The AGOSD investigation was conducted by on-site inspection of selected USAID-funded facilities, interviews with AGOSD field personnel, and discussions with O&M Specialists of WWCG who have extensive experience working closely with AGOSD personnel.

Pump station operation and maintenance was evaluated by site visits accompanied by USAID staff and by review of a WWCG-prepared pump station evaluation report. A total of five operating pump stations representing both WWCG and previously constructed facilities also funded by USAID under a previous contract were visited by PPO.

Three of the four WWCG-constructed facilities were visited: Maamoura Main Pump Station on April 11, 1991: Sidi Bishr Pump Station on April 14, 1991: and East Zone Pump Station on April 15, 1991. The New Smouha Pump Station was not visited. The Maamoura Pump Station was selected as being representative of the WWCG facilities and was contrasted with the WWCG report for accuracy and verification of their findings.

Two USAID-funded facilities designed and constructed by CDM prior to WWCG's involvement were also visited. The Ras El Soda Pump Station was visited on April 11, 1991 and the Sporting Pump Station on April 14, 1991.

Briley, Wild's evaluation of the USAID-funded O&M activities was based upon interviews held with key WWCG personnel responsible for the various aspects of the O&M program, review of available documentation, discussions with AGOSD operating and maintenance personnel and first hand participation in training activities, in-country.

Methodology - Egyptian Consulting Group

Refer to Chapter 1, Methodology and Action Processes of the Egyptian Consulting Group Report contained in this volume.

SECTION 4

REFERENCES

1. AGOSD Organizational Chart
2. AID Informational Statements (1981).
3. Alexandria Sea Outfall Draft Report on Preliminary Office Investigations and Design, Vol. I, June-1983 (M&E)
4. Alexandria Wastewater Facilities Development Program Special Report #3 (CDM) (population, land use, etc.) (May-1977).
5. Amendment #1, Project Data Sheet ($87,321,000) (Sept-1979).
6. BODR for Nouzha West Collection Sewer System, AGOSD (December-1985).
7. BODR for Sidi Bishr collection facilities (November-1981).
8. BODR-Abu Qir/Mamoura, Laterals-Sanitary Sewers-Storm Drains (February-1982).
9. "Cairo Today" article on Alexandria wastewater system (August-1990).
10. CDM Alexandria Wastewater Master Plan w/Special Reports (1978).
11. CDM SCOPE OF PROJECT PAPER (late 1978) (recommendations for project financing as a follow-on to Alexandria Wastewater Master Plan Study).
12. CDM Special Report #2, Existing Physical Sewerage System (April-1977).
13. Comprehensive O & M Program Description Presentation Notes.
14. Comprehensive O & M Program Update (July 1 - 31 December 1990)
15. Estimated Cost-to-Operate for USAID Funded Facilities (May-1990).
16. Existing Sewerage System Map, Figure 3-1, from 1978 Alexandria Wastewater Master Plan Review and Update-May 1981.
17. Final Design Report for Collector General Relief Sewers (CDM) (May-1980).
18. ICS (Inventory Control System) Description.
19. Job/Task Analysis Report - A User's Guide (January-1991).
20. Job/Task Analysis Volume 1 - Sporting PS (January-1991).
21. Lake Maryout Improvements, Task Data Report #1, April-1983.
22. Land Application Alternative Map (Figure 2) (May-1982).
23. National Urban Policy Study (draft) (Jan-1982).
24. O & M Training Lesson Plan #2 - Confined Spaces.
25. O & M Training Schedule.

26. OMI Memo Re: Pump Station Evaluation Report (28 November 1991).

27. Possibility and Limitations for Lake Maryout Loading with Wastewater from Alexandria City (R.Vander Schaef).

28. Project Report #1 (30 October 1980 to 30 April 1981), WWCG.

29. Proposed Improvements for Ras el Soda (drainage, potable water, roads).

30. Ras el Soda O & M Manual (excerpts)

31. Report on the Extent of Safety of Alexandria Beaches Being Affected by the Wastewater, prepared by Mitwally and Galal, July-1981.

32. Sea Disposal Alternative Map.

33. Sea Outfall Report (June-1982).

34. Sidi Bishr O & M Manual (excerpts) (October-1988).

35. Solid Waste Management Study, City of Alexandria (Mitwally) (1984).

36. SOP - Mechanical Bar Screening (draft) (February-1991).

37. Technical Assistance Requests and Disposition (21 April 1991).

38. Training Needs Assessment Report (December-1988).

39. Training Strategy • Institutional Strengthening Strategy • Training Center Concept and Implementation • Direct Assistance (February-1991).

40. TUMMS (Total Utility Maintenance Management System) Description.

41. USAID/Government of Egypt Project Grant Agreement (1979) and subsequent Amendments.

42. USAID/WWCG Contract Modification #5.

43. WHO Conference (April-1985) (mentions in paper WSSP/12 about Ras el Soda and water).

44. WHO Conference Papers, Alexandria (1985).

45. WHO Conference Papers, Wastewater Application for Land (Mitwally) (1985).

46. WHO Conference, AGOSD paper on Alex sanitary drainage program: Progress in Sanitary Drainage for Alexandria 1981-1985 and Prospects and Plans for 1985-1990 by Eng. Moustafa El Nekhely, AGOSD Chairman (4-85). (Second National Conference on the Sector Progress and Needs of the IDWSSD in Egypt; April 16-18, 1985).

47. WHO Conference, AGOSD paper on Alexandria's sanitary drainage program: Progress in Sanitary Drainage for Alexandria 1981-1985 and Prospects and Plans for 1985-1990 by Eng. Moustafa El Nekhely, AGOSD Chairman (April-1985). (Second National Conference on the Sector Progress and Needs of the IDWSSD in Egypt; 16-18 April 1985).

48. WWCG Internal Project Schedule Records.

49. WWCG Library List.

50. WWCG Phased Implementation Plan (1982).

51. WWCG Phased Implementation Plan Update (1990).

52. WWCG Review and Update of 1978 Alexandria Wastewater Master Plan (1981).

APPENDIX 5

DISCUSSION TOPICS FOR PROJECT MANAGEMENT EVALUATION

PROJECT MANAGEMENT EVALUATION

Discussion Topics

A part of the Project Management Evaluation, the Briley, Wild & Associates team held informal interviews with the WWCG department management staff. The direction of these conversations was established using the following format:

1. General discussion of WWCG Management Organization.

2. Does management of the Alexandria Project function in a manner consistent with the WWCG organization chart?

3. Explain the apparent dual reporting responsibility of the Program Management/Program Control Section as you understand it.

4. In your opinion, how could the organization of the WWCG Management structures be updated?

5. Discuss the CH2M Hill/Metcalf & Eddy joint venture relationship.

6. Are there any issues regarding project management that you would like to see discussed in this report ?

7. Do you have any questions regarding our evaluation?

APPENDIX 6

FORMAL MEETINGS

Formal Meetings

Many persons associated with the Alexandria Project were interviewed during the progression of the Review. Several meetings of significant importance that were held were the following:

- 25 March 1991 - Preliminary Project Introduction (Dan Vincent, Bill Durham, George Kinias, others).

- 28 March 1991 - Formal Project Briefing (Bill Durham, Dr. Moustafa Saad, Dr. Mohammed Farag, Dr. Hassan Mitwally, George Kinias, Mohammed Fahmy).

- 1 April 1990 - Preliminary meeting with Egyptian Social and Environmental Consultants (ESC) regarding their proposed scope-of-work (John Levanger, J.R. Sloane, Dave Porter, John Schoch, Dr. Moustafa Saad, Dr. Hassan Mitwally, Dr. Samia Fahmy and Dr. Ahmed El-Sherbini).

- 2 April 1991 - Continued discussion with ESC regarding their proposed scope-of-work (John Levanger, J.R. Sloane, Dave Porter, John Schoch, Dr. Moustafa Saad, Dr. Hassan Mitwally, Dr. Samia Fahmy and Dr. Ahmed El-Sherbini).

- 7 April 1991 - Continued discussion with ESC regarding their proposed scope-of-work (John Levanger, J.R. Sloane, Dave Porter, John Schoch, Dr. Moustafa Saad, Dr. Hassan Mitwally, Dr. Samia Fahmy and Dr. Ahmed El-Sherbini).

- 9 April 1991 - Project schedule review and data transfer (J.R. Sloane, Dave Porter, John Schoch, John Hatch, Ron Bell, Al Ewton, Terry Connell, Warren Rockwell, Hesham Abdullah).

- 21 April 1991 - Training program discussion (Ossama Affifi and Ray Hanson).

- 21 April 1991 - Discussed development of twinning program (Bill Rappold-WWCG-Director of Human Resource and Ray Hanson).

- 21 April 1991 - Discussed AGOSD finance and budgeting (Ahmed Farid Fadle and Ray Hanson).

- 21 April 1991 - Discussed AGOSD organization Mahmoud Fahmy, Deputy Director of O&M .

- 21 April 1991 - Documentation-standard procedure development meeting with Frank Quick.

- 22 April 1991 - Mid-project review meeting held in WWCG Alexandria offices with Mr. James LoCaste, Mr. Sayed Hassan, and Ms. Mervat Sallem.. BWA personnel in attendance included Mr. Ray Hanson and Mr. J.R. Sloane.

- 22 April 1991 - Review general program objectives with George Kinias.

- 23 April 1991 - Review general program objectives with George Kinias, O&M Director.

- 23 April 1991 - Discussion of O&M manuals for wastewater treatment plants with Gary Horton.

- 23 April 1991 - Review of computer preventive maintenance programs with Gary Shreve.

In addition, numerous informal meetings and discussions were held throughout the April-June 1991 period. These meetings/conservations were between various Evaluation Team members and USAID personnel, WWCG staff, and AGOSD employees.

APPENDIX 7

SITE VISITS

Documentation

Appendix 4 contains a list of the documents used by the Briley, Wild Evaluation Team as references during this evaluation in order to develop an overall understanding of the goals and objectives of the Project, and to provide a chronology of events since Project inception.

1.40 Site Visits

The following site visits were made during the progression of the Physical Progress and sustainability Review:

- 25 March 1991 - Smouha Pump Station and East WWTP (Dave Porter, J.R. Sloane, John Levanger and George Kinias).

- 11, 14, 15 April 1991 - Site Visits to East and West WWTP's, and major pump stations (Dave Porter, Ray Hanson and Sayed Hassaan---J.R. Sloane accompanied them on the 11th only).

The March 25th site visits were preliminary in nature and were made early in the data research phase of the review. The purpose of these preliminary site visits was to give the advance Evaluation Team a general understanding of the typical design and construction methods used throughout the Project.

The 11, 14 and 15th April site visits were more comprehensive in nature. The East and West wastewater treatment plants and the Abu Qir, Maamoura, Ras El Soda, Sidi Bishr, East Zone, and Sporting pump stations were toured and operating staff at these locations were interviewed.

The following site visits were made in the course of the Social/Environmental Review:

- 17 April 1991 (morning): Automobile tour of areas of Smouha, Siouf Keblia, El Nassr Village, Ras El Soda, Maamoura, and Abu Qir; included vicinity of the Mahmoudia and Montazah canals, the Smouha Drain, the New Smouha Pump Station, the Abu Qir Pump Station, Abu Qir Bay, and the eastern Mediterranean Coast (John Dillard, John Schoch, and Hesham Abdullah).

- 17 April 1991 (afternoon): Automobile and foot tour of Smouha Drain, Kalaa Pump Station, Kalaa Drain, Hydrodrome, Lake Maryout, the Mex Canal, and the Western Harbour; included vicinity of East Treatment Plant (John Dillard, John Schoch, Tarek Zohdy).

- 17 April 1991 (afternoon): Foot tour of all sea outfalls from the Sporting Pump Station to the Eastern Harbor (John Dillard).

- 18 April 1991 (afternoon): Automobile tour of areas of Smouha, Hagar El Nawatiya, Victoria and Nouzha (John Dillard, John Schoch, and Sayed Hassaan).

APPENDIX 8

DETAILED PROJECT HISTORY

Detailed Project History

For the purpose of this report, the start of the Project will be assumed to be 1977 with the submission of CDM's Special Report Number 1 (Oceanographic Studies) dated 28 February 1977.

The 1978 CDM Wastewater Master Plan (CDM-MP) stated 5 objectives for the Project:

1. Elimination of surface drainage of untreated sanitary and industrial wastewater by providing necessary sewers, collectors, pump stations, and appurtenances for the underground collection and conveyance of the wastewater to treatment facilities and points of disposal.

2. Elimination of overflow, or other discharge of untreated sanitary wastewater or combined runoff up to at least three times average dry weather flow to the beaches or near-shore water of the Mediterranean Sea, Abu Qir Bay, and the harbors of Alexandria.

3. Treatment of collected sanitary and industrial wastewater to a degree which will assure proper operation of disposal facilities and/or will allow discharge to receiving waters or land mass of the area without stressing natural purification processes, resulting thereby in maintenance of an acceptable steady state condition in the environment.

4. Elimination of troublesome flooding during wet weather of certain key areas of the city that are important to commerce and transportation.

5. Accomplishment of the above objectives with maximum use of existing facilities and processes of nature and with minimum adverse impact on the social, natural, and financial resources of Egypt.

This Master Plan concluded that six (6) independent collection treatment-disposal systems were desirable, each with its own recommended action plan to meet the objectives listed above. The principal elements of the recommended system consisted of the following:

East:	One preliminary treatment facility and long submarine outfall.
West/Central:	Two preliminary treatment facilities and a single long submarine outfall.
Abu Qir:	Separation of system flows: Peninsula flows (domestic) to the East System, the Bay (industrial) flows conveyed to a remote evaporation pond at Lake Idku.
Nouzha:	Use of existing East Sewage Treatment Plant.
Mex/Dekheila:	Waste stabilization ponds with discharge to the West Noubaria Main Drain.
Ameria:	Waste stabilization ponds with discharge to the West Noubaria Main Drain.

The CDM-MP provided for over 92,000 connections, 1040 kilometers of additional lateral sewers, and principal wastewater conveyance facilities. It also recommended a staged construction program which consisted of the following:

Top Priority Projects:	1978 -1981	Immediate rehabilitation, repair, and improvement works in existing system.
Stage I Construction:	1979 - 1983	Emphasis on expansion of collection system in the Outer East Zone along with new treatment and outfall facilities to serve the entire eastern area. Also to be included were expanded collection facilities in the West Zone and initiation of the Nouzha collection system.

Stage II Construction:	1984 - 1988	Construction of the West/Central treatment and disposal system, as well as "outer area" projects in Mex/Dekheila, Ameria and Abu Qir.
Stages III and IV:	1989 - 2000	Expansion of the entire collection system to meet additional service demands from domestic and industrial development as it occurs.

On 29 August 1979 the Arab Republic of Egypt (ARE) and the United States Agency for International Development (USAID) entered into an Agreement to provide for the construction and start-up for the first stage of expansion of facilities for the Alexandria Wastewater System, consisting of:

1. Two primary treatment plants with sea outfalls.
2. Wastewater pumping stations, force mains and sewer collectors.
3. Extension of sewers into selected unsewered areas.
4. Upgrading of selected existing facilities to be retained as part of the future system.

Annex I of the Agreement further defines the scope of the Project to include:

1. East Zone Treatment Plant and Sea Outfall.
2. Smouha Sewerage System.
3. Siouf Keblia Sewerage System.
4. East Zone Pumping Station Rehabilitation and Additions.
5. Central Zone Treatment Plant and Sea Outfall.

6. West Zone Sewerage and West Treatment Plant Upgrading.

7. Nouzha Sewerage and East Treatment Plant Upgrading.

According to the Agreement, the principal benefit of the Project is to alleviate public health problems caused by water-borne diseases related to sewage ponding in streets and disposal of raw sewage along the Mediterranean shoreline and into Lake Maryout. The primary beneficiaries would be poor urban residents, with secondary benefits accruing to local business.

Further, the Agreement states that "USAID agrees to grant the Grantee an amount, not to exceed Sixty Million United States ("U.S.") Dollars ($60,000,000) to assist in completing the project." The Grant was to be used only to finance foreign exchange costs, as defined in Section 6.1. of the Agreement, of goods and services required for the Project.

The Agreement states that the "Project Assistance Completion Date" (PACD), was estimated to be 31 August 1985. Further, the Agreement lists 9 Miscellaneous Covenants as follows:

1. The Grantee and GOSSD (General Organization for Sewage and Sanitary Drainage) shall take necessary actions to establish the organizational structure to insure that the existing sewer use law applicable to this Project is enforced.

2. The Grantee shall consider modifying the current sewer use law, applicable to this Project, in order to conform with the proposed draft Ordinance Regulating Sewer Construction, Sewer Use and Industrial Waste Discharge, as recommended in the Wastewater Master Plan Study for Alexandria.

3. Consistent with Grantee's obligations under Article 16 of Proposal for the Protection of the Mediterranean Sea Against Pollution form Land-Based Sources as developed through the United Nations Environmental Programme, the Grantee shall cause to be exchanged with the contracting parties such Protocol information concerning the environmental aspects of the Project as may be appropriate under the Protocol.

4. The Grantee and GOSSD shall consult the GOFI and other responsible agencies to ensure coordination with regard to problems related to industrial wastes and the disposal of toxic materials, and within one year of the signing of the Agreement submit a plan of action which would indicate how this problem is to be addressed.

5. The Grantee and GOSSD shall undertake necessary studies to evaluate the problem of disposal of solid waste and within one year of the signing of the Agreement propose a plan to exclude from the public sewer system solid waste such as mazout, used oil, grease, manure, septage, slaughterhouse and tannery wastes and trash.

6. The Grantee shall investigate the need for the creation and implementation of a utilities coordination board which would coordinate and notify all agencies of any construction efforts involving blasting and/or excavation by utility organizations and by private contractors to minimize interruption of services, damage, repair costs and inconvenience to the public.

7. Upon the completion of the Wastewater Management and Tariff Study, the Grantee shall submit a specific tariff plan for the Alexandria Water and Sewer System.

8. The Grantee and GOSSD shall issue, or cause to be issued in a timely manner, all permits, licenses, decrees, etc., required for expeditious implementation of the Project.

9. The Grantee and GOSSD shall take necessary actions to provide continuous and adequate monitoring of the aquatic system in the vicinity of the sea outlets and the beaches of Alexandria to detect any changes in such systems resulting from the Project.

Shortly after the 1978 Master Plan was completed a USAID Final Environmental Impact Statement (issued in August, 1979) required that the level of treatment of the sewage be modified to include primary treatment. This change required that the Master Plan be reviewed and updated as the costs and land requirements for the original plan were significantly increased.

On September 22, 1979 the "First Amendment to Grant Agreement" was effected. This Amendment:

1. Increased the grant funding to Eighty-Seven Million Three Hundred Twenty-One Thousand and Forty-Five United States ("U.S.") Dollars ($87,321,045).

2. Contained other administrative details/requirements not presented here.

In 1982 the Wastewater Consultants Group (WWCG) prepared and released its 1981 Update of the CDM-MP. This Update of the 1978 plan contained the following recommendations:

1. Adopt a program to best provide interim treatment and disposal of Alexandria wastewater flows as soon as possible based on local and foreign funds available at that time. The plan development should center on the roles that the East and the West plants can play in minimizing the pollution load to Lake Maryout and the sea. Consideration should be given to expanding both plants immediately to "high rate" primary plants to serve as much of the greater Alexandria area as possible. In addition, consideration should be given to supplementing the natural treatment capacity of a portion of Lake Maryout through selected dredging, supplemental aeration, and other means.

2. Conduct marine studies to determine the design data needed to construct the new pipeline at the existing Kait Bey outfall.

3. Identify possible capital financing constraints associated with the land application options. Conduct field studies needed to confirm the technical and economic feasibility of the land disposal system when funding sources have been identified.

4. Adopt land disposal as the goal for disposal of wastewater in Alexandria, and continue to investigate alternate means of financing. When funds are available, divert the sewage flow to land disposal on a phased program. In the event all flows can be diverted to the land, the Kait Bey outfall can be used for

stormwater flows and emergency standby. Should difficulties be encountered during the phased implementation program that cannot be resolved with regard to land disposal, AGOSD should reevaluate other alternatives presented in this report.

5. Continue with ongoing design and construction activities.

In 1982 WWCG subsequently prepared and released a report entitled Phased Implementation Plan for the Rehabilitation and Expansion of the Alexandria Wastewater System. The Phased Implementation Plan (PIP) presents a schedule for implementation of the Updated Wastewater Master Plan.

The schedule states that it provides for completion of Phase-I and Phase-II construction by 1990. Milestones within the program included the following:

1. Relief of Smouha district underpass flooding by October, 1984.
2. Commencement of partial East Plant operations by mid-1983 and full operations by January, 1986.
3. Commencement of full West Plant operations by September, 1985.
4. Completion of service extensions to Abu Qir by July, 1987.
5. Completion of East and West plant expansions by March, 1988.
6. Commencement of treatment of some Central Zone flows at the West Plant by March, 1988.
7. Completion of sewage collection and disposal facilities for the Outer West Zone by July, 1989.
8. Discontinuance of West Plant discharges to Lake Maryout by November, 1989 and initiation of discharges through the new Kait Bey outfall.

Specific Phase-I components of the plan consisted of the following:

Outer East Zone:

The Outer East Zone, including the Maamoura and Abu Qir districts, will be connected to the East Zone for treatment and disposal. Of the two districts, only Maamoura is sewered at this time, and its flows are pumped to the East Zone by way of Pumping Stations 2E, 6E and 11E.

When the proposed Abu Qir and Ras El Soda collection system are operational, Maamoura will be retained either for emergency use or abandoned. Flow contributions from Abu Qir are expected to be minor until the implementation of Phase-II.

East Zone:

The basic concept for servicing the East Zone under Phase-I is to: (1) construct the wastewater facilities needed to convey the sewage collected within the East Zone (including Abu Qir) to the East Treatment Plant; (2) rehabilitate and expand the East Treatment Plant to 325 ML/d; (3) continue to use Lake Maryout as the receiving water body for the East Plant effluent.

Central Zone:

The Central Zone will continue to discharge untreated waste to the sea during Phase-I; however major collection system improvements are to be constructed in this phase.

West Zone:

The basic concept for servicing the West Zone under Phase-I is to: (1) construct the wastewater facilities needed to convey the sewage collected within the West Zone (including allowances for Nouzha) to the West Treatment Plant; (2) complete construction of the initial stage of the West Plant and place it into service as a 175 ML/d primary treatment facility; (3) discharge the

treated effluent to Lake Maryout; and (4) make in situ improvements to Lake Maryout to enhance its waste assimilative capacity and minimize nuisance conditions.

Outer West Zone and Nouzha: These facilities are described under the Phase-II program. Construction may be moved up into Phase-I if funding is available.

Specific Phase II components of the plan consisted of the following:

Outer East and East Zones: As sewage collection needs for the Outer East and East Zones were provided in Phase-I, only treatment and effluent disposal systems require major expansion for Phase-II.

Central Zone: The key conceptual changes for the Central Zone in Phase-II are the discontinuance of raw sewage discharges, the conveyance of all flows to the West Plant for treatment, and the construction and operation of a major improved effluent outfall system off Kait Bey.

West Zone: The key changes in the West zone in Phase-II are the shifting of the effluent disposal from Lake Maryout to the sea, the West Plant expansion to accommodate Central Zone flows, and the extension of sewerage services to Nouzha.

Outer West Zone: The Outer West Zone consisting of Agami and Mex-Dekheila is proposed to have a separate collection and treatment system. Treatment proposed in the original Master Plan would be by a series of anaerobic lagoons followed by aerobic waste stabilization lagoons constructed in the dry marsh areas of west Lake

Maryout. Effluent could be discharged to the lake bed, to the proposed West Noubaria main drain, or to the West-Central Zone effluent system. This work is outside present foreign assistance commitments.

On September 28, 1983 the "Second Amendment to Grant Agreement" was effected. This Amendment:

1. Increased the grant funding to One Hundred Sixty-Six Million Seven Hundred Twenty-One Thousand and Forty-Five United States ("U.S.") Dollars ($166,721,045).

2. Changed the Scope of the Project to read: "The Project, which is further described in Annex 1, will provide for the design, construction, and start-up for the first phase of expansion of facilities for the Alexandria Wastewater System.

   The activities financed by this grant, as amended, include: (1) review of the 1979 Environmental Assessment to ascertain the effect of upgrading treatment from preliminary to primary upon the recommendations and conclusions of the Master Plan and to develop a phased implementation plan; (2) foreign exchange costs of management advisory services to assist the Alexandria General Organization for Sanitary Drainage (AGOSD) in carrying out the Project and improve its capability to manage, operate, and maintain the Alexandria Wastewater System; (3) foreign exchange costs of engineering design and engineering services during construction; (4) foreign exchange costs of construction contracts awarded to U.S. firms; and (5) foreign exchange costs of selected commodity procurement.

3. Stated "The Grantee shall provide, by July 1, 1984, and at six month intervals thereafter, plans for the introduction of wastewater tariffs, including the schedules and levels of such tariffs".

4. Changed references to GOSSD by substituting the term AGOSD.

5. Changed the Project Description to:

   A. The elements of the Project are:

      a. The Abu Qir collection system.
      b. The East District collection system including the Ras El Soda Pump Station and force main.
      c. The Smouha collection system.
      d. The first phase modification /development to the East Treatment Plant.
      e. The West District collection system.
      f. The first phase modification/development to the West Treatment Plant.
      g. Sludge disposal system for East and West Plants.
      h. Procurement of commodities for construction and maintenance of the wastewater system.
      i. Improvements in the Central District including the Sporting Pump Station and Force Main.
      j. Engineering studies, design services during construction, and advisory services; and
      k. Management advisory services.

6. Contained other administrative details/requirements not presented here.

On November 10, 1983 the "Third Amendment to Grant Agreement" was effected. This Amendment:

1. Increased the grant funding to One Hundred Ninety-Eight Million Six Hundred Twenty-One Thousand and Forty-Five United States ("U.S.") Dollars ($198,621,045).

2. Contained other administrative details/requirements not presented here.

On September 22, 1987 the "Fourth Amendment to Grant Agreement" was effected. This Amendment:

1. Increased the grant funding to Two Hundred Fifty-Two Million Seven Hundred Sixty-One Thousand and Forty-Five United States ("U.S.") Dollars ($252,761,045).

2. Required AGOSD to establish a "Training Department" for personnel to be trained under the project and further required that AGOSD submit evidence of complying with this condition.

3. Contained other administrative details/requirements not presented here.

On September 30, 1987 the "Fifth Amendment to Grant Agreement" was effected. This Amendment:

1. Increased the grant funding to Two Hundred Sixty-Two Million Three Hundred Nineteen Thousand and Forty-Five United States ("U.S.") Dollars ($262,319,045).

2. Contained other administrative details/requirements not presented here.

On September 4, 1989 the "Sixth Amendment to Grant Agreement" was effected. This Amendment:

1. Stated that A.I.D.'s total contribution to the Project would be limited to Three Hundred Eighteen Million, Four Hundred Fifty-Eight Thousand United States ("U.S.") Dollars ($318,458,045).

2. Stated, "The Grantee, through its implementing agency, the Alexandria General Organization for Sanitary Drainage, will ensure that the operations and maintenance program for all facilities constructed under the Project will be contracted for and administered on a timely basis and as a single package.

3. Contained other administrative details/requirements not presented here.

141

In 1990 The Wastewater Consultants Group (WWCG) prepared and released a report entitled "Phased Implementation Plan Update for the Rehabilitation and Expansion of the Alexandria Wastewater System". This report states that the Phase-I work alone does not achieve the full objectives of the program. The main emphasis of this 1990 Update was to present the major future elements what were needed to fully achieve the program's overall objectives, as originally envisioned.

The Update presents an implementation schedule for the Updated Wastewater Master Plan. This schedule is presented as Figure IV-3 of the Implementation Plan Update. The basic elements of the schedule are as follows:

1. 1990, Implementation of Future Program.

2. 1990 - 1996, East Plant Primary Expansion.
3. 1990 - 1996, West Plant Primary Expansion.

4. 1990 - 1996, Expand WTP Sludge Dewatering.

5. 1991 - 1995, Sludge Disposal Expansion (Site 9N).

6. 1990 - 1996, Central Zone Tunnel.

7. 1990 - 1996, Central Zone Connections.

8. 1990 - 1996, Qabbari Relief Sewers.

9. 1990 - 1997, Sea Outfall.

10. 1990, Predesign Evaluations for Landbased Outfall Conveyance Systems.

11. 1991 - 1996, Landbased Outfall Conveyance System.

12. 1991 - 1997, Landbased Outfall Force Main Tunnel.

13. 1991 - 1996, Outfall Pump Station.

14. 1990 - 1996, Interim Effluent Disposal (East and West WWTP's).

15. 1990 - 1992, Outer West BODR (Basis of Design Report).

APPENDIX 9

EGYPTIAN CONSULTING GROUP REPORT

FINAL REPORT
THE SOCIAL IMPACTS
OF
THE IMPROVEMENT IN SEWAGE
DISPOSAL IN ALEXANDRIA

ACKNOWLEDGMENT

The terms of reference for the present team are:

Overall social and environmental impact, improvement and expansion.

Improvement and expansion of Alexandria Wastewater Facilities have considerably reduced the dangers of street and basement flooding by wastewater. To what extent this has impacted the social fabric and environmental health of community is not clearly identified and measured. The Subcontractor shall examine the effects of USAID financed sewerage improvements as well as other locally financed wastewater project to identify:

- Community knowledge and attitudes toward the improvements in the sewer system and the impact of these improvements on their daily lives, in the served zones and unserved ones.

- To determine locations subjected to sewerage flooding and ponding in streets and basements with sewer service areas before and after the program, also in the unserved districts.

- Provide selected public health vital statistics data on population, birth rate, infant/mortality and child born diseases related to sewerage flooding and ponding in served and unserved areas.

On behalf of the team we extend our deep thanks to the staff of WWCG for this cooperation to facilitate our assignment during the study - field work. Special thanks to Mr. William Durham and Administration, Clerical and Design Departments.

ECG
Consultants

1991

EXECUTIVE SUMMARY

The aim of the present project is to increase the capacity of the existing drainage network, extending the coverage of the sewage drainage to the deprived areas and increasing the capacity of the two treatment plants at the East and West of Alexandria.

The objective of the present evaluation is to assess the social, environmental and health impact of the present project through measuring the community knowledge and attitudes towards the improvements in the sewerage system.

Comparing the situation in the served areas before and after the project; 62.7% stated that they are able to go to their work on time now, and 54.7% indicated that their children are able to go to school. Transportation means have reached their neighborhood as stated by 44.0% and their is improvement of other services as telephones and safe drinking water which was stated by 60% of the interviewed sample. Improvement of the sewage drainage system encouraged stores to start business in the served areas which were flooded before. At the same time there are unmet expectations as the sewers are not connected with the houses of some inhabitants. There are still wastewater ponds which is contaminated with sewage flooding in some areas.

Comparing the served with the unserved communities; 100% of the unserved sample stated that their difficulties for the means of transportation to reach their areas, 20% of the unserved said they are not able to go to work now and 36.0% their children are not able to go to schools. 28% showed that other public services are not available due to lack of proper sewage drainage and 92% stated that even wondering vendors do not reach the areas.

With the upgrading happened in the system there is improvement in the health level as shown by the drop of admissions of water born diseases to the fever hospital as infectious hepatitis which dropped from 87.5/100,000 in 1986 to 54.9/100,000 in 1990, typhoid dropped from 24.7/100,000 in 1986 to 12.9/100,000 in 1990 and paratyphoid dropped from 4.9/100,000 in 1986 to 0.9/100,000 in 1990. The mortality indices showed definite drop; the infant mortality rate dropped from 69.51/1000 in 1980 to 25.95/1000 in 1990.

While both the served and the unserved as well as the community leaders interviewed all requested to complete the present program, the expressed desires varied asking for complementary services as spraying the areas by insecticidal to control insects which increased due to the improper sewage drainage. Both served and unserved wanted proper maintenance service to be associated with efforts to complete the project.

Further studies are proposed to follow up all relevant aspects.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ANNEXES

LIST OF MAPS

LIST OF PICTORIAL RECORD OF FLOODING CONDITIONS IN SERVED AND UNSERVED AREAS IN ALEXANDRIA GOVERNORATE (See Attached Album)

I. **In Served Areas:**

A: El Montazah District:

1.	Ezbett El Haramine	No flooding now and environmental improvement
2.	Gamea El Saida St.	No flooding now and environmental improvement
3.	Rass El Soda	No flooding now and environmental improvement
4.	Sixty four St.	No flooding now and environmental improvement
5.	Malak Hefni Nassef St. (Parallel to train line)	No flooding now and environmental improvement
6.	El Siouf Keblia	No flooding now and environmental improvement

B: East (Shark)

1.	El Kosaai	No flooding now and environmental improvement
2.	Maamal El Katakit St.	No flooding now and environmental improvement
3.	Victoria College Square (infront of HIVO Restaurant)	No flooding now and environmental improvement
4.	Danna	No flooding now and environmental improvement
5.	Abu Soliman	No flooding now and environmental improvement
6.	Smouha Bridge	No flooding now and environmental improvement
7.	Smouha Square	No flooding now and environmental improvement
8.	Kilopatra R.R. Way Bridge	No flooding now and environmental improvement

C: Central (Wassat)

1.	El Ibrahimia Bridge	No flooding now and environmental improvement
2.	Moharem Bey Bridge	No flooding now and environmental improvement
3.	Back of Sporting Club (Parallel to the Subway line)	No flooding now and environmental improvement

/jk (FR-ES)

D: El Gomrok

1.	Zawia Kattab	No flooding now and environmental improvement
2.	Gomrok Main st.	No flooding now and environmental improvement

II Unserved District

A: Amria District

1.	El Mex	Suffering from Sewage Flooding
2.	Wadi El Kammar	Suffering from Sewage Flooding
3.	Dekheila	Suffering from Sewage Flooding
4.	Around Chemical Co. in Dekheila	Suffering from Sewage Flooding and bad odor
5.	Around Leather Co.	Suffering from Sewage Flooding and bad odor
6.	El Agami Old	Suffering from Sewage Flooding and bad odor
7.	El Agami Water Co.	Suffering from Sewage Flooding
8.	New Housing Compounds.	Surrounded by flooding and insects.

III Partial Served Areas: Still Suffering:

1:	Ezbett Nadi El Seide	Still suffering, from flooding and ponding. (Because of disconnected pipes to homes)
2.	Ezbett El Mattar (Back of Air port & International Park)	Still suffering, from flooding and ponding.

/jk (FR-ES)

INTRODUCTION

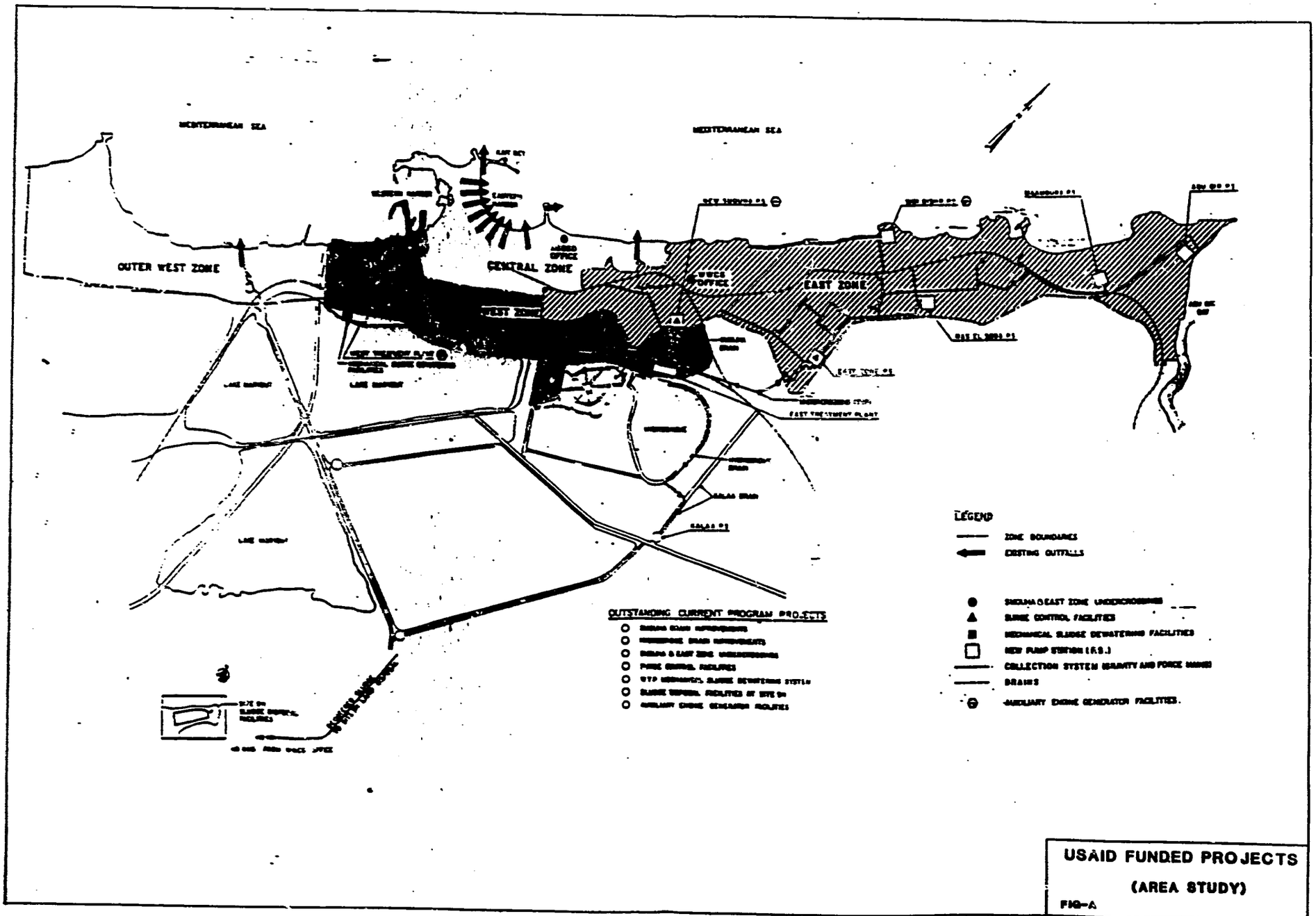
The improvement in the environment of the served areas by sewage disposal is not limited to the technical and physical components of the project, but the social environment has shown a change. The promotion of wastewater drainage plan in Alexandria started in 1978 and the implementation of this project is in process up till now in 1991 (Figure A). This is a continuation of developing this service which started in 1908 and passed by continuous support and development till the early sixties when the coverage reached 40% of the population of Alexandria. In 1978 a project was designed to promote this coverage financed mutually from the Egyptian Government and the American Government. This project is aiming at:

1. Increasing the capacity of the existing drainage network covering Glymonopolo, Tharwat, El Sarayah and Sidi Bishr areas which are parts of the Montazah and East (Shark) Districts.

2. Extending coverage of the sewage drainage to areas which were deprived of this service and had become in need of it due to increase of inhabiting population. These are the areas on the two geographic extremes; east and west of Alexandria.

3. Increasing the capacity of the two treatment plants at East and West of Alexandria.

161



USAID FUNDED PROJECTS

(AREA STUDY)

FIG-A

CHAPTER I

METHODOLOGY AND ACTION PROCESSES

CHAPTER I

Method of Assessment of the Overall Social and Environmental Impact of Sewerage Improvement Plan in Alexandria Governorate

---

Improvement and expansion of Alexandria Wastewater Facilities have considerably reduced the dangers of streets and basement flooding with wastewater.

Objectives:

Community knowledge and attitudes toward the improvements in the Sewage System and its impact on their daily living are the main objectives, yet to reach this goal Sub-objectives are:

1. To determine locations subjected to sewerage flooding and ponding in streets and basements with sewer service areas before and after WWCG program.

2. Provide selected public health vital statistics data on population; infant mortality, birth rate, also related diseases to sewerage flooding and ponding in served areas and unserved ones.

Methodology and Action Processes:

1. Analyzing available documents and maps concerning the WWCG Sewerage System in Alexandria (before and after the project).

2. Interviewing key figures: Professionals, political and administrators.

3. Interviewing a sample of families served and unserved by the project to assess their awareness and benefits from the services. (See Annexes No. 3 & 4).

4. To design general maps placing on them the following data.

   4.1 Update population growth in several areas especially served ones.
   4.2 Fertility in the last 10 years.
   4.3 Infant Mortality in the last 10 years.
   4.4 Environmental Changes.
   4.5 Water related diseases.
   4.6 Improved flooded streets in served districts, flooding ones in unserved districts.

-164-

RESEARCH SAMPLE

The sample is a purposive sample, selected by a multistage processes as the following:-

Because we would like to ensure a desired representation of Served areas by the project, the first stage will be withdrawing sample of families according to the size of population in each district as shown from the following table.

- Since the project served 5 districts only then the sample will be on two strata:

  First: 75 families from all 5 districts served.

  Second: 25 families as control group.

The following criteria will be considered in the chosen Sample in districts:

1 - Families will be chosen from served districts density populated.

2 - Families residing in the districts not less than 10 years. This to ensure that they know the situation before and after the project.

3 - The families from each district will be chosen from the worst off streets, where families suffered from flooded areas, bad smell dirt, indirect problems of sewage.

4 - The number of families from each district will be selected from the worst Off Streets, and in case any of these families does not meet the above stated criteria, we will choose a substitute family instead.

Third:

A chosen sample of Professionals and Community Leaders representing, Sanitation, City Planning and Public Leaders. The public authorities will be interviewed individually. The aim is to give their opinion on the project and their recommendations.

165

The following are Samples chosen:

Table (I-1) The Districts benefitted from the Project Showing Selected Purpose Samples

No.	Name of District	Pop. Density by Families	No. Family Sample selected
1	El Montazah	136098	17
2	East	171915	21
3	Middle	134569	17
4	West	119187	15
5	El Gomrok	36781	5
Grand Total		599050	75

Table (I-2) The District unserved by the project for use of Control Group

No.	Name of District	Pop. Density by Families	No. of Families Sample Selected
1	El Ameria	43649	25

Tools to be Used in the Study:

1. Interviewing schedule directed to chosen purpose sample. whether served or unserved.
2. Interviewing guide leading figures.[1]
3. Documents on vital statistics regarding population, infant death rate, diseases.
4. Observation on still flooded areas or newly developed within served districts.

[1]Leading figures will be presented before interviewing with WWCG & Briley Wild, Associates representatives. These are shown in Annex 6.

966

Manpower for Completion of the Study:

1. Two main Consultants in Social, Cultural, environmental and health fields. They will act jointly as principal investigator and Co-principal investigator.

2. One public health expert.

3. Four Senior social workers, in community organization and development.

4. A city planner for maps and diagrams.

5. Computer expert.

6. Typist.

7. Driver.

Work Plan by Time:

Since the time of the evaluation of the Social and Environmental impact work on served areas in Alexandria is limited we would like to recommend two more weeks following the expected date of first draft on June 11, 1991 i.e. the final report will be presented towards the end of July but in any case, no later than 6th August 1991.

First Stage - April - April 23

- Meeting with WWCG representatives for approval to take over the responsibility.

- Presenting an overall out line to project director for determining the budget from AID and supporting technical aid and transportation from WWCG.

- Choosing team members needed.

Stage No. 2 April 23 - April 30

- Contract agreement.

- Endorsement Letter to first investigator.

- Permits to team members.

- Introducing letters of authorization to interview experts, officials, head of districts.

- Orientation to team work by representatives of WWCG.
- Supplying maps on the project for different purposes.
- Supplying documents Arabic & English on the background of the Project (basic facts).

Stage No. 3 1st of May till 15th of May

- Choosing Sample of Key Figures.
- Choosing Sample of Families.
- Preparing two questionnaires to the above groups also observation sheets to the sights.
- Approval of the questionnaire by WWCG representatives and Briley Wild and Associates representatives.

Stage No. 4: May 1st - May 30

- Interviews with Key Figures.
- Interviews with Citizens.
- Locating flooded areas within districts served.
- Photographing problem districts.
- Preparing maps with up-date data on population growth in served areas - fertility and mortality - distribution of water born diseases.

Stage No. 5: May 30 - June 10

Tabulation of the results

1. Tables
2. Figures
3. Maps

Stage No. 6: June 11th:

Presenting an overall review of 60% percent of the results with WWCG representatives, and Briley Wild & Associates representatives.

Stage No. 7: June 12 - 6 August:

Presenting final report on the study with all attached maps.

CHAPTER II

THE DEMOGRAPHIC CHANGES

CHAPTER II

The Demographic Changes

Parallel with the efforts to promote the sewage drainage capacity of Alexandria, the population had increased 670,425 persons between the year 1976 and 1986 as shown by the 1986 census data. The rate of natural increase was 2.3% and the rate of population increase was 2.8% per year. The difference is due to the settling of immigrants from other governorate in Egypt mainly. The increase due to the difference between births and deaths is mostly in the new settlement areas which are present in the East and West of Alexandria. The increase in immigration is mainly due to working manpower in industrial areas and around the harbor where the economic activities attract immigrants to settle.

The Governorate of Alexandria is divided into six Districts: Montazah, East (Shark), Central (Wasat), Gomrok, West (Gharb) and Amrya. Shark district has 26.4% of the population of Alexandria followed by Wasat which has 21.0% of the population while Amrya has 7.1% only. The distribution of the population is shown in Table I according to 1987 census. Montazah District 20.8% and Amrya District (7.1%) are settlement areas for newly married couples while Gharb districts (17.0%) is the settlement area for internal immigrants.

The population of Alexandria had increased between 1980 and 1990 as shown in Table II from 2.5 millions to 3.2 millions i.e. 0.7 million i.e. 28.2%. The increase was 2.4% between 1980 and 1981 but reached 2.8% between 1989 and 1990. The rate of natural increase dropped from 23.41 per thousands in 1980 to 18.66 in 1990. The drop is more rapid in 1989 and 1990.

Births

The crude birth rate dropped drastically between 1980 and 1990. It was 31.76 per thousand of population in 1980 to 30.20 in 1988 reaching to 25.33 in 1990. The drop between 1980 and 1990 is 16.12%.

Deaths

The crude death rate dropped from 8.35 per thousand in 1980 to 6.67 per thousand in 1990. The drop in more drastic in the infant mortality rate as shown in Table III from 69.51 per thousand live births in 1980 to 25.95 per thousand live birth in 1990 i.e. 62.7% of that rate in 1980.

The most sensitive age group to environmental changes are the children during their first year of life. The death of these children is measured through two indices, these are:

120

1. The infant mortality rate which is the death during the first year of life per thousand births.

2. The neonatal mortality rate which is the death during the first 4 weeks of life per thousand live births.

By deducing the neonatal mortality rate from the infant mortality rate, the post-neonatal mortality rate is calculated, it is an index of the exposure to the environmental factors mainly. The ratio between the post-neonatal to the neonatal rates reflects the value of environmental risks in relation to the individual biological risks. The hazards from contamination by wastewater is part of the environmental risks. It is to be shown that in Alexandria this ratio dropped from 1:2.1 in 1980 to 1:1.4 in 1990 as shown in Table III. This drop which is about one third during the last ten years might reflect the improvement in the environment. During the same period the rate of natural increase dropped by 20.3% and the crude births rate dropped by 20.2% and the crude death rate dropped by 20.1%. The drastic drop of deaths among postneonatal infants reflects the improvement in the environment and sanitation.

Table II-1

Distribution of Population of Alexandria According to Alexandria Districts in 1987

District	Population	Percentage
Mountaza	621,537	20.8
Shark	790,063	26.4
Wasat	626,780	21.0
Gomrok	230,867	7.7
Gharb	507,058	17.0
Amrya	212,411	7.1
Total Alexandria	2,988,716	100

Source: Annual Statistical Report. Alexandria Department of Health 1987.

Table II-2
Demographic Features of Alexandria During the Period 1980-1990

Year	Population	CBR	CDR	RNI
1980	2,532,000	31.76	8.35	23.41
1981	2,592,556	31.42	8.33	23.09
1982	2,652,482	30.24	8.61	21.63
1983	2,715,626	31.10	7.85	23.25
1984	2,785,690	32.54	7.39	25.15
1985	2,854,821	31.65	7.44	24.21
1986	2,917,327	31.23	7.34	23.90
1987	2,988,716	31.01	7.12	23.89
1988	3,072,000	30.20	7.27	22.92
1989	3,158,016	27.16	7.01	20.15
1990	3,246,490	25.33	6.67	18.66

- Population estimates except 1986 is census data
- CBR = Crude Birth Rate per 1000 Population.
- CDR = Crude Death Rate per 1000 Population.
- RNI = Rate of natural increase per 1000 population

Source of Data: Annual Statistical Reports. Department of Health. Alexandria Governorate.

172

Table II-3

Deaths of Infants during the Period 1980-1990 per Thousand Live Births

Year	I.M.R.	NNMR	Post NNMR	Ratio NNMR:PostNNMR
1980	69.51	21.91	47.60	1 : 2.1
1981	62.40	21.00	41.40	1 : 2.0
1982	64.37	19.73	44.64	1 : 2.3
1983	52.09	18.05	34.04	1 : 1.9
1984	42.85	16.01	26.84	1 : 1.7
1985	38.06	14.10	23.96	1 : 1.7
1986	34.28	14.34	29.94	1 : 2.1
1987	34.46	14.01	20.45	1 : 1.5
1988	31.75	13.55	18.20	1 : 1.3
1989	27.44	11.30	16.14	1 : 1.4
1990	25.95	9.85	14.00	1 : 1.4

IMR = Infant mortality rate per 1000 live births
NNMR = Neonatal Mortality rate per 1000 live bills
Post NNMR = Post neonatal mortality rate per 1000 live births

Sources: Annual statistical reports of Alexandria Department of Health

Data from statistical section of Department of Health of Alexandria.

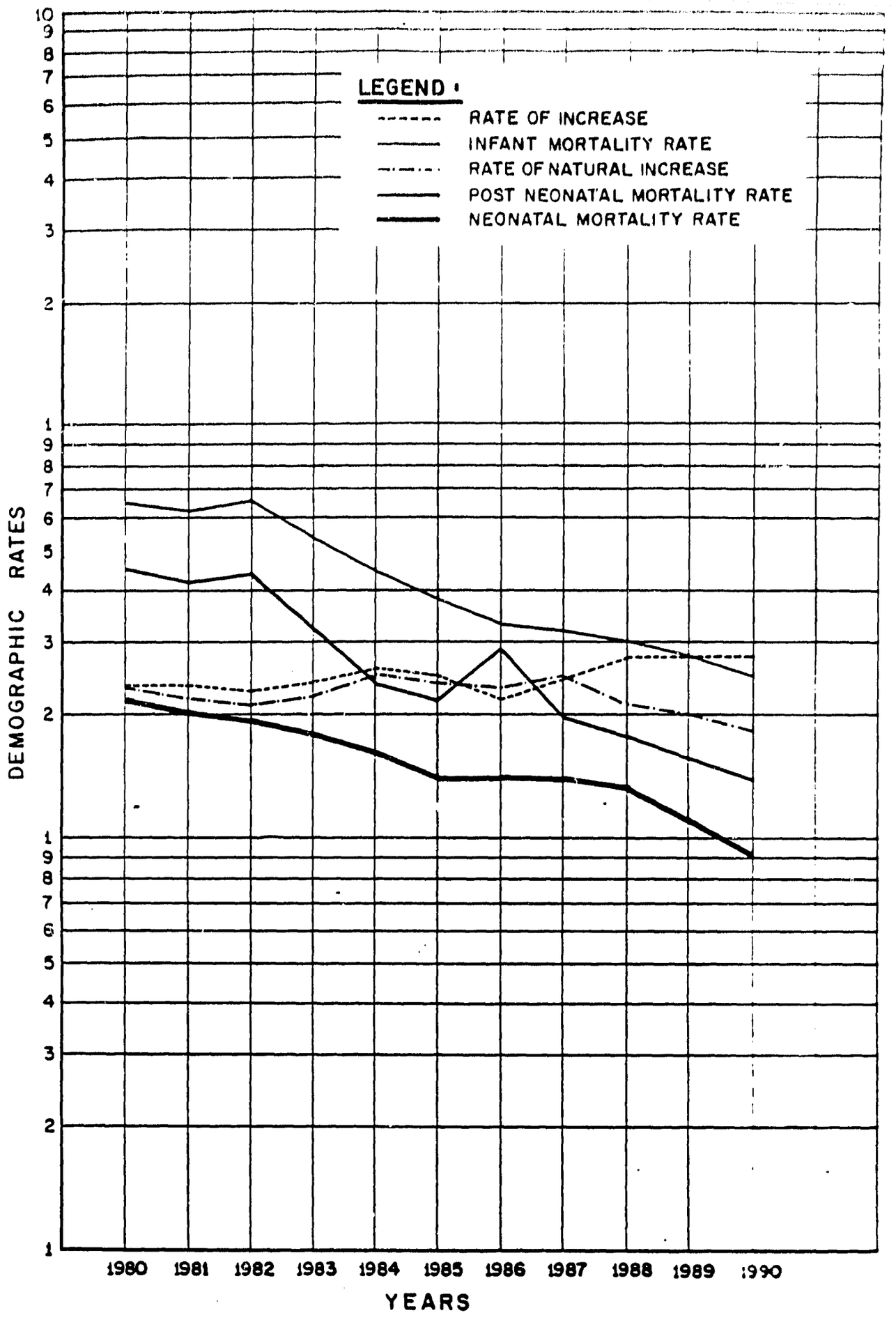


FIGURE (1) — DEMOGRAPHIC INDICES 1980-1990

CHAPTER III

THE SOCIAL FEATURES OF THE SERVED COMMUNITY

CHAPTER III

THE SOCIAL FEATURES OF THE SERVED COMMUNITY

The social reaction to the improvement in sewage disposal was studied through a purpose sample of families in areas which were served and a control of unserved areas. Table III-1.

Features of the sample living in the served areas. The sample size is 75 families which have the following features.

Family Size: The mode size of the families studies were 5 individuals i.e. father, mother and three children, these families formed 34.67% of the sample. The next in frequency were families of 4 individuals forming 26.66% of the samples. The least frequent were families of two individuals, these were 4.0% of the families. Big families of eight or more were only 6.67% as shown in Table III-2.

Educational Level: The majority of the fathers were illiterates 46.66% while the illiterate mothers were 68.0%, these illiterates were those who have no official certificates of education since some of them can read and write only. Among the fathers 21.33% had university degrees while 13.33% of mothers had a university degree as shown in Table III-3.

Occupation: Among the fathers 38.67% were employees either civil service or in private sector, 28.0% were manual workers, 13.33% were in trade and small business. 10.17% were on pension. Among the mothers 86.67% were not working out of doors some of them were university graduates; yet some might be working informally. Table III-3.

Income: The commonest percentage of families 50.67% had an income of 100-200 pounds per month. Those who has an income of 200 - 300 were 21.33%. Those whose income of 300 and more were 24.00%. Only 4.0% had an income of less than 100 pounds per month. Table III-4.

The Housing Features: The house is formed of three rooms among 54.67% of the studied sample of families, while 33.33% of families were living in 2 room house. The least frequent were families having 4 rooms or more as a residency, these are 12.0% of the sample. Table III-5.

All these residency units have the basic residential needs as water supply sewage disposal and electrical current supply.

The crowding index: The majority of families (44.00%) have a crowding index 1 to less than 2. Those whose crowding index of

176

2-<3 were 42.67%. Those remaining 13.33% had a crowding index of 3+. Table III-5.

The Social Standard: Using the social scoring developed by Fahmy and El Shurbini (1983), See Annex No. II. It has been found that 50.67% of families are of very low social standard, 19.00 of the sample was at low standard. Of the moderate standard 14.67% were of high moderate and 13.33% of the moderate standard. Those of high social standard were only 9.33%. See Table III-6.

The Environmental Condition

Sanitary Condition

The responses by the sample describe represents the situation in Alexandria, before the project, as the following:

1. Those who expressed suffering from sewage flooding before the implementation of the project were 73.33%. The majority of those (42.86%) were suffering from bad odor while 37.09% polluted water ponds were formed and 19.05% complained from the presence of stagnant ponds of sewage water.

2. The amount of sewage flooding was described by 60.0% as excessive, 34.55% as medium flooding and 5.45% as minimal flooding.

3. The duration of flooding varied, it was described 58.18% as less then 3 months 27.27% said less than 6 months while 14.55% said it was all around the year. Table III-7.

The Impact on the Community Life

The responds show that before the present project there were the following impacts:

1. Housing: 22.5% of the sample stated that there was high humidity in the house which has its effects on the furniture. Flooding of the basement floors was the next feature. The painting of the walls had been peeled as walls had been mentioned. It had been stated by 10.28% of the sample that old houses collapsed. Table III-8.

2. Social: The sewage flooding prevented the people to go to work as stated by 18.89% while 17.92% said that children were not able to go to school. No visitor or social relations had been mentioned by 12.38% while 8.4% stated that they were not able to attend religious services. Table III-9.

3. Sanitation: Contamination of the water had been said by 18.32% of the sample. The spread of insects (17.25%) and increase of diarrheal diseases among children had been mentioned by 8.46% of the sample. Table III-10.

11

Improvements after implementation of the Project

There is definite improvements after the project as stated by 54.67% of the sample, 37.33% said there is partial improvement while 8.0% said no improvement.

1. Housing: Humidity is lower now as stated by 57.3%. Basement flooding is reduced to great extent although some still have it as stated by 41.0% of the sample. The houses are more safe as stated by 72%.

2. Sanitation: The spread of insects is less now as had been stated by 44% of the sample.

3. Social: 62.7% stated that they are able now to go to work on time. Those who stated that the children are able now to go to schools easier were 54.7%. 44% said that transportation means reached their neighborhood. Table III-11.

The difference in perception how to improve the situation between men and women:

While men as heads of families see that spraying of insecticidal will improve the situation after the project (29.84%), the wives see also this is the approach of prime importance but it was 36.94% of women. Also getting rid of rain water was the next way of choice among women (22.29%) it was only expressed by 12.04% of men. Continuous maintenance and cleaning of sewers was choice of second importance among men (22.53%) but it was only expressed by 19.75% of women.

The Suggestion of the People to Solve the Problem

The majority see that insecticidal spray is the intervention needed now, the second suggestion was proper maintenance services to the sewer, the rapid disposal of rain water was the third suggestion. The disposal of the ruminants of the present project was the forth answer.

Table III-1

The Sample Distribution According to the Districts of Alexandria

District	No.	Percent
El Montazah	17	22.67
Shark (East)	21	28.00
Wasat (Central)	17	22.67
Gharb (West)	15	20.00
El Gomrok	5	6.00
Total	75	100

Table III-2

Family Size of the Sample

Family Size	No.	Percent
2	3	4.0
3	4	5.33
4	20	26.66
5	26	34.67
6	6	8.00
7	11	14.67
8	5	6.67
Total	75	100

Table III-3

The Features of the Parents of the Sampled Families

The Family Feature	No.	Percent
The Father Education		
1. Illiterate	13	17.33
2. Read and Write	23	29.33
3. Primary Education	3	4.00
4. Preparatory Education	2	2.68
5. Secondary Education	19	25.33
6. High Education	16	21.33
Occupation		
1. Civil Service	29	38.67
2. Manual Worker	21	28.00
3. Trade	10	13.33
4. Retired	8	10.67
5. Service Worker	7	9.33
The Mother		
1. Read & Write non Working		
2. Primary Education Working	51	68.00
3. Prepast Education non Working	2	2.67
4. Secondary Education not Working	3	4.0
5. Secondary Education Working	3	4.0
6. University Education not Working	6	8.0
7. University Education Working	6	8.0
	4	5.33

Table III-4

The Family Income Per Month

Income per Month	No.	Percent
Family Income:		
< 100	3	4.0
100 -	38	50.67
200 -	16	21.33
300 +	18	24.00
Individual Income		
< 100	72	46.00
100 -	2	2.67
200 +	1	1.33

Table III-5

Housing Condition of the Sample

	No.	Percent
Rooms Number		
2	25	33.33
3	41	54.67
4+	9	12.00
Premises		
Potable Water	75	100
Electricity	75	100
Water Closet	75	100
Crowding Index		
< 2	33	44.0
2-	32	42.67
3-	10	13.33
4+	0	0

Table III-6

The Social Standard of the Families Within the sample

The Scored Standard		No.	Percent
Very Low	< 10	8	10.67
Low	10-	30	40.00
Low Moderate	15-	13	17.33
High Moderate	20-	7	9.33
High	25+	17	22.67

Table III-7
The Complaints and Suffering from Sewage Disposal Before the Project

The Complaints	No.	Percent
<u>Complaints</u>		
1. Suffering	55	73.33
2. Not Suffering	20	26.67
<u>Type of Nuisance</u>		
1. Bad Odor	45	42.86
2. Fermentation of Ponds	40	38.09
3. Water Contamination	20	10.05
<u>The Magnitude of Flooding</u>		
1. High	33	60.00
2. Moderate	19	34.55
3. Low	3	5.40
<u>Continuity of Flooding</u>		
1. Three months or less	32	58.18
2. Six Month	15	27.27
3. All the Year	8	14.55

182

Table III-8
The Effect of Sewage Flooding on the Houses

Effect	No.	Percent
High Humidity	58	22.05
Effect on Foundation	56	21.29
Flooding of Basements	55	20.90
Cracking of Paint	38	14.45
Effect on Walls	29	11.03
Collapse of houses	19	7.24
Collapse of Streets	8	3.04

Table III-9
Social Effects of Sewage Flooding

Social Difficulties	No.	Percent
Difficulty to go to work	58	18.89
Difficulty to go to School	55	17.92
Difficulty to get transport	52	16.94
No Relatives to Visit	40	13.03
No Wondering Sellers	38	12.38
No Availability of Services	38	12.38
Unable to Carry Religious Services	26	8.46

Table III-10
Sanitation Difficulties Due to Sewage Flooding

Health Difficulties	No.	Percent
Spoiling of Streets by Flood	68	18.32
Spread of Insects	64	17.25
Spoiling of Houses by Flood	52	14.02
Difficulty of Ventilation	52	14.02
High Humidity	50	13.48
Diarrhea of Children	37	9.97
Diarrhea of Inhabitants	26	7.01
Spoiling of Schools by Flood	22	5.93

Table III-11
The Features of Improvement
after the Project Implementation

Features	No.	Percent
1. Improvement of sewage disposal	54	72.0
2. Ability to go to work	47	62.7
3. More services to the area	45	60.0
4. Less humidity at home	43	57.3
5. Children able to go to school	41	54.7
6. More means of transportation	33	44.0
7. Control of insects	33	44.0
8. Less effect on walls and furniture	31	41.3
9. Less diarrheal disease	31	41.3
10. More flood selling facilities	31	41.3
11. More able to conduct religious services	30	40.0
12. Increase of prices of the land.	30	40.0
13. Better carrying domestic responsibilities for wives.	24	32.0

Table III-12
Operations of the Sample About How to
Intervene to Treat the Situation

Intervention	No.	Percent
Governmental Action	48	44.86
Non-Governmental Group Action	34	31.78
Individual Companies	20	18.69
Private Sector Companies	2	1.87
Indifferent, No Action	3	2.80

CHAPTER IV

THE SOCIAL FEATURES OF THE UNSERVED COMMUNITY

CHAPTER IV

THE SOCIAL FEATURES OF THE UNSERVED COMMUNITY

This unserved community studied is located in El Dekheila, El Agami and Wadi El Kamar. This is the part of Amrya District which is taken as a control sample being unserved.

Features of the Unserved Community

The sample size is 25 families. See Table IV-1.

The Family Size: The majority of the families (52%) were of 5 members, those having 4 member or 6 members formed each 16%. Those who were 3 members or 7 members or more, each formed 8%. Table IV-2.

1. Educational Level: The majority are of middle education who were 52%, those who were of high education formed 16% while those who were just read and write were also 16%. Those of primary education formed 8%. See Table IV-3.

   Among the women the majority were of middle education and working (44%) and 28% were read and write and not working. Those of high education and working were only 8%. See Table IV-3.

2. Occupation of the Father: The majority were in civil service forming 52%, those in trade were 20% and the manual working were 16%. The retired fathers were 8%. See Table IV-3.

Income: The highest frequency are those who have an income between 200-300 pounds per month per family forming 36%. Those who have an income of 300+ were 24% the same frequency was for those having an income of 100-200. Those having an income less than 100 formed 16%. See Table IV-4.

The income per capitum was less than 100 pounds per month among 90% of the sample.

The Housing

1. The house size: the majority of the sample members were living in three room house (68%) followed by those living in four rooms house (32%). See Table IV-5.

2. The crowding index: the majority was a crowding index of 2 or more forming 64%. Those having a crowding index less than 2 were only 36%. See Table IV-5.

3. All the houses have, water supply electricity and water closets.

The Social Standard

The majority of the sample was at the high middle score of the social standard forming 40% those of low middle were 20% and the very low standard were 20%. Those of the high social standard score were only 4%. See Table IV-6.

The Sanitary Complaints

1. Those suffering from sewage flooding were only 36% of the sample. They were suffering from bad odor (55.56%) and formation of sewer ponds (44.44%). See Table IV-7.

2. The flooding was of middle size (77.78%) while it was high as stated by 22.22% of the sample. See Table IV-7.

3. The duration of sewage flooding was during 3 months as stated 66.67% of the sample members while 33.33% stated that flooding duress for 6 months. See Table IV-7.

The Effects of Sewage:

1. On Housing:

   The effects on the houses: the majority were suffering from flooding of the basement floors forming 38.89% while 22.22% complained of effect on furniture. Those complaint of high humidity in the house formed 16.67%. The least complaints were cracking of walls (11.11%) or destruction of wall paints (11.11%). See Table IV-8.

2. On Social Life:

   The social effects varies; the majority complained of difficulty of getting means of transportation to reach to their areas (35.21%). The wandering sellers do not reach to their areas among 32.39% while 12.68% complained that the children were not able to go to schools. Those who were not able to go to their work formed 7.04%. See Table IV-9.

3. On Sanitation:

   The effects on sanitation were shown by the complaints that there is spread of insects 16.5%. Those suffering from spread of diarrheal diseases were 13.25%. See Table IV-10.

The Intervention to Control the Situation

1. The Present Efforts: The majority of families intervene through cooperative action with the neighbors (40.0%)

followed by those ask for governmental help 36.0%. Table IV-11.

2. Future Efforts Needed: The improvement of the present situation could be achieved through the following suggestions.

2.1 Men

2.1.1	29.12%	Improvement of the present facilities
2.1.2	24.05%	Implementation of the water carriage sewage disposal project.
2.1.3	20.25%	Suggested spray of the area by insecticidal. See Table IV-12.

2.2 Women

The house wives suggested that the intervention of primary importance is the spray of insecticidal (34%) while 28% suggested implementation of the sewage disposal project. See Table IV-12.

Table IV-1

The Distribution of the Unserved Sample according to residences

Locality	No.	Percent
El Dekheila	10	40
El Agami	10	40
Wadi El Kamar	5	20
Total	25	100

Table IV-2

The Distribution of the Unserved Sample According to Families

Family Size	No.	Percent
3	2	8
4	4	16
5	13	52
6	4	16
7	2	8

Table IV-3

The Features of the Unserved Communities

The Family Feature	No.	Percent
A. The Father		
1. Education		
Illiterate	1	4
Read and Write	4	16
Primary	2	8
Preparatory	1	4
Intermediate	13	52
High	4	16
2. Occupation		
Civil Service	13	52
Trade	5	20
Manual Worker	4	16
Retired	2	8
Service Worker	1	4
B. The Mother (Educational & Occupation)		
1. Read & Write non Working	7	28
2. Primary Education Working	1	4
3. Intermediate Education non Working	3	12
4. Intermediate Education not Working	11	44
5. High Education Working	1	4
6. High Education not Working	2	8

Table IV-4

Income of Unserved Sample

Income per Month	No.	Percent
Family Income:		
< 100	4	16
100 -	6	24
200 -	9	36
300 +	6	24
Per Capitum		
< 100	24	96
100 -	1	4
200 +	0	0

Table IV-5

The Housing Condition of the Unserved Sample

Features	No.	Percent
Rooms Number		
2	-	
3	17	68
4+	8	32
Premises		
Potable Water	25	100
Electricity	25	100
W.C	25	100
Crowding Index		
< 2	4	36
2-	16	64
4+	0	0

Table IV-6

The Social Standard of the Unserved Sample

Social Standard & Score	No.	Percent
Very Low (<10)	0	0
Low (10-)	7	28
Low Middle (15-)	2	8
High Middle (20-)	10	40
High (25+)	6	24

Table IV-7
The Nuisance from Sewerage Flooding
Among the Unserved Sample

Features of Nuisance	No.	Percent
Complaints		
Suffering	9	36
Not Suffering	16	64
Type of Nuisance		
Ponds	40	44.44
Bad Odors	20	55.56
Degree Flooding		
High	2	60.00
Medium	7	34.55
Weak	0	5.40
Duration		
3 months	6	66.67
6 months or more	3	33.33

Table IV-8
The Effect of Sewage on the Houses of the Unserved Community

Effect	No.	Percent
Flooding of the Basement Floors	7	38.89
Spoiling of Furniture	4	22.22
High Humidity of the House	3	16.67
Cracking of Walls	2	11.11
Destruction of Painting	2	11.11

Table IV-9
The Social Effects of Flooding on the Unserved Community

Social Effect	No.	Percent
No means of Transportation	25	38.21
No Wandering Sellers	23	32.39
Children Don't go to School	9	12.68
No Available Services	7	9.86
Not able to go to Work	5	7.04
No Social Relation	2	2.82

Table IV-10
The Sanitary Effects of Flooding on the Unserved Community

Complaints	No.	Percent
1. Spread of Insects	25	16.56
2. Pollution of Streets	23	15.22
3. Difficulty in creating the house.	22	14.57
4. Spread of Diarrhea among Children	20	13.25
5. Spread of Diarrheal Diseases in the pollution.	20	13.25
6. Pollution of Schools	20	13.25
7. High Humidity	14	9.27
8. Pollution of Houses	7	4.63

Table IV-11
Suggested Intervention by the Unserved Communities

Intervention	No.	Percent
1. Community Group Efforts	10	40
2. Governmental Efforts	9	36
3. Personal Efforts	4	16
4. Non-Governmental Companies	2	8
Men:		
1. Promotion of the present sewage disposal system	23	92
2. Introduction of sewers to the area.	19	76
3. Better supervision for sewage disposal	6	24
Women:		
1. Spray of insecticidal	17	68
2. Extension of sewers to the area.	14	56

Table IV-12
The Suggested Means of Intervention by
the Unserved Community

Suggestions	No.	Percent
Men		
1. Improvement of the present means of sewage disposal.	23	92.0
2. Extension of the project to the area.	14	76.0
3. Spray of insecticidal	16	64.0
4. Increase of the clearance mobile tanks.	15	60.0
5. More supervisors for the process of sewage clearance	6	24.0
Women		
1. Spray of insecticidal	17	68.0
2. Extension of the project to the area.	14	56.0
3. More mobile clearance tanks	11	44.0
4. More workers for sanitary services in the area	8	32.0

CHAPTER V

FOLLOW UP OF THE IMPACT OF THE SEWAGE DISPOSAL PROJECT ON THE WATER BORN DISEASES

CHAPTER V

HEALTH CHANGES
FOLLOW-UP OF THE IMPACT OF THE SEWAGE DISPOSAL PROJECT ON THE WATER BORN DISEASES

Morbidity due to diseases related to improper sewage drainage and consequent contamination of food or drink. They are the vehicles of spread of the disease showed changes which during the last five years which varied from one area to the other. The index used is the cases admitted to the fever hospital per thousand population of the district. This index varied according to the districts.

MONTAZAH DISTRICT

This is the most eastern district of Alexandria. (Table V-I)

1. Hepatitis: Cases admitted to the fever hospital were 72.0/1000 population in 1986 and dropped gradually to 39.4/1000 in 1989 but in 1990 increased again to be 51.9. The drop formed 45.2% of hospital admissions per thousand in 1989.

2. Typhoid: In 1986 admission to the fever hospital were 33.8/1000 population and dropped gradually to 10.7/1000 in 1991. This drop formed 68.3% of the admissions in 1986.

3. Paratyphoid: In 1986 the admissions were 5.9/1000 and dropped to 0.6/1000 in 1990. This drop formed 89.8% of the admissions in 1986.

4. Dysentery: The admitted cases in 1986 per 1000 population were 1.5 and dropped to 0.7/1000 population in 1990. This drop forms 53.3% of admission in 1986.

5. Poliomyelitis: The admitted cases in 1986 were zero. There was a vibration of admission between 0.2 and 0 between 1988 and 1989. In 1990 0.3/1000 were admitted.

There is implementation of sewage disposal project in Montazah district. In Abu Qir a new network of sewers was established serving 300,000 population and there is a pumping station in Maamoura. These services are in Montazah District. The drop in hospital admission might be correlated with the improvement of sewage disposal. The increase in hepatitis might be due to other risk factors which help the spread of the disease in 1990.

East (SHARK) DISTRICT

This area was served before the project especially the northern part of it. There is an improvement of sewage disposal by improving the collective sewer which improved the drainage in Glym, Sarwat and El Saraya which are areas in the Shark District. As shown in Table V-2 the changes are:

1. Hepatitis: In 1986 the admissions to fever hospital were 73.1/1000 population and dropped continuously to reach 46.7/1000 in 1990. The drop reached 36.1% of the 1986 admission.

2. Typhoid: There is a continuous drop of admission between 1986 and 1990. In 1986 the admissions were 22.2/1000 population reached 13.3/100 population. During that period the drops was 40.1% of the admission in 1986.

3. Paratyphoid: In 1986 the admissions were 4.0/1000 population which dropped to 0.4/1000 in 1989 then increased to 0.7/1000 in 1990. So between 1986 to 1990 the drop was 75% of 1986 admissions.

4. Dysentery: There is a gradual increase of admissions between 1986 to 1990. In 1986 the admissions were 0.4/1000 population and increased to 1.0/1000 in 1987 then dropped to 0.6/1000 in 1988 then 0.8/1000 in 1989 and reached 0.7/1000 in 1990.

5. Poliomyelitis: The admissions to the fever hospital of this is vibrating at low amipletude. It was zero in 1986 reached 0.2/1000 in 1987 dropped to 0.1 in 1988 and 1989 then zero in 1990.

CENTRAL (WASAT) DISTRICT

This district includes Smouha area which has a part of the project serving 670,000 population beside a collective sewer and a pumping station. The changes are shown in Table V-3.

1. Hepatitis: There is a continuous drop between 1986 and 1989 from 107.2/1000 admission to 56.0/1000 admissions then increased in 1990 to 59.1/1000 admissions. The drop between 1986 and 1990 was 44.9% of the 1986 admission.

2. Typhoid: The admissions in 1986 was 26.6/1000 populations dropped to 10.8/1000 in 1989 then increased to 12.8/1000 in 1990. The drop was 51.9% of the 1986 admissions.

3. Paratyphoid: There is a continuous drop between 1986 to 1989 from 5.5/1000 to 0.3/1000. This is followed by a rise to 1.2/1000 in 1990. The drop between 1986 to 1990 was 78.2% of 1989 admissions.

4. Dysentery: There is a continuous increase in admission between 1986 to 1990. In 1986 the rate was 0.8/1000 population and reached 2.0/1000 in 1990 i.e. an increase of 150% of the admissions in 1986.

5. Poliomyelitis: There is an increase of admissions between 1986 which was zero to 0.3/1000 population in 1990.

WEST (GHARB) DISTRICT

This district has Manshia, Karmouz and El Labban areas. All the areas are served by the old sewerage system, but Labban and Karmouz are highly abused. Manshia is a business area. The changes are shown in Table V-4.

1. Hepatitis: The admissions were 166.0/1000 population in 1986 and dropped to 89.0/1000 in 1989 then increased to 98.8/1000 population in 1990. The drop was 40.5% in 1990 from 1986 admissions.

2. Typhoid: 31.7/1000 population was the admission in 1986 dropped to 18.4/1000 in 1989 then increased to 21.5/1000 in 1990. The drop was 32.2% in 1990 from 1986 admissions.

3. Paratyphoid: In 1986 the admissions were 3.7/1000 population dropped to 0.9/1000 in 1989 and then increased to 1.8/1000 in 1990. The drop in 79.3% of 1986 admission.

4. Dysentery: No admission due to dysentery in 1989 and increased to 0.4/1000 population in 1990.

5. Poliomyelitis: No admissions during the studied period.

EL-GOMROK DISTRICT

This district has two areas; El-Gomrok and Mina El Basal. The first has old sewers while the second is not served by sewers. This district is served by the old system. The changes are shown in Table V-5.

1. Hepatitis: The admissions dropped from 55.2/1000 in 1986 to 27.7/1000 in 1989 and increased again in 1990 to 31.4/1000. The drop was 43.1% from 1986.

2. Typhoid: In 1986 the admissions were 13.5/1000 and dropped to 5.1/1000 in 1989 then increased to 8.1/1000 in 1990. The drop was 40.0% in 1990 from 1986 admissions.

3. Paratyphoid: The admission was 2.6/1000 in 1986 dropped to 0.2/1000 in 1989 and reincreased to 0.8/1000 in 1990. The drop in 1990 is 69.2% of 1986 admission.

20'

4. Dysentery: There were no admissions due to dysentery in 1986, in 1987 it was 0.5/1000 population dropped to 0.2 in 1989 then increased to 0.4/1000 in 1990.

5. Poliomyelitis: No admissions due to poliomyelitis during the studied period.

AMRYA DISTRICT

This has two areas Dekheila and Amrya. This is unserved area. Mostly newly developing areas of housing for the newly married or desert area where Bedwans are settling recently. The changes are shown in Table V-6.

1. Hepatitis: The admissions was 76.2/1000 in 1986 dropped to 57.8/1000 in 1989 this increased to 63.9/1000 in 1990. The drop was only 16.1% in 1990 from 1986 admissions.

2. Typhoid: The admission was 13.4/1000 in 1986 dropped to 11.2/1000 in 1987 then increased gradually to 14.6/1000 in 1990.

3. Paratyphoid: In 1986 the admissions were 1.9/1000 population dropped to zero in 1988 then increased to 1.4/1000 in 1989 then dropped to 0.4/1000 in 1990.

4. Dysentery: Admission was 0.5/1000 in 1986 then vibrated between 1.4/1000 in 1987 and 0.9/1000 in 1988, then increased to 1.3/1000 in 1989 then dropped to zero 1990.

5. Poliomyelitis: It has an admission of 0.5/1000 in 1986 increased to 3.9/1000 in 1990.

TOTAL ALEXANDRIA

The admissions of cases allover Alexandria as shown in Table V-7 might suggest an improvement during the last five years which could be correlated with improvement of sewage disposal although in 1990 there is a tendency to increase of diseases.

1. Hepatitis: The admissions per 1000/populated in Alexandria was 87.5/1000 in 1986, it dropped to 50.2/1000 in 1989 then increased to 54.9/1000 in 1990. The drop was 37.3% at 1990 from 1986 admissions.

2. Typhoid: There is a drop in admission between 1986 which was 24.7/1000 to 10.9/1000 in 1989 then increased to 12.9/1000 in 1990. The drop at 1990 was 47.8%.

3. Paratyphoid: The drop was more drastic between 1986 which was 4.9/1000 to 1989 which reach 0.5/1000 then increased to 0.9/1000 in 1990. The drop at 1990 was 81.6 of 1986 admission.

4. Dysentery: There is a drop from 1.4/1000 in 1986 to 0.9 in 1990. The drop is 35.7% of the 1986 admissions at 1990.

5. Poliomyelitis: There is a definite increase of admissions between 1986 and 1990. At 1986 it was 0.03/1000 and reached 0.4/1000 in 1990.

These figures of admitted cases to the fevers Hospital is an indirect index to the prevalence of these disease, in the different district. In Montazah District hepatitis dropped by 27.9% between 1986 to 1990 but poliomyelitis increased. for Shark District the drop of 30.6% happened in admissions of hepatitis but there is an increase in dysentery cases admitted. The same features are shown in Wasat District, while there is a drop in hepatitis of 44.8% there is an increase in dysentery of 150%. There are districts where the present project had contributed to their drainage capacity. At Amrya Districts, where there is no implementation of the present project; the drop of hepatitis case was 16.1%.

Table V-1

Alexandria Fevers Hospital Reported
Water Born Disease Per 100,000 Population
In Mountaza District between 1986-1990

Year	Hepatitis	Typhoid	Paratyphoid	Dysentery	Polio Myelitis
1986	72.0	33.8	5.9	1.5	0
1987	51.2	33.9	4.1	0.3	0.2
1988	62.3	18.0	1.3	0.9	0.2
1989	39.4	10.6	1.9	0.3	0
1990	51.9	10.7	0.6	0.7	0.3

Calculated from data got from Annual Statistical Report and Statistical Dept. - Alexandria H.D.

Table V-2
Alexandria Fevers Hospital Reported Water Born
Diseases per 100,000 Population in Shark District
During 1986-1990

Year	Hepatitis	Typhoid	Paratyphoid	Dysentery	Polio Myelitis
1986	73.1	22.2	4.0	0.4	0
1987	56.1	26.2	2.3	1.0	0.2
1988	65.8	16.1	1.2	0.6	0.1
1989	49.3	10.3	0.4	0.8	0.1
1990	46.7	13.3	0.7	0.7	0

Calculated from data shown in Annual Statistical Reports and from Statistical Department. Alexandria Health Department.

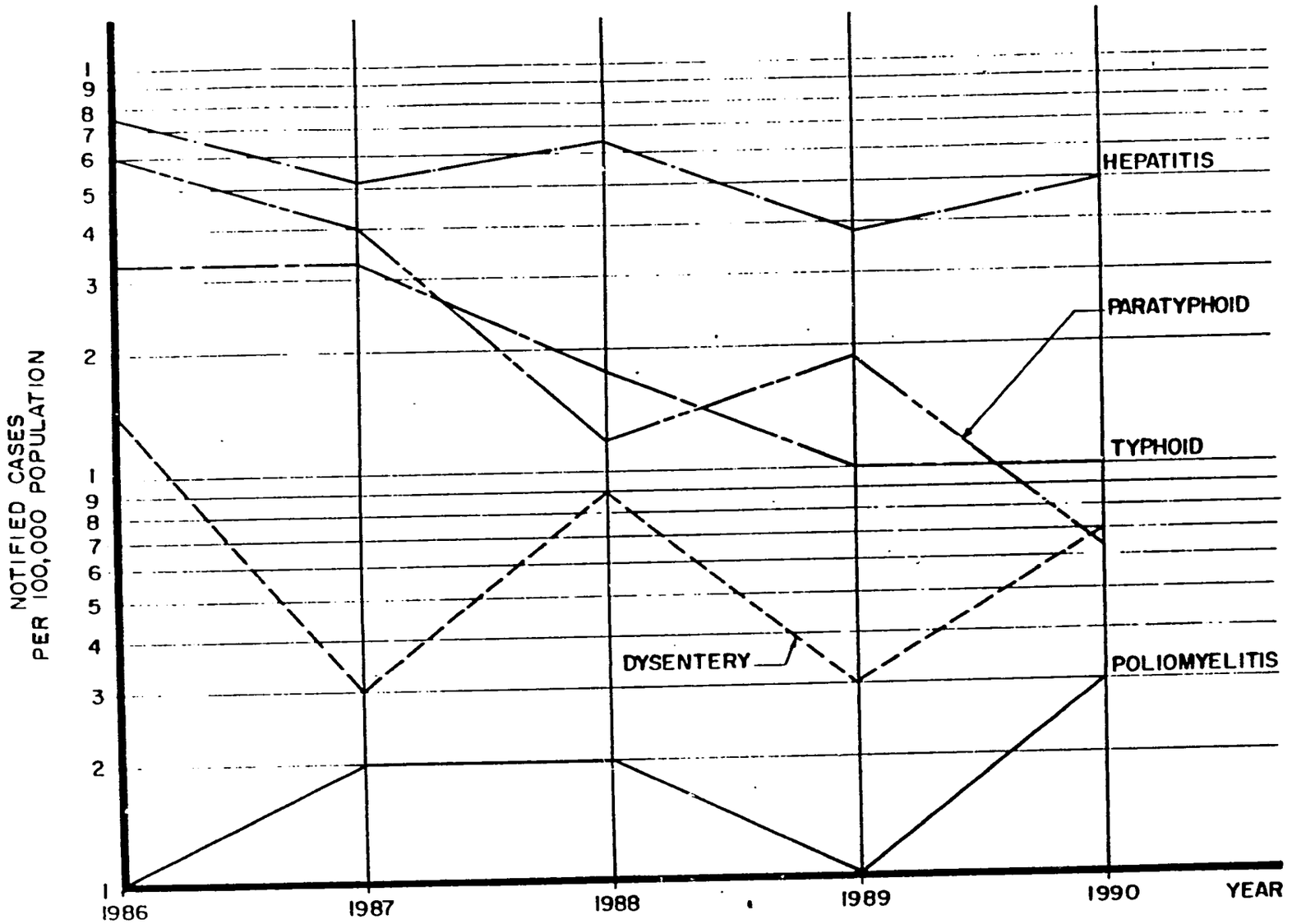


FIGURE 2

NOTIFIED NUMBER OF CASES
MOUNTAZA DISTRICT

Table V-3

Alexandria Fevers Hospital Reported Water Born Diseases per 100,000 Population in Wasat District During 1986 - 1990

Year	Hepatitis	Typhoid	Paratyphoid	Dysentery	Polio Myelitis
1986	107.2	26.6	5.5	0.8	0
1987	75.8	26.8	2.9	0.8	0
1988	85.3	15.4	2.0	1.2	0.2
1989	56.0	10.8	0.3	1.5	0
1990	59.1	12.8	1.2	2.0	0.3

Calculated from data got from the annual statistical reports and data got from the statistical Division - Alexandria Department of Health.

Table V-4

Alexandria Fevers Hospital Reports Water Born Diseases per 100,000 Population in Gharb District During 1986 - 1990

Year	Hepatitis	Typhoid	Paratyphoid	Dysentery	Polio Myelitis
1986	166.0	31.7	8.7	0	0
1987	129.7	30.2	1.0	0.5	0
1988	141.6	29.7	2.2	0.4	0
1989	89.0	18.4	0.9	0.2	0
1990	98.8	21.5	1.8	0.4	0

Calculated from data got from the annual statistical reports and data got from the Statistical Division of Alexandria, Department of Health.

Table V-5

Alexandria Fevers Hospital Reported Water Born Diseases per 100,000 Population in El Gomrok District During 1986 - 1990

Year	Hepatitis	Typhoid	Paratyphoid	Dysentery	Polio Myelitis
1986	55.2	13.5	2.6	0	0
1987	43.3	9.4	0.7	0.5	0
1988	40.8	8.1	0.4	0.4	0
1989	27.7	5.1	0.2	0.2	0
1990	31.4	8.1	0.8	0.4	0

Source:

Calculated from data got from the annual statistical reports and data got from the Statistical Division - Alexandria Department of Health.

Table V-6

Alexandria Fevers Hospital Reported Water Born Diseases per 100,000 Population of Amrya District During 1986 - 1990

Year	Hepatitis	Typhoid	Paratyphoid	Dysentery	Polio Myelitis
1986	76.2	13.4	1.9	0.5	0.5
1987	60.6	11.2	1.7	1.4	0.9
1988	61.2	11.8	0	0.9	0.5
1989	57.8	13.2	1.4	1.3	0
1990	63.9	14.6	0.4	0	3.9

Source:

Calculated from data got from the annual statistical reports and data got from the Statistical Division of Alexandria, Department of Health.

Table V-7

Alexandria Fevers Hospital Reported Water Born Diseases for Alexandria Governorates per 100,000 Population During 1986 - 1990

Year	Hepatitis	Typhoid	Paratyphoid	Dysentery	Polio Myelitis
1986	87.5	24.7	4.9	1.4	0.03
1987	56.3	28.2	2.4	0.8	0.20
1988	73.0	16.4	1.3	0.9	0.10
1989	50.2	10.9	0.5	0.9	0.03
1990	54.9	12.9	0.9	0.9	0.40

Source:

Calculated from data got from the annual statistical reports and data got from the Statistical Division - Alexandria Department of Health.

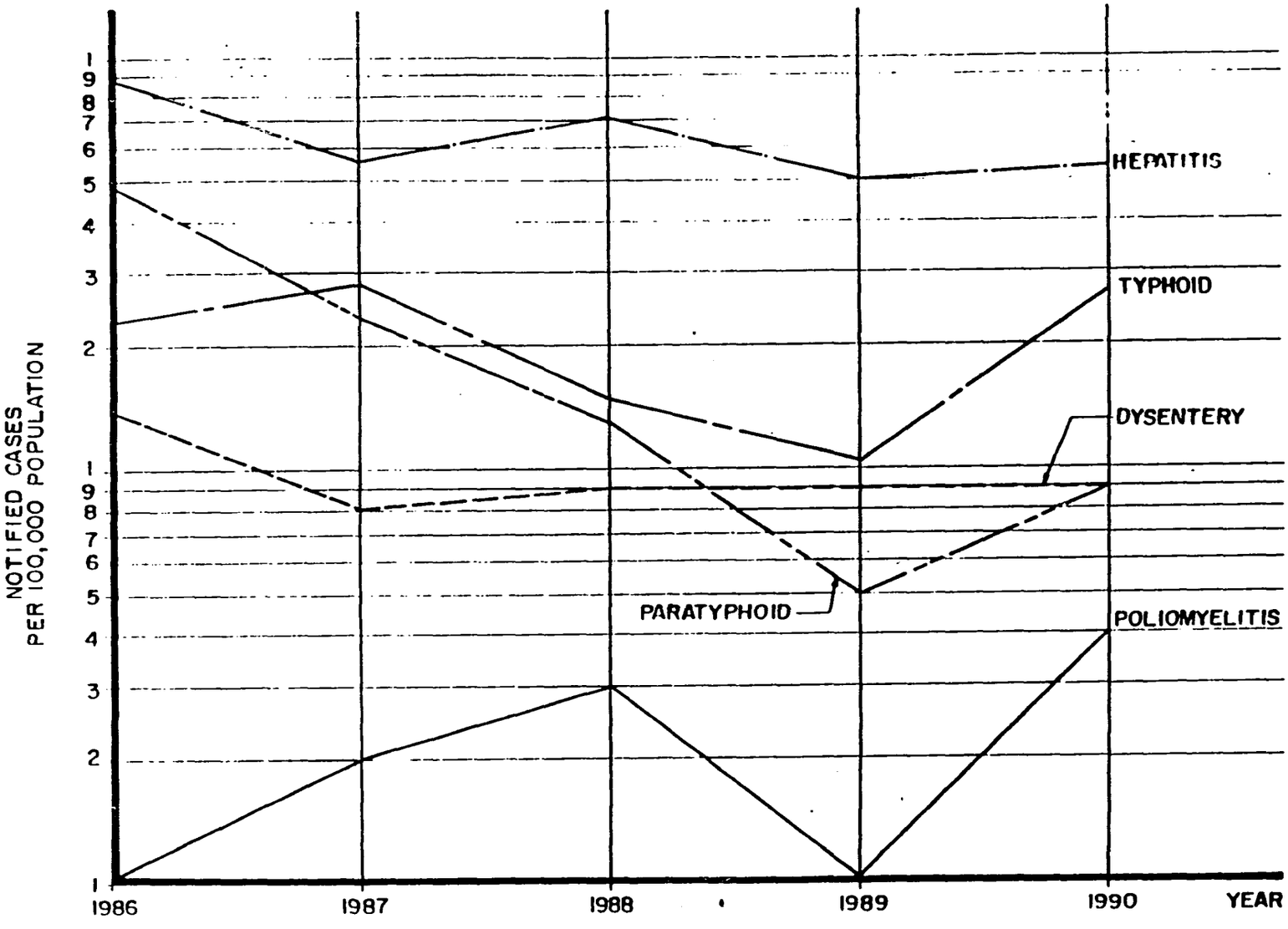


FIGURE 3

NOTIFIED NUMBER OF CASES
THROUGHOUT ALEXANDRIA

CHAPTER VI

THE INTERVIEW RESULTS OF THE PROFESSIONAL, POLITICAL AND ADMINISTRATORS

CHAPTER VI

THE INTERVIEW RESULTS OF THE PROFESSIONAL, POLITICAL AND ADMINISTRATORS

The leader's interview included:

1. The Districts Council heads
2. The Governorate Council leaders
3. Professional and Technical leader

The results of the interview could be summarized under the following items:

1. <u>The Sewage Disposal in the Served Areas before the Project</u>

1.1 Using traditional methods before the new project made the sewage disposal unsatisfactory for the individual families on the communities and neighborhoods. This is more apparent as the density of population in certain areas which had been served by the project had been exaggerated and the old system was not capable to cope with the produced sewage. This bad impairment of sewage disposal has its after effect on the housing, sanitary and social aspects. These after effects led to disturbances in human and social relations in the communities. As well diseases spread especially diarrhea.

The impaired sewage disposal was a barrier in proper pavement of the streets.

1.2 As a result of building high apartments building to cope with the needs of housing a high pressure on the sewers present is created. As the old sewers system was old, so it was not able to cope with the new pressure and became a threatening risk for the inhabitants of the area. Such a situation imposes the necessity to promote the capacity of old system and update the techniques of disposal.

2. <u>The Impact of the Project Implementation</u>

2.1 There is definite improvement in sewage disposal whether in areas previously served or those served for the first time.

2.2 The promotion of drainage capacity has minimized the flooding which has consequent good effects socially and have good health impacts.

2.3 Served communities which are still suffering of sewage impairment are due to the following:

211

2.3.1 Some of the inhabitants dispose with their garbage through the sewers so block it.

2.3.2 Some of the shops and public premises dispose with their waste in the sewers leading to blockage.

2.3.3 Some of the building are old and their design is not planned to drain through the present sewage disposal system.

3. The Need to Complete the Present Project

3.1 The unserved communities has to be covered by the project although some of the areas did not complain. The unserved areas, El Max, El Dekheila and El Agami. They are suffering mainly from the progress of improvement of drainage of sewers or rain water.

3.2 El Agami as a summer resort area is disposing the sewage in septic tanks which might not tolerate the increase of pressure in summer time.

4. The Need for Safe Sewage Disposal

4.1 The policy decisions maker has to decide where the sewers are put is doing to be disposed as this would enhance the improvement and promotions of the present project implementation. This had been stated by one of the districts heads.

4.2 How the sludge is going to be benefitted of; this question is to be decided about as it is of importance for Montazah District which has an extensive agrarian area.

5. Side Benefits of the Project which Started to Show

5.1 Increase of the land prices in the newly served areas which promoted the types of buildings and attracted a socially higher groups of inhabitants and the building taxes income had been increased to the community.

5.2 The improvement of the environment has motivated the promotion of the public services, new pipes of water supply had been added, better electricity supply and distribution of better securely services and control of crime.

5.3 Better Garbage collection and avoidance its bad after effects.

5.4 Better durability of the building which due to the control of water logging of the foundations.

5.5 More interest to open shops and services premises in the served areas which promoted the economic activities in these areas.

6. Motivating Community Participation in Sewage Disposal

6.1 Continuous sanitary health education to the public to change the behavior about the utilization of the sewer system and do not throw solid garbage which blocks the sewer.

6.2 Training of workers for better maintenance of the sewer system to avoid its blockage.

6.3 Extending the project to the presently unserved areas and allowing more community participation as paying part of the cost.

6.4 Better utilization of the sludge.

6.5 Make accessible service machinery which responds in a quick way to face any problem of sewage disposal.

6.6 Put in consideration the problem of industrial waste disposal is in some areas of Alexandria is a major source of contamination and bad odor.

CHAPTER VII

COMPARISON BETWEEN THE SERVED AND THE UNSERVED COMMUNITIES

CHAPTER VII

COMPARISON BETWEEN THE SERVED AND THE UNSERVED COMMUNITIES

The Project Coverage

The components of the present project are:

1. Improvement of sewage drainage as the following areas;
   a. Glymonoplo and Sarwat areas which are parts of the Eastern Districts (Shark District).
   b. El Saraya and Sidi Bishr which are parts of Montazah District.
2. Introduction of sewage drainage system though introduction of a sewers network in
   a. Abu Qir, El Maamoura, El Siou. (South) which are areas in Montazah District.
   b. Smouha area which is part of the Central District (Wasat District).
3. Improvement of drainage as:
   a. Bakos, Hagar El Nawatya, Ghobrial, Abu Soliman, Ezbet Dannah, (East District).
   b. El Hadarah and El Ibrahimia (Central District).
   c. El Wardian (Western Districts) Gharb.
4. Improvement and increase of capacities of the Eastern and Western Purification stations.

The Effects of Implementation of the Project

A. Social Reaction

1. The reaction of the interviewed sample showed that while 54.7% stated that the project has achieved its aims, yet 33.3% pointed out that it achieved its aim to a certain extent.
2. 62.7% stated that they are able to go to their work on time now.
3. 54.7% indicated that their children are able to go to school easier.

4. Transportation means had reached their neighborhood as stated 44%.

5. Improvement of sewage disposal was associated with the improvement of other services as telephones and safe drinking water supply as stated by 60% of the sample.

6. Improvement of sewage disposal encouraged stores and other services to start business in the areas served.

7. In Glym, Sarwat and Saraya areas. These are summer resort areas with summer tourists who come seasonally. Their number increased after the improvement of the sewage disposal especially when no more row sewage is disposed with at Sarwat pumping station. The number is not that expected as new summer resort areas had been established along the North Coast during the second half of the last decade.

Housing Change

1. Humidity is lower now in houses as stated by 57.3%.

2. Insects had been got rid off as stated by 44% of the sample.

3. Basement flooding is less now as stated by 41%.

4. 72% stated that their houses are safer now.

The Un-met Expectation

1. The sewage pipes did not reach their own houses.

2. There are still wastewater ponds which is contaminated with sewage water flooding.

The Unserved Sample

1. They are living mostly in Dekheila and Agamy which form parts of Amrya District.

2. 52% of them are Governmental Civil Service.

3. 50% are middle age.

4. In Agami area, mostly newly married had chosen this area because the rent is low and the crowding index in the sample is high reaching 2+, in Agami.

The Difference of Expressed Desires to Meet the Sewage Disposal Problems

While the expressed desires to improve the sewage disposal of the served sample could be considered as nonbasic, yet they have to

put in consideration to complete the whole project. The incompleteness will have a reversed after effect on both the served and unserved areas.

The Served Sample Desire:

A. Men:

1. Spraying insecticidal to get rid of insects (65%)
2. 57.3% needs maintenance services to the present established project.
3. 30.7% removing rain water as soon as possible as it complicates the sewage problem.
4. 49% asked about periodic and continuous cleaning of the sewers to avoid blocking.

B. Women:

1. 77.3% asked for insecticidal spraying.
2. 46.7% asked to remove rain water.
3. 44% asked to include the sewers maintenance inspection of the home services connection.
4. 41.3% asked continuous maintenance to sewerage pumping.

Unserved Areas

A. Men

1. 92% of husbands blamed formal organization, for being unable to keep up with sewerage problems in the district.
2. 65% demanded the extension of the project to their neighborhood.
3. 64% needs continuous spraying of the area by insecticidal.
4. 60% asked continuous inspection and supervision of the sewage disposal system.

B. Women

1. 56% asked for extension of the project to their areas.
2. 78% asked spraying with insecticidal especially in Agami and Dekheila.

217

3. 80% proper working and care of the present sewage disposal system.

4. 50% asked proper clearing of the street out of garbage which blocks the sewer.

Comparison of the Health indices between the served and unserved areas

The best index for the health impact is the water born diseases. Hepatitis admissions per thousand population, could be a reasonable index as it is water and food born, besides there is no obligatory vaccination up till now. Consequently any drop in incidence is highly correlated with improvement of environmental sanitation. The virus being excreted in the stools, this is an effective mechanism in absence of proper sewage disposal.

In 1986 the admitted cases to fever hospital were from Montaza Districts were 72.0/1000 and in East District (Shark) was 73.1/1000. These are the areas which are served by the project at the Eastern Zone. In 1989 it dropped to 39.4/1000 in 1990. In Eastern District (Shark) it dropped to 46.7/1000 in 1990. During this period the implemented project started to function. The increase between 1989 and 1990 in Montazah District might be due to that the increase of population and the whole system has not been well adjusted yet. This district has Ras El Soda as part of it which was one of worst flooded area or measures for food sanitation was not well controlled. Such an increase between 1989 and 1990 is shown also in Wasat District (Central), Gharb (West), Gomrok and Amrya Districts which is not served.

The degree of drop is very drastic in Montazah and Shark (East) Districts but in Amrya it did not exceed 16.1%. The pronounced increase in the admissions of poliomyelitis case between 1986 and 1990 in Amrya is worthy to show the impact of non serving of the Amrya area by the sewer system in spit of the obligatory vaccination.

CHAPTER VIII

SUGGESTED FURTHER STUDIES

CHAPTER VIII

SUGGESTED FURTHER STUDIES

The following are suggested points for further study to give more depth for the present findings.

1. An indepth study for the social impact of the present project.

2. A study about the sustainability of the present project.

3. The utilization of the developed skills which resulted as an output of the present project processing. This skills ought not to be disposed with and not utilized to become a waste.

4. The health impact of the present project has to be following for a long time to detect the remote after effect.

5. Collection and analyses the present legislation related to sewage disposal and to what extent it has to be amended to meet the present changes.

6. Training program for the maintenance of the present project how to be done to keep the sewage system in operation.

7. How to develop a system of self remaining to assure the sustainability of the sewage disposal.

8. The relative value of final disposal of the sewage output.

220

REFERENCES

REFERENCES

1. Review and update of the 1978 Alexandria Wastewater Plan May 1981. Wastewater Consultants Group.

2. Report of the Central Agency for Mobilization and Statistics Census of 1986.

3. Population Council N-Y 1983 Andrew Fisher, John Laing, John Stoeckel. Handbook for Family Planning. Operation Research Design.

4. Sawsan I. Fahmy and A.F. Elsherbini. Determining sample parameters for Social Classifications for health research. Bulletin of the High Institute of Public Health Vol. XIII NO. 5, 1983.

ANNEXES

ANNEX I

RESEARCH TEAM

ANNEX I

THE STUDY TEAM

ECG CONSULTANTS

ANNEX II

SOCIAL SCORING

The Bulletin of the High Institute
of Public Health, Vol.XIII-No.5-1983.

DETERMINING SIMPLE PARAMETERS FOR SOCIAL CLASSIFICATIONS FOR HEALTH RESEARCH

By

SAWSAN I. FAHMY and A.F.El Sherbini

High Institute of Public Health
Alexandria University

Health and disease are distributed unequally among populations. These inequalities are often related to social class and culture concepts that describe diverse characteristics of the person and his environment that affect life quality and longevity.

As stated by Klein (1980) various dimensions; as the income, education, occupation and housing conditions may correlate differently with the incidence of specific diseases. In other words dimensions that probably designate the social or developmental class of individuals correlate to different health problems in different communities. She added that the social class had proved to be

an extremely useful epidemiologic variable for it reflects education, income, values, health behavior and life style variables all influencing the health status.

Gross and Harkavy (1980) illustrated the Barlon model of health and development showing the inter-relating effects of the five interacting variables namely income, education, nutrition, fertility and health. However the scoring of these variables to determine the social or developmental class is changeable in the different communities.

The aim of this paper is to illustrate the developed social scores of different variables used to determine the social standards approximately, representing the Egyptian community. This was developed through several trials in health research using simple social parameters which reflect its effect on the extent of the health problems.

MATERIAL AND METHODS

The materials of the study are scores of some social parameters used to categorise the social standards of families of subject with special health problems. These developed social scores were used in different public health research supervised by the authers during the last ten years. This included the scores presented by Abdel Kader (1978), Bayoumi (1978), Kamel (1979), Nousseir (1981) El Daly (1981), Naguib (1984) and Ramzy (1984). The Social standards were used in these studies to find the relation to the health hazards. Certain modifications were needed for these scores. First to use more detailed parameters in certain situations for example in relation to sanitation in urban and rural areas and second to

follow the continuous economic changes in the community. Also the modifications were intended to add certain parameters for certain research objectives. For example in researches related to cultural aspects among the parameters added are the presence of information aids in the homes of the families of children.

RESULTS

The results are presented in models of social scoring using social variables or indices which might change with the health problem to which the social score to be correlated.

Model I:

This was the type of social score used to calculate the social standards to be correlated to chronic handicapping diseases of children as for example epilepsy (Abdel Kader 1973) and bronchial asthma (Kamel 1979). Some modifications were needed to end in this model. The indices used were education of father, education and work of mother, percapita income of family members, crowding index and home sanitation in general.

Model I. Social score to calculate social standards of families of children with chronic diseases

1- **Education of father**

- Read and write or illiterate	2
- Primary education	4
- Preparatory education	6
- Secondary education	8
- University or higher	10

2- Education and work of mother

- Read and write or illiterate	non working	1
- Read and write or illiterate	working	2
- Primary education	non working	3
- Primary education	working	4
- Preparatory education	non working	5
- Preparatory education	working	6
- Secondary education	non working	7
- Secondary education	working	8
- University education	non working	9
- University education	working	10

3- Percapita income/month (Egyptian Pounds)

40 +	4
30 - 40	3
20 - 30	2
< 20	1

4- Crowding index

5 or more / room	0
4 -	1
2	2
< 2	3

5- Sanitation:

According to the presence of pure water supply all through the day, electricity and special water closets inside the house the score is thus:

All the three present	3
2 out of 3	2
1 out of 3	1

In this model education of the father was meant to express his level of education and also the standard of his occupation, economically. Education of the mother is scored associated with her work. Education expresses her level of knowledge but her work with this level expresses the type of work and its economic reward. This prevents the falacy of high score if she is working a low waged one as in case of working low educated mothers. However the scoring measurements are based on the present community natural equivalents subjectively assessed. For example 10 pounds income equals approximately one point of status score. For education it is assumed that three years approximately equals one point status score. Another two points are added scoring the work whether for the father or the mother. Status scores for other social indices as crowding index or sanitary facilities or information tools (coming model) are considered on pure subjective basis.

The total score of this model summed 30

Scores of 25 - 30 are considered of high social standards
Scores of 20 - 25 are considered of middle social standards
Scores of 15 - 20 are considered of low social standards
Scores of < 15 are considered of very low social standards

This is based on the fact that high social standard families are higher than 85% of families in the community, middle are higher than 65 - 85%, lower higher than 50 - 56% and very low less than 50%.

Model II:

This was the type of social score used to correlate the social standards with health problems related more to the physical and biological environment of the family house. This was used for example in health researches

involving infectious diseases (Nousseir 1981) and those of parasitic infestation (El Daly 1981). With some modifications this model is finalized. It differs from the previous model in the details of sanitary measures inside the houses of families studied. Thus it included scoring of informations as regards water supply, refuse disposal, latrines inside houses and sewage disposal. The family size is also included and scored.

Model II Social Score to calculate social standards of families in studies of infectious and parasitic diseases

1 and 2 Education of father and education and work of mother: same as previous model

3- Percapita income / month: same as previous model

4- Family size

- 3 & 4 members	8
- 5 members	6
- 6 members	4
- 7 or more	1

5- Sanitation

A- Water Supply

Rural: -Pure water supply inside house all day
-Pure water supply inside house sometime and stored in Zeir .....
-Common tap outside stored in Zeir.....
-From the Canal .....

Urban:

-Special water supply inside home all day 6
-Special water supply inside home some of the day 5
-Shared water supply inside home all day 4
-Shared water supply inside home some of day 3
-Common tap outside 1

B- Refuse disposal:

Rural:

- Collected & thrown infront of house uncovered 1

- Collected & thrown infront of house covered 2

- Collected & thrown away from house in a special collecting space 4

Urban:

- Thrown outside uncovered 1

- Collected (uncovered) by refuse collector 2

- Collected (covered) by refuse collector or placed in a collecting area 4

C- Latrines:

Rural:

- Present and properly used (covered) 6

- Present and improperly used 3

- Absent 0

Urban

- Special latrines inside home with flushing system 6
- Special latrines inside home without flushing system 4
- Shared latrines with other families with flushing system 2
- Shared latrines with other families without flushing system 1

D- Sewage disposal:

Rural:

- In an accepted hygienic system 5
- In an unaccepted hygienic system 1

Urban:

- Through the common sewerage system 5
- Septic tanks properly educated 4
- Septic tanks flowing up 1

E- Illumination:

- Electricity mainly 4
- Gas lamp mainly 2
- Kerosine lamp mainly 1

The total score summed 57:

High social standard	50 - 57
Middle social standard	40 - 50
Low social standard	30 - 40
Very low Social standard	< 30

Model III:

This was the type of social score used to correlate the social standard with the knowledge attitudes and practices of certain groups with certain health problems related to culture. This was implimented as an example in dealing with researches involving patterns of food distribution among family members in relation to the nutrition status (Bayoumi 1978) knowledge of mothers about needs of children in health and disease (Nosseir 1981), patterns of toilette training (Naguib 1984) and knowledge of school students about family planning (Ramzy 1984).

The present model is modified with certain additions of some social indices which included the presence or absence of audiovisual aids of informations inside houses.

Model III Social score to calculate social standards of families in K.A.P. studies:

1 and 2 Education of father and education and work of mother as Model I

3 Percapita monthly income as model I

4 Family size may not be included in this score.

5 Crowding index same as model I

6 Sanitation might be abstracted like model I or detailed like model II

7 Information tools inside the house

Radio, television and video

Two of them	4
One of them	2
None	0

DISCUSSION

Social class describes one's position relative to others in society. The higher one's position the better the chances in every way, notably lower risk of morbidities and mortatities (Klein 1980). Indicators or variables or indices of the social class are numerous. WHO (1980) pointed that ideally these indicators should be valed that is actually measuring what they are supposed to measure, objective, sensitive to changes and specific reflecting the situations concerned. However, in real life there are few indicators that meet all these conditions. Indicators have to be taken as merely reflections of a real thing. They are indirect or partial measures of a complex situation but if measured sequentially over time they indicate direction and change. Collman et al (1978) stated that sociologists have been interested mainly in the distribution of occupations and secondarily in the distribution of education. Economists have concentrated on the size distribution of income. They added that these parameters were always chosen because of the long history of sociological research which suggests their key importance in establishing individual social standing. However social class differences are also accompanied by cultural variations specifically way of living or life style and behavior patterns and attitudes. Life styles are complex patterns of many small trials & behaviours.

In the presented model the parameters used covered the recommended areas without details. It covered education, income and some life style patterns as family size and its relation to the house units (crowding index), sanitary facilities in and outside the house and information tools inside homes as radio, television and video tapes. Occupation of the fathers is ignored since in

Egypt the level of education usually expresses the type of profession and its social status. For mothers the level of education is expressed whether working or not working. This is to differentiate the income level of highly educated from illiterate working mothers.

The percapita income of family individuals is a changeable social index. It should be continuously modified according to time of research. In studies done ten years from now the highest score was given to 15 pounds or more which is considered now the lowest.

In some studies the family income as a whole is scored according to its balance with expences whether with debt or with savings. This has the falacy of getting balanced budgets in different social strata irrespective to the amount of income itself which is the important social index. These parameters when experimented in the different studies of health services were found satisfactorily designating the social strata in a simple way and presenting the relation between the strata and health problem clearly. It proved sufficient and factual in the previous mentioned studies and were used later in similar ones.

CONCLUSIONS AND RECOMMENDATIONS

The social standards of families for health research can be developed and scored through simple index parameters. The presented models can be used safely to correlate the social standard with the health problem and proved to give logic correlations. However it is recommended when using it to test them with each study during the pilot. More parameters might be added and

scored according to the need of these extra ones. Continuous modifications of scores of the percapita income areneeded because of the continuous economic changes in the community.

SUMMARY

Studies of community health problems need correlations with social standards. Estimation of social standards of families in a community needs to identify certain parameters with high validity. The present paper presented three models of social scoring for different health problems. The models were previously used with satisfactorily acceptable social leveling and correlations with the health problems.

REFERENCES

Abdel Kader, E. (1973): Epilepsy Among School Children in Alexandria. Unpublished thesis submitted to the High Institute of Public Health Alexandria University in Partial fulfillment of the requirements of the degree of Dr. Public Health.

Bayoumi, S. (1978): Patterns of food distribution in the family and its effects on nutrition of Preschool child. Thesis submitted to the High Institute of Public Health University of Alexandria in Partial fulfillment of the requirements of the degree of Dr. Public Health.

Collman, R.P., Rainwater, L. and McClelland, R.A.(1978): Social standing in America. Basic Books, Inc., Publishers New York, p.p. 21,79.

El Daly, S. (1981): Parasitic infections Among Pre-school children in Day Care Centres in Alexandria. Unpublished thesis submitted to the HIPH. Alexandria University in partial fulfillment of the requirement for the Degree of Master of Public Health.

Cross, R.N. and Harkavy, O. (1980): The role of Health in Development. Social Sc. and Medicine 14C; 2 pp. 165-169

Kamel, K. (1979): The effect of Bronchial Asthma on School children in Alexandria. Unpublished thesis submitted to the HIPH Alexandria University in Partial fulfillment of the requirement for the Degree of Dr. P.H.

Klein, S.D. (1980): Class, Culture and Healthy in Public Health and Preventive Medicine. by Maxy - Rosenau. 11th ed. Appleton - Century - Craft. New York. P. 1021

Naguib, W.S. (1984): Patterns of Toilet Training in Egyptian Children. Unpublished thesis submitted to the Faculty of Medicine, University of Alexandria in Partial fulfillment of the requirement for the Degree of Master of Paediatrics.

Nonsseir,S. (1981): Health Needs and Demands of Pre-school Children in Partial fulfillment of the requirement for the Degree of Master of Public Health.

Ramzy, M. (1984): Family planning in School Curriculum. Unfinished thesis submitted to the HIPH Alexandria University in Partial fulfillment of the requirement for the Degree of Master of Public Health.

W.H.O. (1980): Indicators for monitoring progress towards health for all. Geneva, PP. 5-6.

ANNEX III

INTERVIEW SHEETS FOR SERVED SAMPLE

مشـــروع الصـــرف الصحـــى
بمدينـــة الاسكندريـــة

مسلسل خاص	
مسلسل عام	

دراسة تقويمية لاتجاهات المواطنين نحو مشروع الصرف الصحى بمدينة الاسكندرية (المرحلة الأولى)

[خاص بالمستفيدين من المشروع]

بيانات هذه الاستمارة سرية، ولاتستخدم إلا فى أغراض البحث العلمى.

أولاً البيانات الأولية :

(١) الاســـم :

(٢) الوظيفة : عامل حرفى ( ) عامل خدمات ( ) بائع متجـــول ( )
تاجر ( ) موظف ( ) بالقوات المسلحة أو الشرطـــة ( )
بالمعاش ( ) لايعمل ( )

(٣) العنوان:

(٤) الحالة التعليمية لرب الأسرة :

أمى أو يقرأ فقط أو يقرأ ويكتب ( ) (٢)
تعليم ابتدائى ( ) (٤) تعليم اعدادى ( ) (٦)
تعليم ثانوىأومتوسط ( ) (٨) تعليم عالى ( ) (١٠)

(٥) الحالة التعليمية وعمل المرأه (الزوجة):

تكتـب وتقــرأ ولاتعمـل ( ) (١) تقــرأ وتكتـب وتعمـــل ( ) (٢)
تعليـم ابتدائى ولاتعمـل ( ) (٣) تعليـم ابتدائى وتعمـل ( ) (٤)
تعليـم إعدادى ولاتعمـل ( ) (٥) تعليـم إعدادى وتعمـل ( ) (٦)
تعليم ثانوىأومتوسط ولاتعمل ( ) (٧) تعليم ثانوىأومتوسط وتعمل ( ) (٨)
تعليـم جـامعى ولاتعمـل ( ) (٩) تعليـم جامعى وتعمـل ( ) (١٠)

(٦) متوسط دخل الأسرة الشهرى:

– ١٠٠ ( ) (١) ١٠٠ – ( ) (٢) ٢٠٠ – ( ) (٣) ٣٠٠ فأكثر ( ) (٤)

(٧) عدد أفراد الأسرة :

إثنتـان ( ) ثلاثـة ( ) أربعـة ( ) خمسـة ( ) ستـة ( )
سبعـة ( ) ثمانية فأكثر ( )

(٨) متوسط دخل الفرد الشهرى:

متوسط دخل الأسرة الشهرى
عدد أفراد الأسرة

242

(٩) عدد حجرات المسكن:

حجرة واحدة ( ) حجرتان ( ) ثلاث حجرات ( ) أربعة حجرات فأكثر ( ) تذكر

(١٠) درجة الازدحام:

عدد أفراد الأسرة
عدد الحجرات

- ٢ ( ) (٣) ٢ - ( ) (٢) ٤ - ( ) (١) ٥فأكثر ( ) (صفر)

(١١) مرافق السكن:

يوجد مياه شرب طوال اليوم ( ) (١)

(٣) يوجد كهرباء ( ) (٢)

يوجد مراحيض ونظام صرفي ( )

(١٢) مستوى الأسرة:

المجموع الكلي لأوزان المتغيرات / مجموع المتغيرات = ____ / ٣٠

ثانياً: بيانات خاصة بحالة منطقة السكن قبل تنفيذ مشروع تحسين الصرف الصحي

(١٣) هل كنت تعاني من طفح المجاري؟ نعم ( ) لا ( )
في حالة الاجابة بنعم يسأل (١٤)، (١٥)، (١٦)

(١٤) ماتوعه:
بيرك ( ) مستنقعات ( ) رواشح ( )

(١٥) كمية الطفح:
عالية ( ) متوسطة ( ) ضعيفة ( )

243

(١٦) مدة استمرار الطفح:

طوال العام ( ) ستة شهور ( ) ثلاثة شهور فأقل ( )

(١٧) كيفية التدخل لعلاج الطفح: لا أتدخل لعلاج الطفح ( )
عن طريق شركات خاصة ( ) عن طريق جهودى بمفردى ( )
عن طريق جهودى بمعاونة أهالى المنطقة ( ) عن طريق المرافق الحكومية ( )
أخرى ( ) تذكر

(١٨) ما تأثير طفح المجارى على مساكن المنطقة؟

ا- تأثر أساسات المساكن بمياه طفح المجارى ( )
ب- ظهور تشقق فى حوائط المساكن ( )
ج- تسبب فى سقوط بعض المساكن القديمة بالمنطقة ( )
د- تسبب فى سقوط الكثير من العش والحجرات الخشبية التى يسكنها بعض أهالى المنطقة ( )
هـ- تسبب فى تساقط الطلاء الداخلى لجدران المنزل ( )
و- ارتفاع نسبة الرطوبة داخل المنزل ( )
ز- وصول مياه الطفح إلى الأدوار الأرضية بالمساكن ( )
ح- أخرى ( ) تذكر

(١٩) ماهى الآثار الصحية الناتجة من طفح المجارى بمنطقة سكنك؟

ا- إنتشار الحشرات (ذباب وناموس) بالمنطقة ( )
ب- إنتشار الأمراض المعوية بين أطفال المنطقة ( )
ج- إنتشار الأمراض المعوية بين سكان المنطقة ( )
د- تلوث الشوارع بمياه الطفح ( )
هـ- تلوث المساكن بمياه الطفح ( )
و- تلوث مدارس المنطقة بمياه الطفح ( )
ز- صعوبة تهوية المساكن لانتشار الروائح الكريهة من الطفح ( )
ح- إرتفاع نسبة الرطوبة داخل المنزل ( )
ط- أخرى ( ) تذكر

(٢٠) ماهى الآثار الاجتماعية الناتجة من طفح المجارى بمنطقة سكنك؟

ا- صعوبة وصول وسائل النقل المختلفة للمنطقة ( )
ب- إعاقة سكان المنطقة عن الوصول إلى أماكن عملهم ( )
ج- إعاقة أبناء المنطقة عن الوصول إلى مؤساتهم التعليمية ( )
د- تحول دون مرور الباعة الجائلين بالمنطقة ( )

244

هـ- تحول دون توفير بعض الخدمات الأخرى (الكهرباء، مياه شرب، تليفونات) بالمنطقة ( )
و- إعاقة زيارة الأقارب والأصدقاء للأسرة ( )
ز- إعاقة إقامة الشعائر الدينية ( )
ح- أخرى ( ) تذكر

ثالثاً: ماهى الآثار الاجتماعية الناتجة من طفح المجارى بمنطقة سكنك؟

(٢١) هل حقق مشروع الصرف الصحى التحسن المطلوب فى منطقة سكنك؟

نعم ( ) إلى حد ما ( ) لا ( )

(٢٢) فى حالة الإجابة (بنعم، إلى حدما) ماهى مظاهره

ا- حدوث تحسن فى أساليب الصرف الصحى بالمنطقة ( )
ب- إمكان وصول وسائل النقل المختلفة بالمنطقة ( )
ج- إنخفاض نسبة الإصابة بالأمراض المعوية بين سكان المنطقة ( )
د- إمكان القضاء على الحشرات (الذباب والناموس) بالمنطقة ( )
هـ- إنخفاض نسبة تأثر أساسات وحوائط المساكن من مياه الطفح ( )
و- توفر خدمات جديدة بالمنطقة وتحسن المتوفر منها (كهرباء، مياه شرب، تليفونات) ( )
ز- ساعد على أداء سيدات المنطقة للشئون المنزلية بسهولة ويسر ( )
ح- إرتفاع قيمة الأراضى بالمنطقة ( )
ط- توفر محلات الأطعمة والخدمات بالمنطقة ( )
ى- إمكانية إقامة الشعائر الدينية فى دور العبادة ( )
ك- إمكانية ذهاب أهالى المنطقة إلى مؤسساتهم التعليمية ( )
ل- إمكانية ذهاب أهالى المنطقة إلى أعمالهم ( )
م- إنخفاض نسبة الرطوبة داخل المنازل وإمكانية تهويتها ( )
ن- أخرى ( ) تذكر

(٢٣) فى حالة الإجابة (بلا) ماهى الأسباب؟

ا- المشروع لم يقض على طفح المجارى بالمنطقة ( )
ب- المشروع لم يقض على طفح المجارى بمسكنها ( )
ج- تنفيذ المشروع أثر على كفاءة المرافق الأخرى بالمنطقة ( )
د- لاتزال تعانى بعض أحياء المنطقة من طفح المجارى ( )
هـ- أخرى ( ) تذكر

245

طبخ

(٢٤) في حالة حدوث مجاري بالمنطقة وتقدمك بشوى الى المسئولين، ما مدى استجابتهم؟

الاستجابة الفورية ( ) بطئ الاستجابة ( ) عدم الاستجابة ( )

(٢٥) ماهي مقترحاتك بالنسبة لمشكلات الصرف الصحي بالمنطقة ؟

مقترحات الـــزوج	مقترحات الزوجـــة
ا-	ا-
ب-	ب-
ج-	ج-
د-	د-

246

ANNEX IV

INTERVIEW SHEETS FOR UNSERVED SAMPLE

مشـــروع الصـــرف الصحـــى
بمدينـــة الاسكندريـــة

مسلسل خاص	
مسلسل عام	

دراسة تقويمية لاتجاهات المواطنين نحو الوضع الحالى للصرف الصحى بمناطق إقامتهم

[خاص بسكان المناطق المحرومة من وصول شبكة الصرف الصحى إليها]

بيانات هذه الاستمارة سرية , ولاتستخدم إلا فى أغراض البحث العلمى .

أولاً: البيانات الأولية:

(١) الإسم:

(٢) الوظيفة: عامل حرفى ( ) عامل خدمات ( ) بائع متجول ( )
تاجر ( ) موظف ( ) بالقوات المسلحة أو الشرطة ( )
بالمعاش ( ) لايعمل ( )

(٣) العنوان:

(٤) الحالة التعليمية لرب الأسرة:

أمى أو يقرأ فقط أو يقرأ ويكتب ( ) (٢)
تعليم ابتدائى ( ) (٤) تعليم إعدادى ( ) (٦)
تعليم ثانوى أومتوسط ( ) (٨) تعليم عالى ( ) (١٠)

(٥) الحالة التعليمية وعمل المرأه (الزوجة):

تكتب وتقرأ ولاتعمل ( ) (١) تقرأ وتكتب وتعمل ( ) (٢)
تعليم ابتدائى ولاتعمل ( ) (٣) تعليم ابتدائى وتعمل ( ) (٤)
تعليم إعدادى ولاتعمل ( ) (٥) تعليم إعدادى وتعمل ( ) (٦)
تعليم ثانوى أومتوسط ولاتعمل ( ) (٧) تعليم ثانوى أومتوسط وتعمل ( ) (٨)
تعليم جامعى ولاتعمل ( ) (٩) تعليم جامعى وتعمل ( ) (١٠)

(٦) متوسط دخل الأسرة الشهرى:

- ١٠٠ ( ) (١) ١٠٠ - ( ) (٢) ٢٠٠ - ( ) (٣) ٣٠٠ فأكثر ( ) (٤)

(٧) عدد أفراد الأسرة:

إثنتان ( ) ثلاثة ( ) أربعة ( ) خمسة ( ) ستة ( )
سبعه ( ) ثمانيه فأكثر ( )

(٨) متوسط دخل الفرد الشهرى:

متوسط دخل الأسرة الشهرى
عدد أفراد الأسره

٢٧٩

(٩) عدد حجرات المسكن:

حجرة واحدة ( ) حجرتان ( ) ثلاث حجرات ( ) أربعة حجرات فأكثر ( ) تذكر

(١٠) درجة الازدحام:

عدد أفراد الأسرة
عدد الحجرات

- ٢ ( ) (٣) ٢ - ( ) (٢) ٤ - ( ) (١) فأكثر ( ) (صفر)

(١١) مرافق المسكن:

يوجد مياه شرب طوال اليوم ( ) (١)

يوجد كهرباء ( ) (٢)

يوجد مراحيض ونظام صرفى ( ) (٣)

(١٢) مستوى الأسرة:

المجموع الكلى لأوزان المتغيرات / مجموع المتغيرات = ____ / ٣٠

(١٣) هل تعانى من طفح المجارى؟ نعم ( ) لا ( )
فى حالة الإجابة بنعم يسأل (١٤)، (١٥)، (١٦)

(١٤) مانوعه:
بسرك ( ) مستنقعات ( ) رواشح ( )

(١٥) كمية الطفح:
عالية ( ) متوسط ( ) ضعيفه ( )

250

(١٦) مدة استمرار الطفح:

طوال العام ( ) ستة شهور ( ) ثلاثة شهور فأقل ( )

(١٧) كيفية التدخل لعلاج الطفح: لا أتدخل لعلاج الطفح ( )
عن طريق شركات خاصة ( ) عن طريق جهودى بمفردى ( )
عن طريق جهودى بمعاونة أهالى المنطقة ( ) عن طريق المرافق الحكومية ( )
أخرى ( ) تذكر

(١٨) ما تأثير طفح المجارى على مساكن المنطقة؟

ا- تأثر أساسات المساكن بمياه طفح المجارى ( )
ب- ظهور تشقق فى حوائط المساكن ( )
ج- تسببت فى سقوط بعض المساكن القديمة بالمنطقة ( )
د- تسببت فى سقوط الكثير من العش والحجرات الخشبية التى يسكنها بعض أهالى المنطقة ( )
هـ- تسببت فى تساقط الطلاء الداخلى لجدران المنزل ( )
و- إرتفاع نسبة الرطوبة داخل المنزل ( )
ز- وصول مياه الطفح إلى الأدوار الأرضية بالمسكن ( )
ح- أخرى ( ) تذكر

(١٩) ماهى الآثار الصحية الناتجة من طفح المجارى بمنطقة سكنك؟

ا- إنتشار الحشرات (ذباب وناموس) بالمنطقة ( )
ب- إنتشار الأمراض المعوية بين أطفال المنطقة ( )
ج- إنتشار الامراض المعوية بين سكان المنطقة ( )
د- تلوث الشوارع بمياه الطفح ( )
هـ- تلوث المساكن بمياه الطفح ( )
و- تلوث مدارس المنطقة بمياه الطفح ( )
ز- صعوبة تهوية المساكن لانتشار الروائح الكريهة من الطفح ( )
ح- إرتفاع نسبة الرطوبة داخل المنزل ( )
ط- أخرى ( ) تذكر

(٢٠) ماهى الآثار الاجتماعية الناتجة من طفح المجارى بمنطقة سكنك؟

ا- صعوبة وصول وسائل النقل المختلفة للمنطقة ( )
ب- إعاقة سكان المنطقة عن الوصول إلى أماكن عملهم ( )
ج- إعاقة أبناء المنطقة عن الوصول إلى مؤسساتهم التعليمية ( )
د- تحول دون مرور السيارة الجائلين بالمنطقة ( )

251

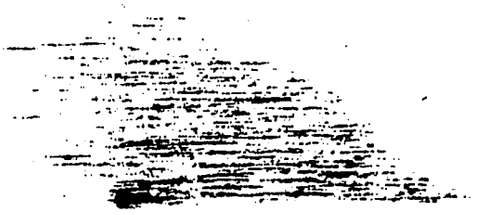
هـ- تحول دون توفير بعض الخدمات الأخرى (الكهرباء، مياه شرب، تليفونـــــات) بالمنطقة ( )
و- إعاقة زيارة الأقارب والأصدقاء للأسرة ( )
ز- إعاقة إقامة الشعائر الدينية ( )
ح- أخرى ( ) تذكر

(٢١) ماهي مقترحاتك بالنسبة لمشكلات الصرف الصحي بالمنطقة؟

مقترحات الـــزوج	مقترحات الزوجـــة

-252

ATTACHED ALBUM NO.II
LIST OF PICTORIAL RECORDE CONDITIONS IN SERVED AND UNSERVED AREAS IN ALEXANDRIA GOVERNORATE



LIST OF PICTORIAL RECORD OF FLOODING CONDITIONS IN SERVED AND UNSERVED AREAS IN ALEXANDRIA GOVERNORATE
(See Attached Album)

I. In Served Areas:

A: El Montazah District:

1.	Ezbett El Haramine/Montazah	No flooding now and environmental improvement
	1.1	
	1.2	
	1.3	
2.	Gamea El Saida St./Montazah	No flooding now and environmental improvement
	2.1	
	2.2	
	2.3	
3.	Rass El Soda/Montazah	No flooding now and environmental improvement
4.	Sixty four St./Montazah	No flooding now and environmental improvement
5.	Malak Hefni Nassef St./Montazah (Parallel to train line)	No flooding now and environmental improvement
6.	El Siouf Keblia/Montazah	No flooding now and environmental improvement

B: East (Shark)

1.	El Kosaai/East	No flooding now and environmental improvement
2.	Maamal El Katakit St./East	No flooding now and environmental improvement
	2.1	
	2.2	
3.	Victoria College Square/East (infront of HIVO Restaurant)	No flooding now and environmental improvement
4.	Danna/East	No flooding now and environmental improvement
5.	Abu Soliman/East	No flooding now and environmental improvement
6.	Smouha Bridge/East	No flooding now and environmental improvement
7.	Smouha Square/East	No flooding now and environmental improvement
8.	Kilopatra R.R. Way/East Bridge	No flooding now and environmental improvement
	8.1	
	8.2	

/jk (FR-ES)

C: Central (Wassat)

1.	El Ibrahimia Bridge/Central	No flooding now and environmental improvement
2.	Moharem Bey Bridge/Central	No flooding now and environmental improvement
3.	Back of Sporting Club (Parallel to the Subway line)/Central	No flooding now and environmental improvement

D: El Gomrok

1.	Zawia Kattab/Gomrok	No flooding now and environmental improvement
2.	Gomrok Main st./Gomrok	No flooding now and environmental improvement

II Unserved District

A: Amria District

1.	El Mex/Amria	Suffering from Sewage Flooding
2.	Wadi El Kammar/Amria	Suffering from Sewage Flooding
3.	Dekheila/Amria	Suffering from Sewage Flooding
4.	Around Chemical Co./Amria in Dekheila	Suffering from Sewage Flooding and bad odor
5.	Around Leather Co./Amria	Suffering from Sewage Flooding and bad odor
6.	El Agami Old/Amria	Suffering from Sewage Flooding and bad odor
7.	El Agami Water Co./Amria	Suffering from Sewage Flooding
8.	New Housing Compounds./Amria	Surrounded by flooding and insects.

III Partial Served Areas: Still Suffering:

A: Central (Wassat) District:

1.	Ezbett Nadi El Seide/Central	Still suffering, from flooding and ponding. (Because of disconnected pipes to homes)
1.1		
1.2		
1.3		
2.	Ezbett El Mattar/Central (Back of Air port & International Park)	Still suffering, from flooding and ponding.
2.1		
2.2		

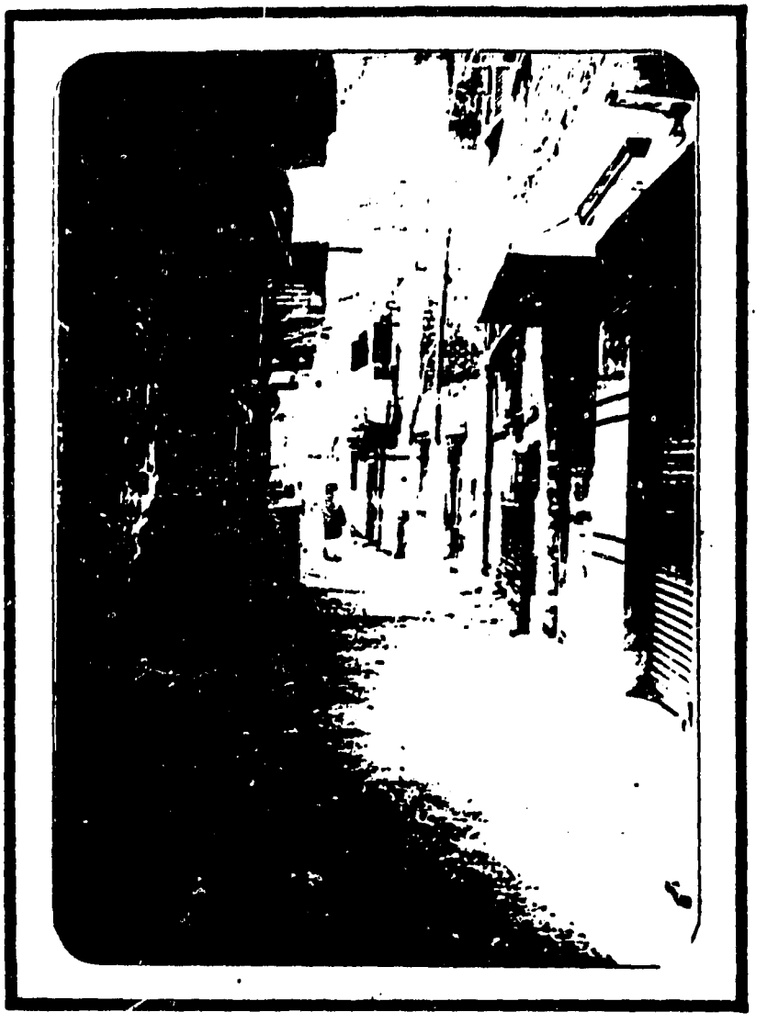
/jk (FR-ES)

THE IMPROVEMENT IN SEWAGE DISPOSAL IN ALEXANDRIA

IN SERVED ARIAS

(A) EL MONTAZAH DISTRICT

THE IMPROVEMENT IN SEWAGE DISPOSAL IN ALEXANDRIA
IN SERVED AREAS



COMMENTS Ezbett El Haramine/Montazah

No flooding now and
environmental improvement

258

THE IMPROVEMENT IN SEWAGE DISPOSAL IN ALEXANDRIA
IN SERVED AREAS

COMMENTS: Ezbett El Haramine/Montazah

No flooding now and
environmental improvement

259

THE IMPROVEMENT IN SEWAGE DISPOSAL IN ALEXANDRIA
IN SERVED AREAS

COMMENTS Ezbett El Haramine/Montazah

No flooding now and
environmental improvement

260

THE IMPROVEMENT IN SEWAGE DISPOSAL IN ALEXANDRIA
IN SERVED AREAS

COMMENTS Gamea El Saida St./Montazah

No flooding now and

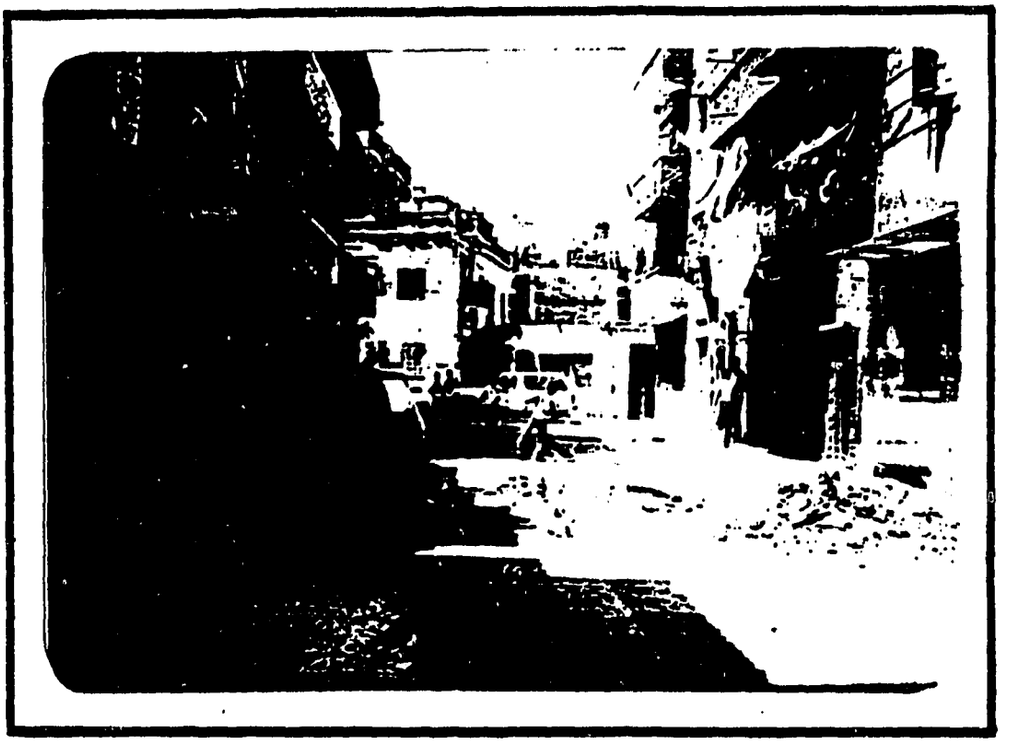
environmental improvement

THE IMPROVEMENT IN SEWAGE DISPOSAL IN ALEXANDRIA
IN SERVED AREAS

COMMENTS Gamea El Saida St./Montazah

No flooding now and
environmental improvement

THE IMPROVEMENT IN SEWAGE DISPOSAL IN ALEXANDRIA
IN SERVED AREAS



COMMENTS Gamea El Saida St./Montazah

No flooding now and

environmental improvement

263

THE IMPROVEMENT IN SEWAGE DISPOSAL IN ALEXANDRIA

IN SERVED AREAS

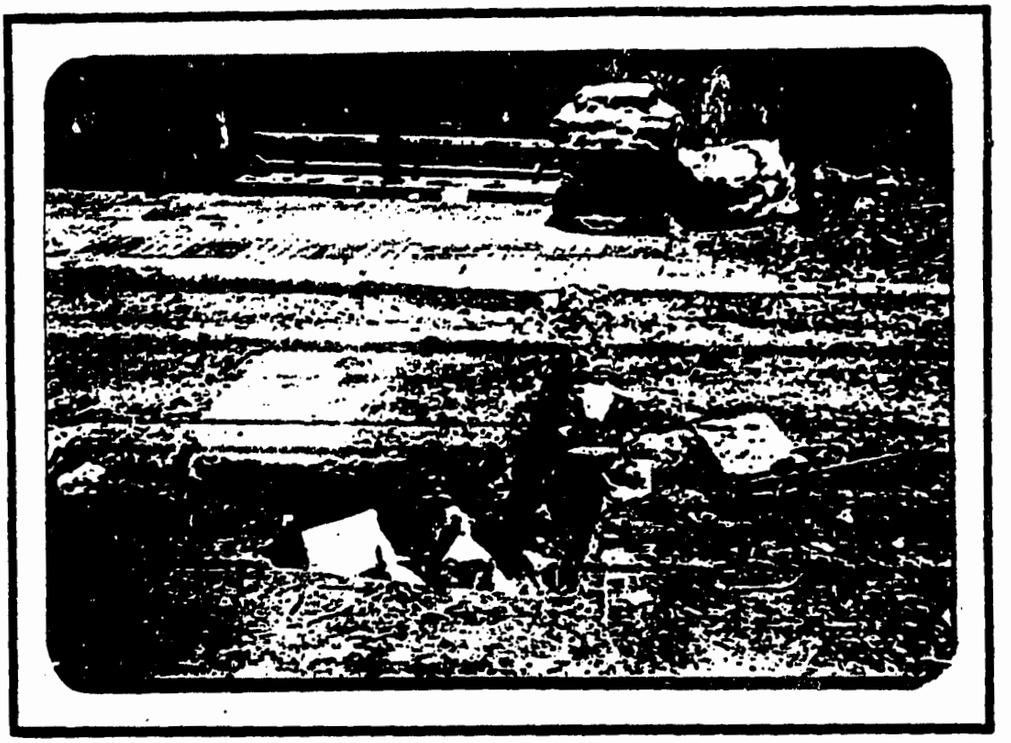
COMMENTS : Rass El Soda/Montazah

No flooding now and

environmental improvement

THE IMPROVEMENT IN SEWAGE DISPOSAL IN ALEXANDRIA

IN SERVED AREAS



COMMENTS Sixty four St./Montazah

No flooding now and

environmental improvement

265

THE IMPROVEMENT IN SEWAGE DISPOSAL IN ALEXANDRIA
IN SERVED AREAS

COMMENTS

Malak Hefni Nassef St./Montazah

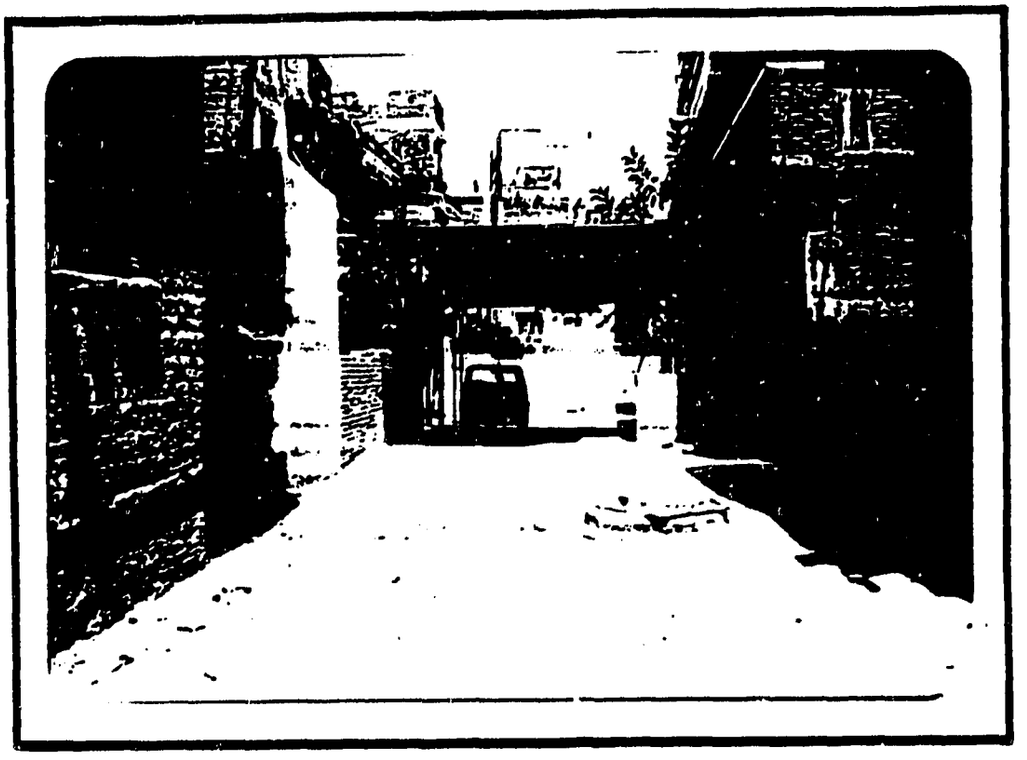
(Parallel to train line)

No flooding now and

environmental improvement

266

THE IMPROVEMENT IN SEWAGE DISPOSAL IN ALEXANDRIA
IN SERVED AREAS



COMMENTS El Siouf Keblia/Montazah

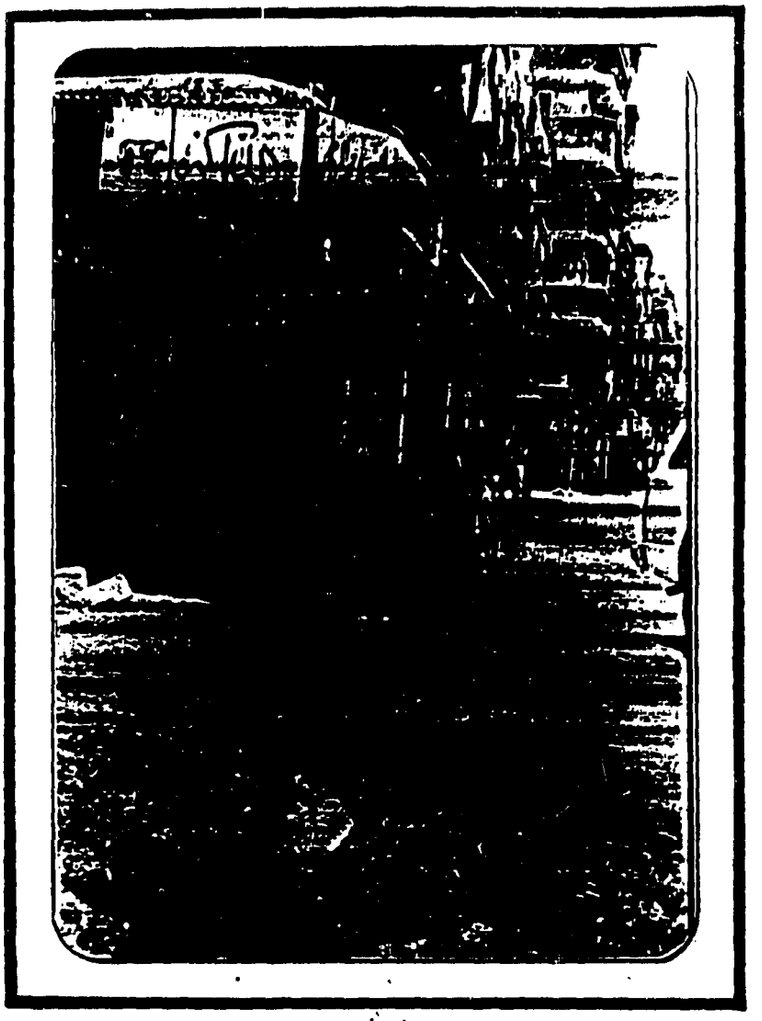
No flooding now and

environmental improvement

267

(B) EAST (SHARK)

THE IMPROVEMENT IN SEWAGE DISPOSAL IN ALEXANDRIA
IN SERVED AREAS



COMMENTS El Kosaai/East

No flooding now and

environmental improvement

269

THE IMPROVEMENT IN SEWAGE DISPOSAL IN ALEXANDRIA
IN SERVED AREAS

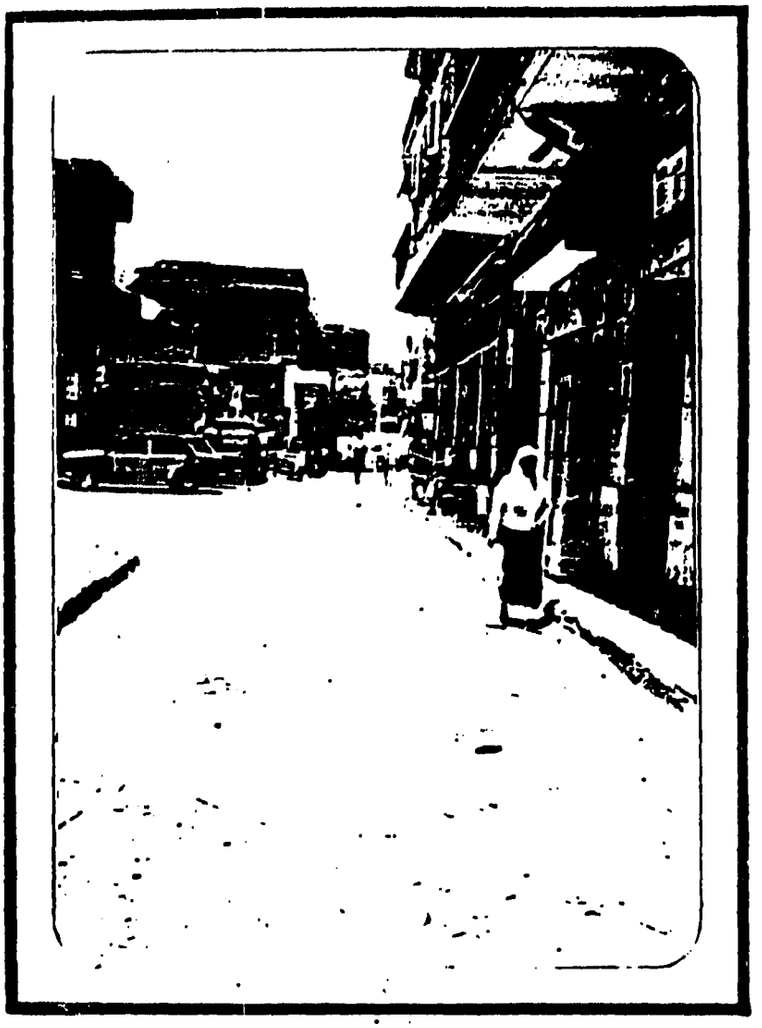
COMMENTS Maamal El Katakit St./East

No flooding now and

environmental improvement

270

THE IMPROVEMENT IN SEWAGE DISPOSAL IN ALEXANDRIA
IN SERVED AREAS



COMMENTS Maamal El Katakit St./East

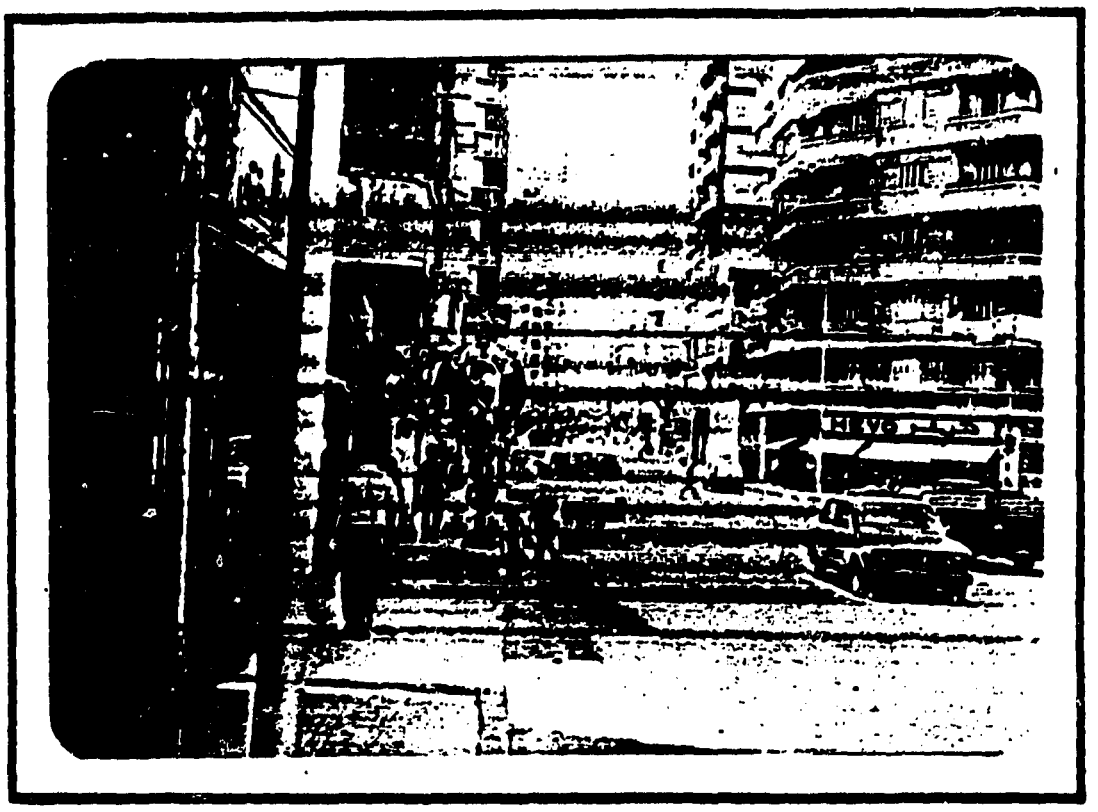
No flooding now and

environmental improvement

271

THE IMPROVEMENT IN SEWAGE DISPOSAL IN ALEXANDRIA

IN SERVED AREAS



COMMENTS Victoria College Square/East (infront of HIVO Restaurant) No flooding now and environmental improvement

272

THE IMPROVEMENT IN SEWAGE DISPOSAL IN ALEXANDRIA

IN SERVED AREAS

COMMENTS Danna/East

No flooding now and environmental improvement

213

THE IMPROVEMENT IN SEWAGE DISPOSAL IN ALEXANDRIA
IN SERVED AREAS

COMMENTS Abu Soliman/East

No flooding now and
environmental improvement

274

THE IMPROVEMENT IN SEWAGE DISPOSAL IN ALEXANDRIA

IN SERVED AREAS

COMMENTS Smouha Bridge/East

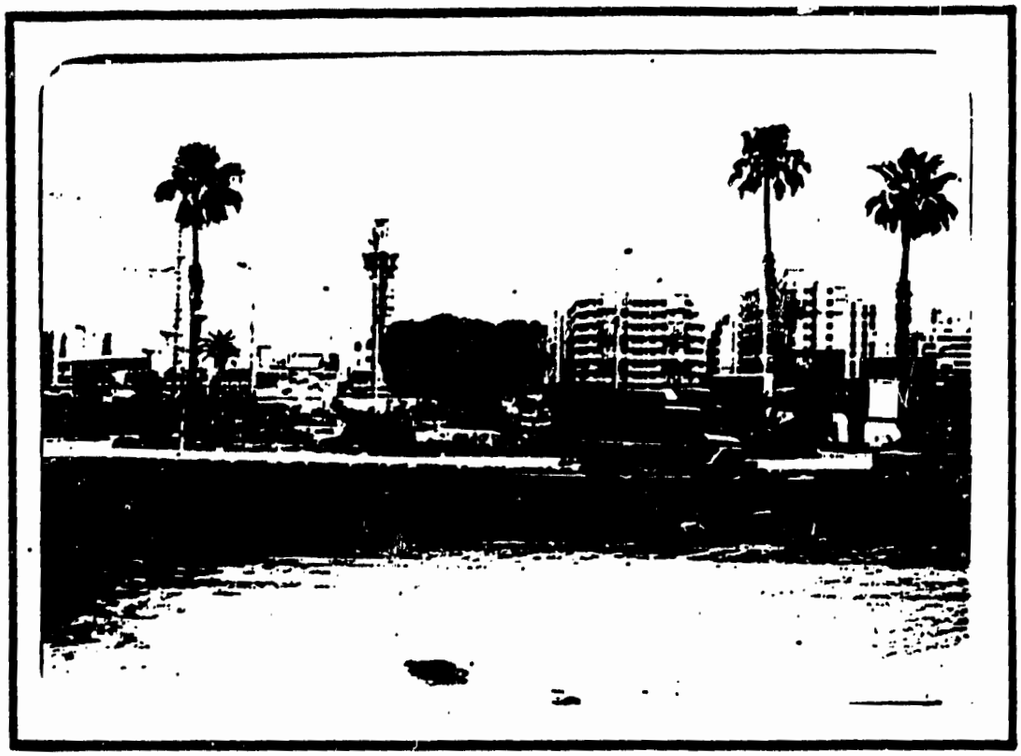
No flooding now and

environmental improvement

215

THE IMPROVEMENT IN SEWAGE DISPOSAL IN ALEXANDRIA

IN SERVED AREAS



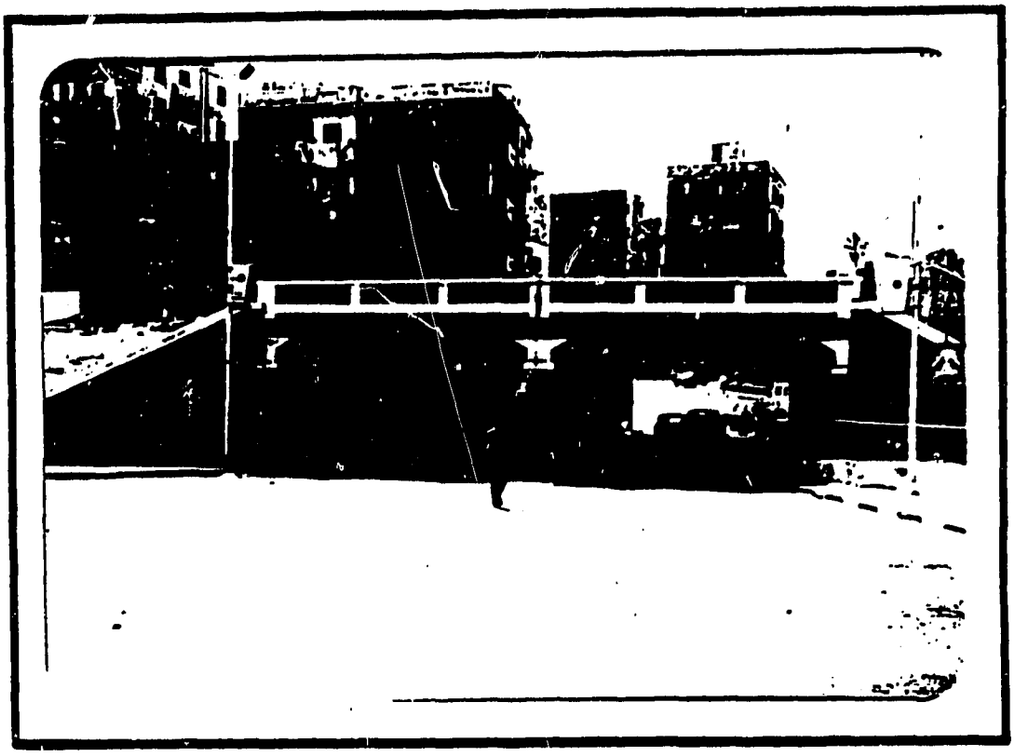
COMMENTS Smouha Square/East

No flooding now and

environmental improvement

216

THE IMPROVEMENT IN SEWAGE DISPOSAL IN ALEXANDRIA
IN SERVED AREAS



COMMENTS Kilopatra R.R. Way Bridge dge /East

No flooding now and

environmental improvement

297

THE IMPROVEMENT IN SEWAGE DISPOSAL IN ALEXANDRIA
IN SERVED AREAS

COMMENTS Kilopatra R.R. Way Bridge /East

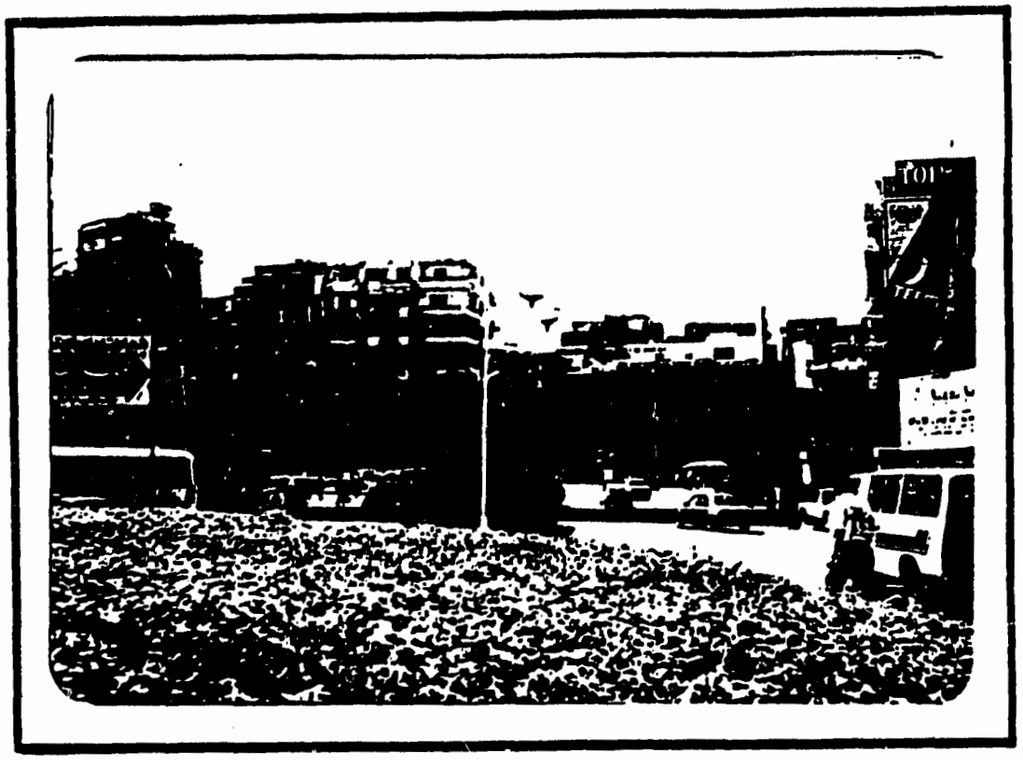
No flooding now and

environmental improvement

278

(C) CENTRAL (WASSAT)

THE IMPROVEMENT IN SEWAGE DISPOSAL IN ALEXANDRIA
IN SERVED AREAS



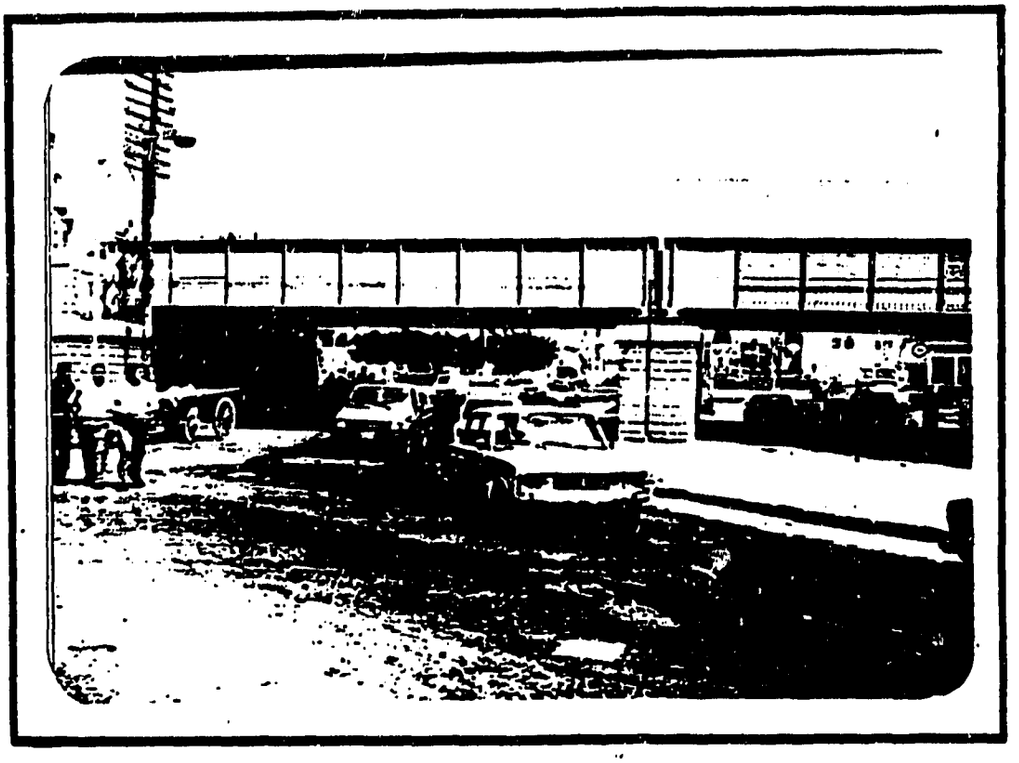
COMMENTS El Ibrahimia Bridge/Central

No flooding now and

environmental improvement

280

THE IMPROVEMENT IN SEWAGE DISPOSAL IN ALEXANDRIA
IN SERVED AREAS



COMMENTS Moharem Bey Bridge/Central

No flooding now and

environmental improvement

28

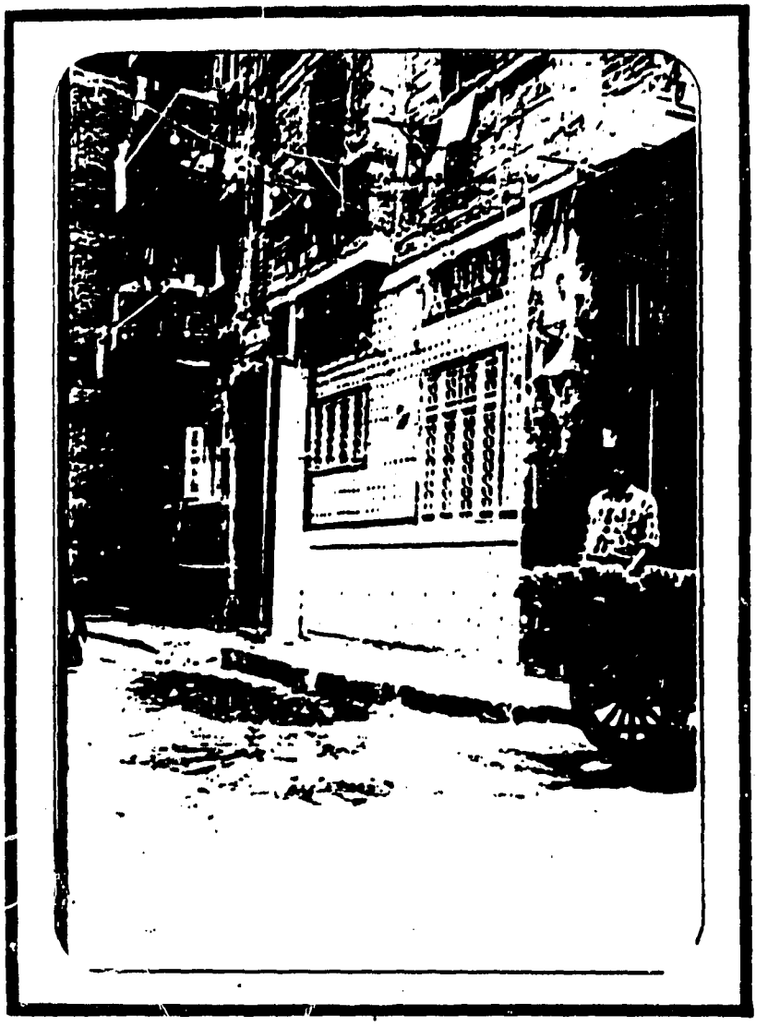
THE IMPROVEMENT IN SEWAGE DISPOSAL IN ALEXANDRIA
IN SERVED AREAS

COMMENTS Back of Sporting Club (Parallel to the Subway line)/Central No flooding now and environmental improvement

282

(D) EL GOMROK

THE IMPROVEMENT IN SEWAGE DISPOSAL IN ALEXANDRIA
IN SERVED AREAS



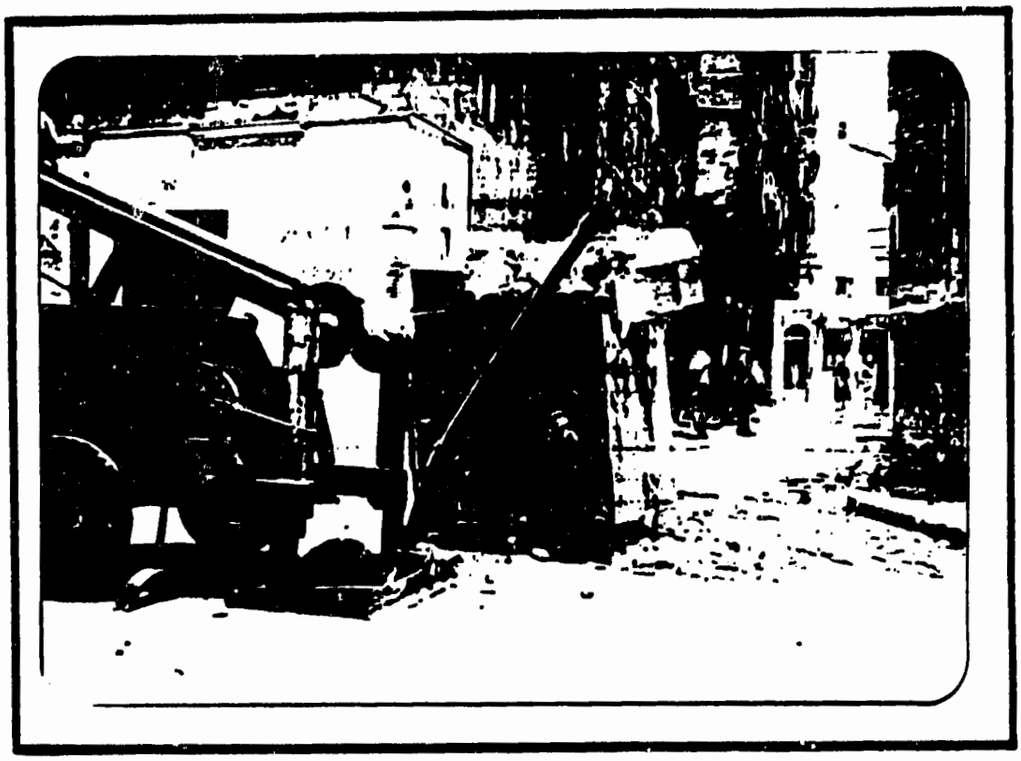
COMMENTS Zawia Kattab/Gomrok

No flooding now and environmental improvement

284

THE IMPROVEMENT IN SEWAGE DISPOSAL IN ALEXANDRIA

IN SERVED AREAS



COMMENTS Gomrok Main st./Gomrok

No flooding now and

environmental improvement

285

SEWAGE FLOODING IN UNSERVED AREAS IN ALEXANDRIA

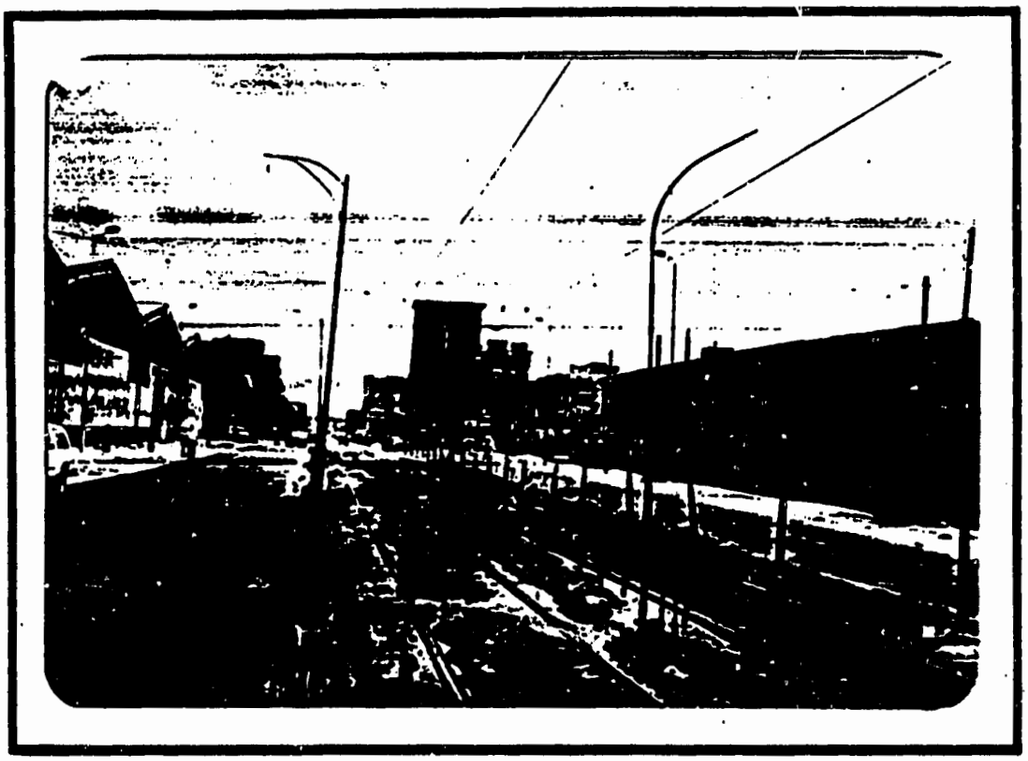
SEWAGE FLOODING IN UNSERVED AREAS IN ALEXANDRIA

COMMENTS El Mex/Amria

Suffering from Sewage Flooding

287

SEWAGE FLOODING IN UNSERVED AREAS IN ALEXANDRIA



COMMENTS Wadi El Kammar/Amria

Suffering from Sewage Flooding

-288

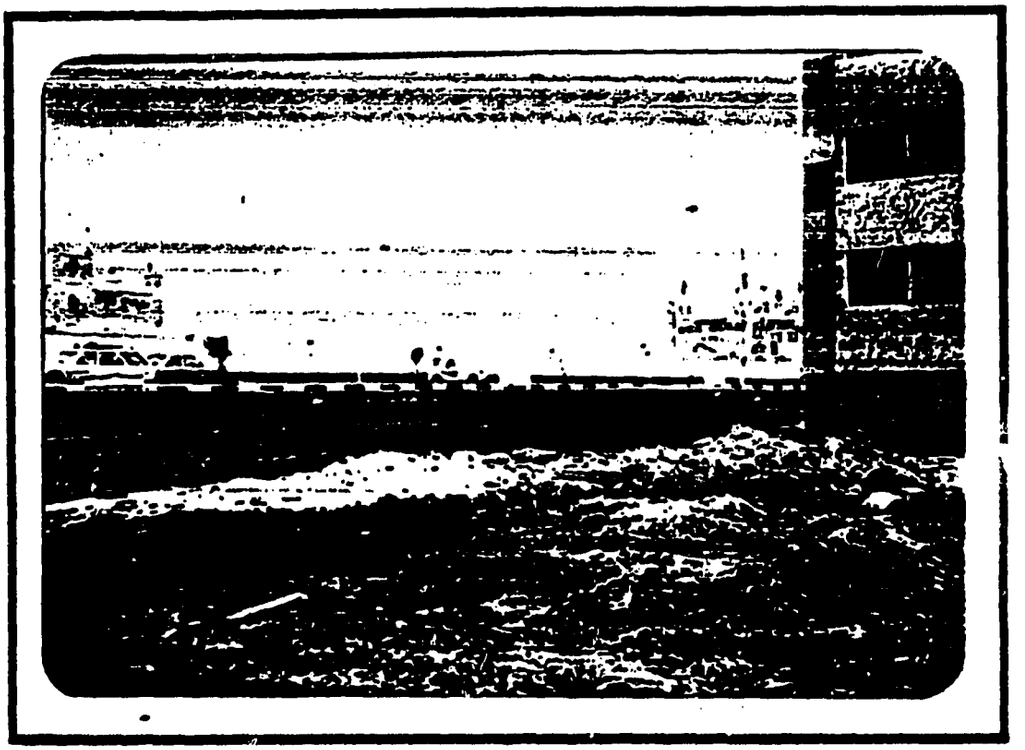
SEWAGE FLOODING IN UNSERVED AREAS IN ALEXANDRIA

COMMENTS Dekheila/Amria

Suffering from Sewage

Flooding and bad odor

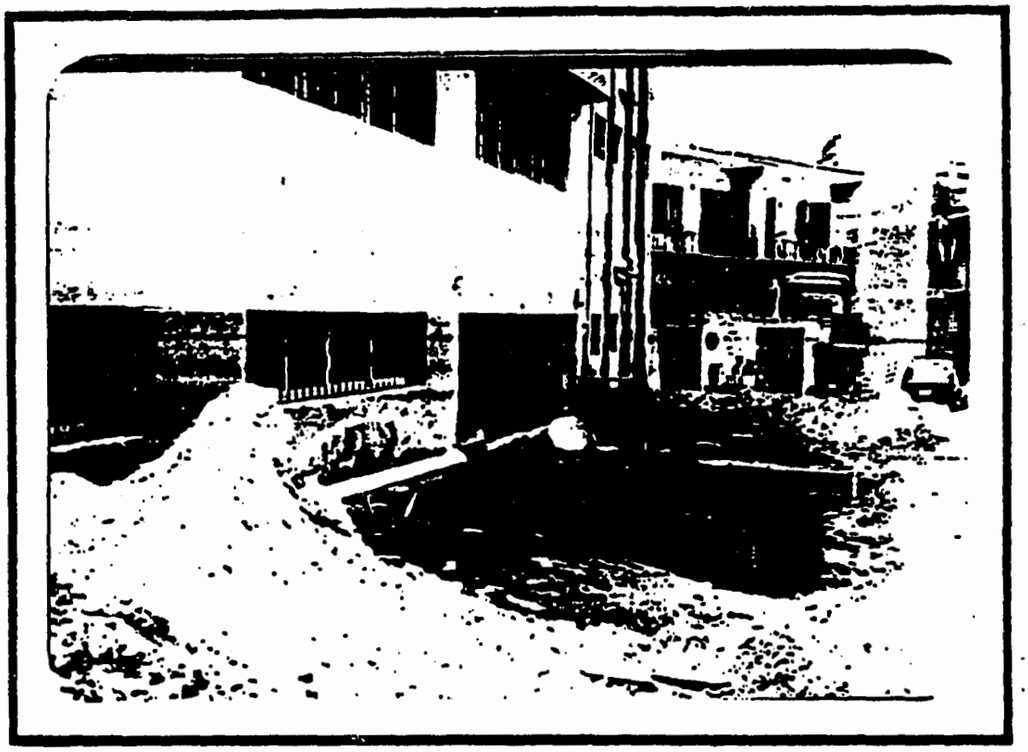
SEWAGE FLOODING IN UNSERVED AREAS IN ALEXANDRIA



COMMENTS Around Chemical Co. in Dekheila /Amria Suffering from Sewage Flooding

290

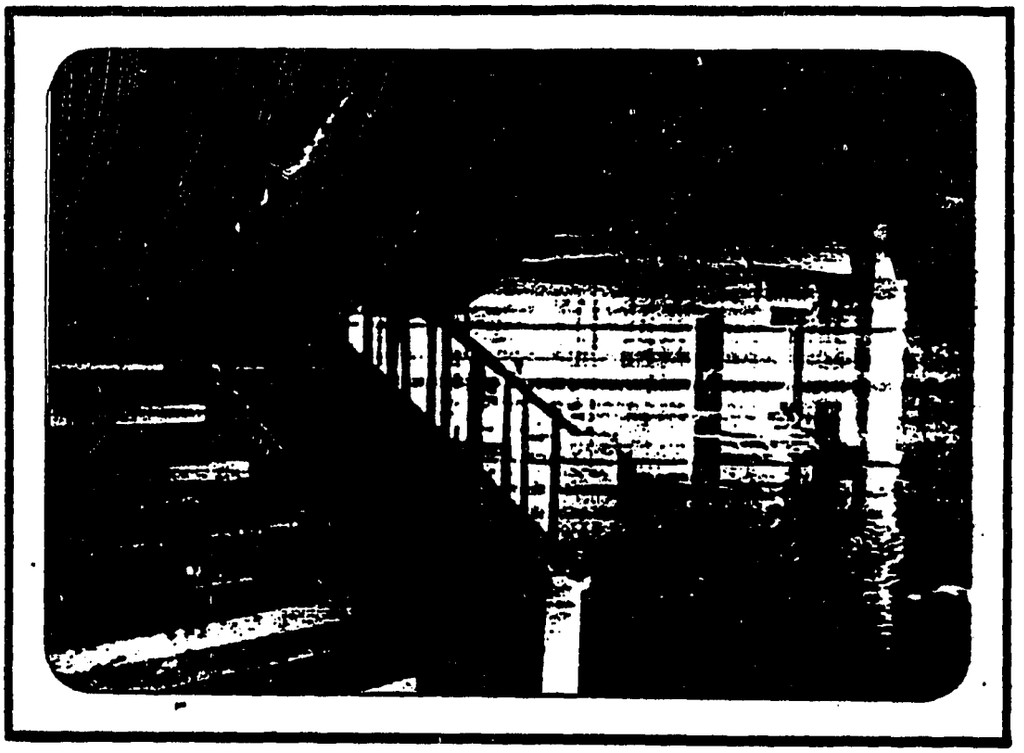
SEWAGE FLOODING IN UNSERVED AREAS IN ALEXANDRIA



COMMENTS: Around Leather Co./Amria
Suffering from Sewage
Flooding and bad odor

291

SEWAGE FLOODING IN UNSERVED AREAS IN ALEXANDRIA



COMMENTS El Agami Old/Amria

Surrounded by flooding and insects.

292

SEWAGE FLOODING IN UNSERVED AREAS IN ALEXANDRIA

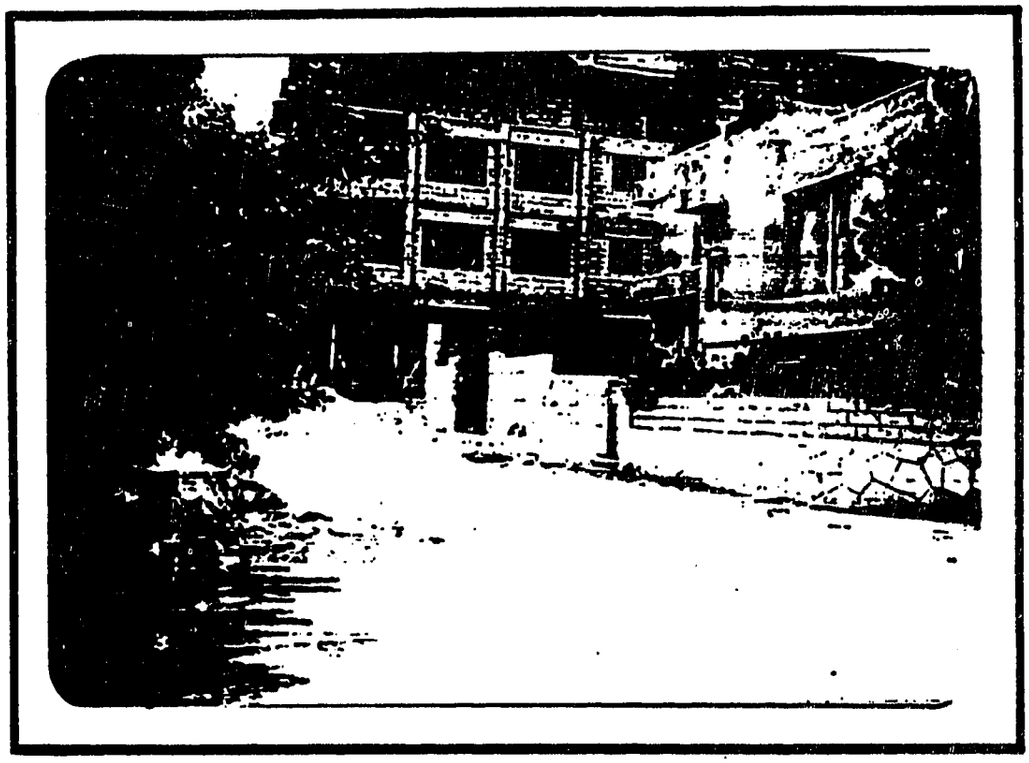
COMMENTS El Agami Water Co./Amria

Suffering from Sewage

Flooding and bad odor

293

SEWAGE FLOODING IN UNSERVED AREAS IN ALEXANDRIA



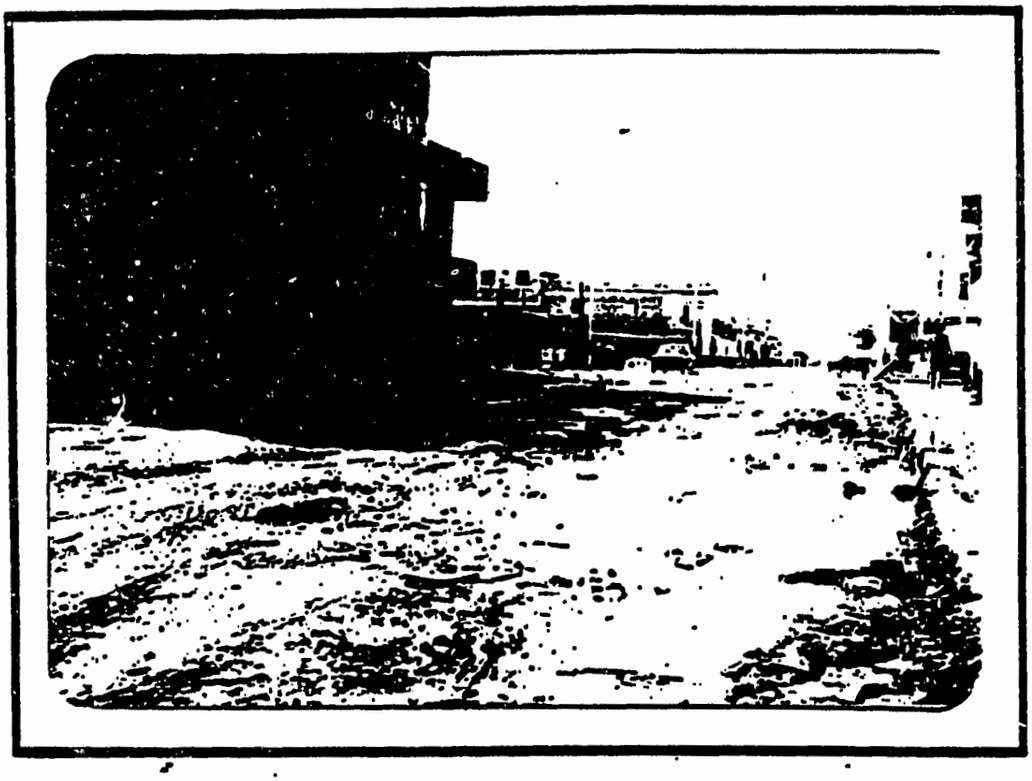
COMMENTS New Housing Compounds./Amria

Suffering from Sewage Flooding

294

THE IMPROVEMENT IN SEWAGE PARTIAL SERVED AREAS

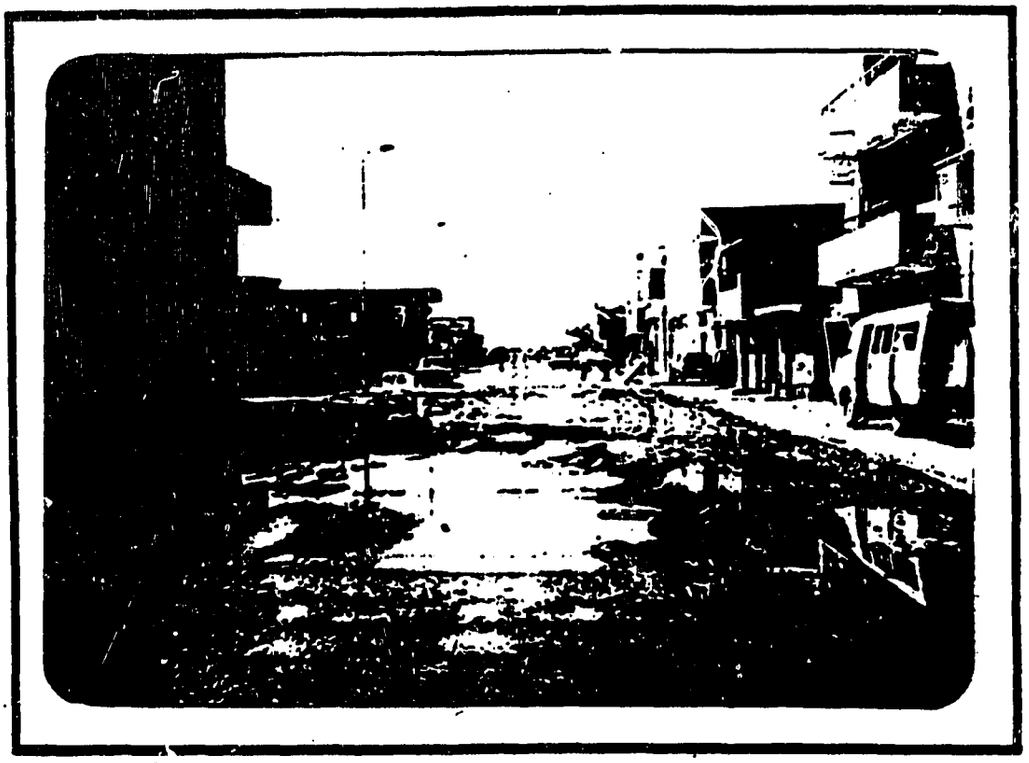
THE IMPROVEMENT IN SEWAGE
PARTIAL SERVED AREAS



COMMENTS Ezbett Nadi El Seide/Central

Still suffering, from flooding and ponding. (Because of disconnected pipes to homes)

THE IMPROVEMENT IN SEWAGE
PARTIAL SERVED AREAS



COMMENTS Ezbett Nadi El Seide/Central

Still suffering, from flooding and ponding. (Because of disconnected pipes to homes)

1.2

297

THE IMPROVEMENT IN SEWAGE
PARTIAL SERVED AREAS

COMMENTS Ezbett Nadi El Seide/Central

Still suffering, from
flooding and ponding.
(Because of disconnected
pipes to homes)

1.3

THE IMPROVEMENT IN SEWAGE
PARTIAL SERVED AREAS

COMMENTS Ezbett El Mattar/Central (Back of Air port & International Park) Still suffering, from flooding and ponding.

2.1

THE IMPROVEMENT IN SEWAGE
PARTIAL SERVED AREAS

COMMENTS Ezbett El Mattar/Central
(Back of Air port &
International Park)
Still suffering, from
flooding and ponding.

300