

PROJECT DATA SHEET

1. TRANSACTION CODE

C A = Add
C = Change
D = Delete

Amendment Number

2

DOCUMENT CODE

3

2. COUNTRY/ENTITY

Egypt

3. PROJECT NUMBER

263-0100

4. BUREAU/OFFICE

ANE

03

5. PROJECT TITLE (maximum 40 characters)

Alexandria Wastewater System Expansion

6. PROJECT ASSISTANCE COMPLETION DATE (FACD)

MM DD YY
1 2 3 1 9 2

7. ESTIMATED DATE OF OBLIGATION
(Under 'B' below, enter 1, 2, 3, or 4)

A. Initial FY 79

B. Quarter 4

C. Final FY 81

8. COSTS (\$000 OR EQUIVALENT \$1 = 2.17)

A. FUNDING SOURCE	FIRST FY			LIFE OF PROJECT		
	B. FX	C. L/C	D. Total	E. FX	F. L/C	G. Total
AID Appropriated Total	87,321		87,321	252,400		262,400
(Grant)	(87,321)	()	(87,321)	(262,400)	()	(262,400)
(Loan)	()	()	()	()	()	()
Other U.S.						
1.						
2.						
Host Country		50,000				
Other Donor(s)					152,481	152,481
TOTALS	87,321	50,000	87,321	262,400	152,481	414,881

9. SCHEDULE OF AID FUNDING (\$000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	C. PRIMARY TECH CODE		D. OBLIGATIONS TO DATE		E. AMOUNT APPROVED THIS ACTION		F. LIFE OF PROJECT	
		1. Grant	2. Loan	1. Grant	2. Loan	1. Grant	2. Loan	1. Grant	2. Loan
(1) ESF	720B	229		198,700		63,700		262,400	
(2)									
(3)									
(4)									
TOTALS				198,700		63,700		262,400	

10. SECONDARY TECHNICAL CODES (maximum 6 codes of 3 positions each)

11. SECONDARY PURPOSE CODE

12. SPECIAL CONCERNS CODES (maximum 7 codes of 4 positions each)

A. Code

B. Amount

15. PROJECT PURPOSE (maximum 480 characters)

To improve public health conditions in Alexandria by expansion and development of wastewater collection, treatment and disposal facilities.

14. SCHEDULED EVALUATIONS

Interim MM YY MM YY Final MM YY
1 0 9 2

15. SOURCE/ORIGIN OF GOODS AND SERVICES

000 941 Local Other (Specify)

16. AMENDMENTS/NATURE OF CHANGE PROPOSED (This is page 1 of a page PP Amendment)

US \$63.7 million will be made available under Amendment 2 to meet the increased project foreign exchange costs resulting from unanticipated implementation difficulties encountered since 1983. These funds will permit the completion of all remaining construction and institutional development activities contemplated under Project Amendment 1.

USAID/Egypt Controller concurs with the proposed methods of implementation and financing.

Signed: [Signature] Date: 8/1/87

Controller, USAID/Egypt

17. APPROVED BY

Signature

Title

8/3/87

Date Signed

MM DD YY

18. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION

MM DD YY

U.S. INTERNATIONAL DEVELOPMENT COOPERATION AGENCY
AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON D.C. 20523

PROJECT PAPER - AMENDMENT 2
EGYPT: ALEXANDRIA WASTEWATER SYSTEM EXPANSION
PROJECT NO. 263-0100

JUNE 1987
DR/UAD
USAID/CAIRO

UNCLASSIFIED

EGYPT - ALEXANDRIA WASTEWATER
SYSTEM EXPANSION
AMENDMENT 2

	Page
Project Data Sheet	i
Table of Contents	ii
Glossary of Abbreviations	iii
Summary and Recommendations	iv
I. Background	
A. Project Origin	1
B. Project Implementation Progress	
II. Project Description	
A. General	9
B. Construction	
C. Institutional Development	
D. Project Administration	
III. Project Cost Estimate and Financial Plan	
A. Project Cost Estimate	14
B. Financial Plan	
C. AID Financing Procedures	
IV. Project Implementation	
A. Implementation Responsibilities	18
B. Project Procurement	
C. Assessment of AGOSD's Contracting and Voucher Examination Capabilities	
D. Implementation Schedule	
E. Conditions and Covenants	
F. Terminal Dates	
G. Monitoring and Evaluation	
H. Audit Coverage	
V. Summary of Technical Analysis	28
VI. Administrative Analysis	35
VII. Economic Analysis	41
VIII. Financial Analysis	44
IX. Social Soundness Analysis	48
X. Environmental Analysis	49

- Annex A Grant Application
- Annex B Grant Authorization
- Annex C Section 611(e) Certification
- Annex D Certification Pursuant to Gray Amendment
- Annex E Statutory Checklist
- Annex F Technical Analysis
- Annex G Detailed Financial Plan
- Annex H Implementation Schedule Control Charts
- Annex I Amplified Institutional Development
Project Activity Description
- Annex J PIL 31-1
- Annex K Revised Log Frame
- Annex L Environmental Assessment
- Annex M Environmental Delegation Cable
- Annex N Environmental Clearance Memo

Glossary of Abbreviations

AGOSD	- Alexandria General Organization for Sanitary Drainage
AID	- Agency for International Development
BEC/AYC	- Boyle Engineering Corporation and Arthur Young & Company
BODR	- Basis of Design Report
CBD	- Commerce Business Daily
CDM	- Camp, Dresser and McKee
CFR	- Code of Federal Regulations
CP	- Condition Precedent
CPM	- Critical Path Method
EIS	- Environmental Impact Statement
FIDIC	- Federation Internationale des Ingenieurs Conseils
FSN	- Foreign Service National
FY	- Fiscal Year
GOE	- Government of Egypt
GOSD	- General Organization for Sanitary Drainage
HCC	- Host Country Contract
IFB	- Invitation for Bid
KM	- Kilometer
L/Comm	- Letter of Commitment
LE	- Egyptian Pound
LOP	- Life of Project
ML	- Million Liters
MOHR	- Ministry of Housing and Reconstruction
MM	- Milimeter
O&M	- Operations and Maintenance
PIL	- Project Implementation Letter
PIP	- Phased Implementation Plan.
PP	- Project Paper
PS	- Pump Stations
RFP	- Request for Proposals
TA	- Technical Assistance
TPP	- TOP Priority Projects
USAID	- United States Agency for International Development
USAID/FM	- Director for Financial Management within USAID
USAID/UAD	- Office of Urban Administration and Development within USAID
USDH	- US Direct Hire
WWCG	- Wastewater Consultants Group a Joint Venture of Metcalf of Eddy and CH2m Hill

EGYPT: ALEXANDRIA WASTEWATER EXPANSION
AMENDMENT NO. 2
SUMMARY AND RECOMMENDATIONS

1. Grantee: The Government of the Arab Republic of Egypt (GOE). The Grant application is attached as Annex A.
2. Implementing Agency: The Alexandria General Organization for Sanitary Drainage (AGOSD).
3. Grant Amendment Amount: FY 1987 \$63.7 million.
4. Project Purpose: To improve public health conditions in Alexandria by expansion and development of wastewater collection, treatment and disposal facilities.
5. Project Description: The project consists of: (a) The design, supervision of construction, construction, start-up and commodities for the first phase of expansion of facilities for the Alexandria Wastewater System; (b) review of the 1979 master plan for the expansion of facilities for the Alexandria Wastewater System; and (c) provision of management advisory services to A/GOSD in connection with expansion, management, operation, and maintenance of the Alexandria Wastewater System.
6. Project Amendment Description: US \$63.7 million will be made available under Amendment 2 to meet the projects increased foreign exchange costs resulting from unanticipated implementation difficulties encountered since 1983. These funds will permit the completion of all remaining construction and institutional development activities contemplated under Project Amendment 1. The AID Grant resources will finance the foreign exchange costs and limited local costs of the construction and consulting services remaining to be contracted under the project.
7. Total Project Cost: The total project cost is estimated to be \$262.4 million and LE 329.460 million.
8. Environmental Considerations: An Environmental Impact Statement (EIS) has been prepared for the original project and supplemented with an Environmental Assessment Annex to the EIS.
9. Source of U.S. Funds: Economic Support Fund.
10. Statutory Criteria: All statutory criteria have been satisfied. See Annex E.

11. Recommendations: That a Grant increase in the amount of US \$63.7 million be authorized on terms and conditions as set forth in the draft Grant Authorization included as Annex B of this paper.

12. Project Committee:

USAID/Egypt:

Chairperson: Charles A. Scheibal, P.E.

Environmental Engineer: John C. Starnes, P.E.

Sanitary Engineer: Michael S. Gould, P.E.

Training Officer: Joy Pollock

Financial Analyst: Thomas Johnstone

Program Officer: John Ryan

Legal Counsel: Kevin O'Donnell

Project Development Officer: Tim Hamman

Social Analyst: Theresa Ware

Economist: Paul Crowe

I. BACKGROUND

A. Project Origin:

- 1.01 In the mid 1970's Alexandria, the second largest city in Egypt and the nation's principal seaport, was confronted with a major public health problem. Following 25 years of rapid population and industrial growth combined with limited investment in public services, Alexandria's wastewater collection and disposal system was totally inadequate to meet existing demands. Each day approximately 560 ML of predominately raw sewage was being dumped into Lake Maryout and along the shoreline of the city's Mediterranean beaches causing extensive pollution of receiving waters and creating considerable nuisance and noxious odors throughout Alexandria. The sewage system was overflowing everywhere and great ponds of wastewater were a common site throughout Alexandria. Raw sewage was frequently overflowing into the public water supply, entering home areas and coming into direct contact with significant numbers of the population. Reported cases of typhoid and paratyphoid, infectious hepatitis and dysentery were markedly higher in Alexandria than in Cairo and Egypt as a whole. Reported cases of cholera in Alexandria were four times greater than the Cairo rate and six times greater than the national average. The situation in Alexandria appeared to be worsening daily and the GOE was concerned that if the sewage problems were not corrected, the health conditions in Alexandria would reach catastrophic proportions within a short period of time.
- 1.02 In 1977 AID funded a contract between the Ministry of Housing and Reconstruction (MOHR) and Camp, Dresser, and McKee (CDM), a US consultant, for the preparation of a master plan for development of the Alexandria wastewater system. During the preparation of this plan, CDM identified several projects to provide significant and immediate improvements to the system. These so-called Top Priority Projects (TPP) included a complete collection system in the Ras El Soda area (which was in dire need of sewerage disposal to relieve extensive wastewater flooding), three pumping stations, and improved system maintenance. In late 1977 AID provided a \$15 million loan (Project No. 263-0089) to assist in these undertakings.
- 1.03 CDM completed the Master Plan in November 1978. The Master Plan recommended the immediate improvement and expansion of the existing wastewater collection system with priority given to the West, Central and East District Service areas. The Master Plan also called for improvements and expansion of existing treatment plants and construction of an effluent disposal system into the Mediterranean (sea outfall). After an environmental review in 1979, the treatment plant improvements were upgraded from preliminary treatment (course screening and grit removal) to primary treatment (screening and grit removal plus settling of solids) thereby generating sludge.

- 1.04 On August 27, 1979 AID authorized \$167 million to finance activities included in this modified master plan as a part of the Alexandria Wastewater System Expansion Project (AID Project No. 263-0100). Also, in August 1979, the Alexandria General Organization for Sanitary Drainage (AGOSD) was established and designated by the GOE as the implementing agency for the project. Following competitive procedures AGOSD entered into a contract with the Wastewater Consultant Group (WWCG), a consortium of two US and two Egyptian firms, to provide the major design and construction supervision services. Due to the severe impact of the decision to upgrade treatment, it was agreed that, prior to undertaking final engineering and design activities, a review and update of the master plan would be necessary. Accordingly, WWCG's first task was to carryout this review.
- 1.05 The master plan review was completed in early 1982. As a result of this review the question of sewage disposal was re-opened. The review showed that there were two technically acceptable alternatives for the disposal of wastewater for Alexandria: (1) a land infiltration system in the desert south of Alexandria near the Alex-Cairo road, and (2) a modified sea disposal system with primary treatment. Although economic considerations favored the sea disposal option, debate on effluent disposal continued.

Rather than delay implementation further, a decision was made to stage system improvements and expansion. As a result, the consultants prepared a Phased Implementation Plan (PIP) outlining a sequence of interventions to improve interim service by doing basic rehabilitation of the city's collection and treatment system, while working towards a longer-term and more sophisticated solution to the wastewater problems of the East, Central and West Districts.

- 1.06 The PIP includes three phases of system improvements and expansion:
- Phase I: (a) Eliminate ponding and flooding of sewage throughout the city by improving the sewage collection system;
 - (b) Upgrade the capacity of the two existing treatment plants to provide primary treatment and capacity to handle the flow in the year 1990; and
 - (c) Provide sludge facilities for the treatment plants.
- Phase II: Increase the capacity of the two existing treatment plants to year 2010 flow.
- Phase III: Construct effluent disposal system for treatment plants.

- 1.07 When the PIP was reviewed it was apparent that the AID authorized funding level of \$167 million would not be sufficient to finance the implementation of all three phases. USAID therefore agreed to finance the first Phase of the PIP since these activities constituted a complete and operable system and would address the current and potentially most serious public health problems in Alexandria.
- 1.08 On September 28, 1983 AID agreed to increase the authorized life-of-project funding to \$198.7 million. The additional \$31.7 million in project resources was needed to cover the increased costs associated with: (a) unanticipated implementation delays resulting from the change in the designated GOE implementing agency and the time spent (two years) in reviewing the master plan; (b) underestimation of the costs for treatment, sludge handling and disposal; (c) the need for management advisory services to strengthen the capacity of the newly created GOE implementing agency; (d) the need to supplement project 263-0089 resources to assure implementation of Top Priority Project activities; and (e) unforeseen construction complications (i.e. exceptionally soft soils at specific construction sites) which resulted in a need to provide more tunneling and less open cut sewers.

B. PROJECT IMPLEMENTATION PROGRESS:

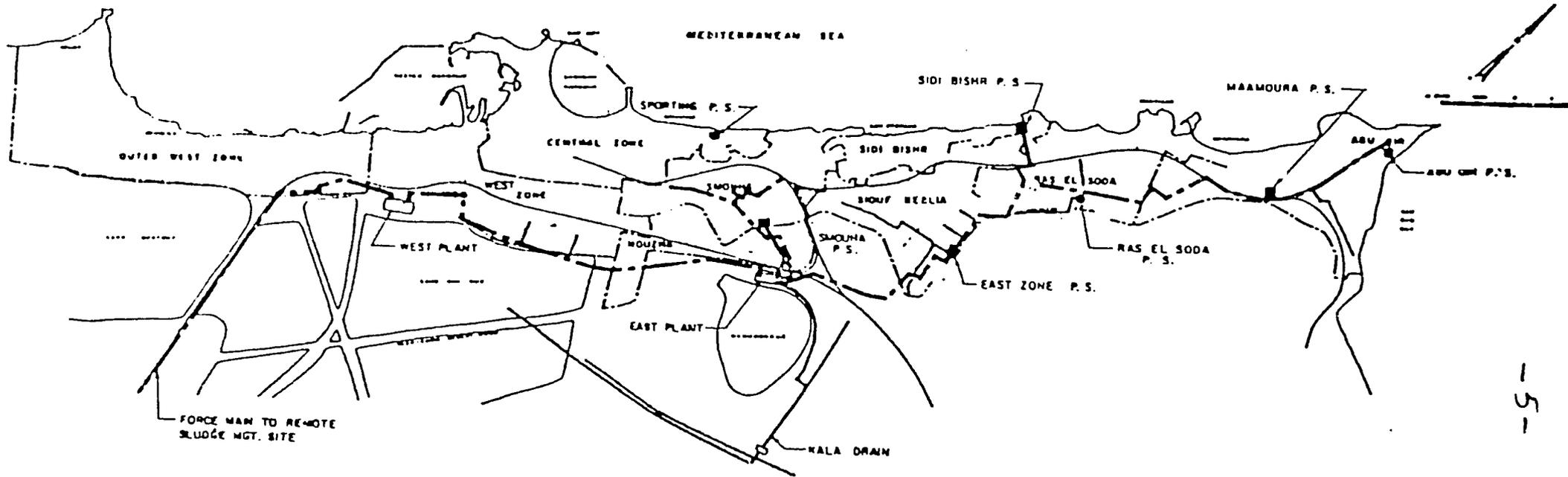
Construction Activities:

- 1.09 Phase I construction activities to improve sewage collection, extend service and provide primary wastewater treatment are well underway. (See Activity Location Map, Exhibit 1). Two pumping stations are completed and four are under construction. The majority of the collectors are under construction with some facilities near completion. The treatment plant upgrade contract was awarded on January 18, 1987. A suitable site for the construction of the sludge management facilities has been selected and preliminary design work has been initiated. (Table 1 summarizes the status of the major U.S. construction contracts).
- 1.10 However, following the approval of the 1983 Project Paper Amendment, a number of significant implementation problems were encountered. These problems have had direct and serious impacts on project costs. In large part these problems were due to a lack of contract administration and construction management capabilities within the implementing agency.

TABLE 1

ALEXANDRIA WASTEWATER PROJECT
MAJOR U.S. CONSTRUCTION CONTRACTS
(000,000)

<u>Activity</u>	<u>Contractor</u>	<u>Contract Amount</u>		<u>Status</u>
		<u>\$U.S.</u>	<u>LE</u>	
1. Sporting and Ras El Soda Pump Stations	Perini	10.0	3.0	Completed February 1987
2. Five Pump Stations (Abu Qir, East Zones, Maamoura, Sidi Bishr and Smouha)	Fishback Moore Oman, J.V.	23	10	Four are under construction and are 60% Complete. Additional AID funds are needed to contract for the fifth station.
3. East and West Collectors &	Maclean Grove & Co.	31.7	7.9	Under Construction, 40% Complete. Additional AID funds are need to contract for the remaining tunneling work.
4. East and West Treatment Plant Upgrade	Fru-Con	61	21.7	Contract Award made on 1/18/87. Under construction
5. Sludge Management Facilities	Contractors not selected	36.9	105.3	Site selected and preliminary design work initiated. The Bidding process will begin following approval of Amendment No. 2 to Grant Agreement.



-5-

Exhibit 1
 ALEXANDRIA
 WASTEWATER SYSTEM
 Phase I Activities

- 1.11 AGOSD was unable to facilitate a timely GOE review and approval of the procurement documents related to the construction of the East and West Treatment Plants. As a result the Invitations to Bidders were issued over two years behind the schedule contained in the 1983 Project Paper Amendment. Furthermore, the low bid received in September 1986 was \$61 million or about \$24 million more than what was budgeted for this construction activity in Amendment 1.
- 1.12 The design of the sludge facilities and subsequent construction has also been delayed more than two years because AGOSD was unable to obtain a suitable site. A site has now been selected and AGOSD has received all required approvals. However, the US dollar cost to construct these facilities is now estimated at \$36.9 million or about \$20.6 million more than what was anticipated in the 1983 Amendment.
- 1.13 After the award of the contract in 1985 for the construction of five pumping stations, AGOSD was unable to obtain the right of way needed to begin work for the Abu Qir pumping station. Locating and securing a new site for this fifth station took much longer than anticipated and finally the work had to be deleted from the contract. As a result of this delay and the need for increased construction work at the new site, it is estimated that an additional US \$1.82 million will be needed to construct the Abu Qir pumping station.
- 1.14 The delays in the procurement of major construction services have also had a direct impact on the required level of consulting engineering services. During the unanticipated period of extended review and IPB preparation, WWCG was required to keep its full force of design engineers in country to provide support to AGOSD. As a result WWCG incurred significantly increased costs which were not provided for in the project budget. Furthermore, WWCG construction supervision forces will now have to be on the project approximately four years longer than originally anticipated.
- 1.15 AGOSD's inability to effectively administer the project financed contracts was demonstrated during the negotiations in 1985 with WWCG for additional project design and construction supervision services. The situation became so bad that as of December 31, 1985 WWCG had not been paid for work performed since July 1985 and both WWCG and the construction contractors had suspended all work and were demobilizing. The problem was finally resolved in March 1986 with USAID executing a direct contract with WWCG for the needed services. In addition, AID agreed to provide funding to cover both the foreign exchange and local currency costs anticipated under the WWCG contract. It was estimated that this local currency cost funding under the AID Grant would require the equivalent of approximately US \$10 million. Such resources were not provided for under the project.

- 1.16 While the 1983 Amendment anticipated a certain amount of tunneling for the collection of wastewater, the resources budgeted were found to be inadequate to meet actual field conditions. Once the precise collection system routes were mapped and the site specific soil tests were made, it was found that the previously encountered soft soil conditions were much more prevalent than expected. Indeed it was determined by the WWCG consultants that approximately 30% more tunneling would be required.

Institutional Development Activities:

- 1.17 Project Implementation Letter No. 1 for Alexandria Wastewater System Expansion project required that, as a condition precedent to disbursement, AGOSD have a contract with a U.S. Consultant for project management and engineering advisory services over a period of several years. This condition precedent was included after the signing of the grant agreement, when the responsibility for the Alexandria Sewerage System was shifted from the General Organization for Sewerage and Sanitary Drainage (GOSSD) to the newly formed Alexandria General Organization for Sanitary Drainage (AGOSD). It was intended that these management and engineering advisory services would aid the new organization both in carrying out its responsibilities under the project and in building its long term capacity to manage, operate and maintain the Alexandria Sewerage System.
- 1.18 In fulfillment of this requirement, AGOSD executed a contract with a joint venture of Boyle Engineering Corporation and Arthur Young & Co. (BEC/AYC). The contractor began work in Alexandria on February 1, 1981.
- 1.19 The BEC/AYC contract was terminated by AGOSD on March 30, 1984, when AGOSD concluded that all that could be gained from the consultant had been accomplished during the three year contract period. While the BEC/AYC technical assistance did not cause any major organizational or administrative policy changes, AGOSD did implement secondary organizational improvements and individual AGOSD managers did attempt to apply specific recommendations within their own divisions.
- 1.20 Although USAID believed AGOSD's decision to terminate BEC/AYC's advisory services was somewhat premature given AGOSD's needs, it was thought that it would provide an opportunity to determine AGOSD's own ability to manage its responsibilities. At the same time, it was clear that the termination of advisory support did not necessarily preclude future provision of advisory services should conditions warrant, particularly since many of BEC/AYC's analyses and recommendations provide a framework in which follow-on activities could be programmed.

- 1.21 In light of the above, project institution development activities have focussed primarily on preparing AGOSD for the operational responsibilities associated with the planned system improvements and expansion. As a first step in this effort, facility-specific operations and maintenance training has been included as part of each facility's construction element. The engineering firms (CDM and WWCG) have been tasked with providing limited hands-on and classroom training to AGOSD's staff in pre-startup equipment checkout, manufacturer's representative equipment training and facility start-up. In addition, the construction contractor for the East and West Treatment Plant rehabilitation (Fru-Con), is tasked with providing longer-term, post start-up operations and maintenance training for a three-year period for the project facilities currently under construction and programmed for construction. The training for the first two pump stations has been well received by AGOSD, and has been critical to station operations as more than 50% of AGOSD's staff assigned to the stations were newly employed by AGOSD.
- 1.22 While AGOSD's ability to operate individual project financed facilities is improving, it is still not capable of effectively managing Alexandria's entire wastewater collection, treatment and disposal systems and facilities. With the completion in late 1986 of the Sporting and Ras El Soda Pump stations, it became apparent that AGOSD now needs to address overall system requirements. In order to properly design this next development phase, WWCG will conduct a Training Needs Assessment. The Assessment will be conducted in conjunction with AGOSD's Training Department and will update and expand upon the diagnostic review of AGOSD's manpower training needs completed in 1981 by BEC/AYC.
- 1.23 Implementation of this next phase of institutional development appears appropriate and timely at this juncture of project implementation. Over the past six years, AGOSD management has devoted much of its time and effort to project construction issues and problems. With the recent contracting of WWCG by AID, an effort has been initiated to shift more of the day-to-day construction management responsibilities to WWCG and thereby permit AGOSD managers to focus more time and attention on overall system planning and operation. In addition, AGOSD management appears to be more supportive of a systemwide institutional development program. The new Chairman of AGOSD has made significant personnel changes in AGOSD's management staff with the replacement and retirement of inefficient managers. The new Chairman's policies appear to better support AGOSD's primary function as a service delivery utility. With the completion of major elements of the Phased Implementation Plan over the next two year period, and the commissioning of the Sporting Pump Station in January 1987, the new Chairman has begun to focus on AGOSD's management needs to effectively plan, manage and operate the expanded Alexandria Wastewater System.

- 1.24 In February 1987 the new Chairman appointed a special committee to review AGOSD's long-term institutional development requirements. This committee identified several specific key constraints requiring priority attention. These constraints include: (a) lack of any established program to regularly train and upgrade the skills of those persons assigned to operate and maintain AGOSD's facilities; (b) inability to effectively support and manage AGOSD's massive material and equipment inventories; (c) inability to obtain reliable and timely information in the areas of general administration and finance; and (d) inadequate understanding among many AGOSD managers regarding systematic utility operations.
- 1.25 In sum, conditions now appear right for USAID to again finance a major activity to assist AGOSD in the development of its institutional capability.
- 1.26 On November 1, 1986, in view of the many implementation difficulties encountered since the first project Amendment was approved, the Administrator authorized an extension of the PACD to December 31, 1992. It was recognized then that in addition to the extension of the PACD, a significant amount of additional foreign exchange would be required to complete the Phase I project activities.

II. Project Description

A. General

- 2.01 The project purpose and description as approved in 1983 under Amendment 1 will remain the same. Accordingly, the project will consist of: (1) the design, supervision of construction, construction, start-up and commodities for the first phase of expansion of facilities for the Alexandria Wastewater System; (2) review of the 1979 master plan for the expansion of facilities for the Alexandria Wastewater System; and (3) provision of management advisory services to A/GOSD in connection with expansion, management, operation, and maintenance of the Alexandria Wastewater System. A revised project log frame is presented in Annex K.
- 2.02 US \$63.7 million will be made available under Amendment 2 to meet the increased project foreign exchange costs resulting from unanticipated implementation difficulties encountered since 1983. These funds will permit the completion of all remaining construction and institutional development activities contemplated under project Amendment 1. The AID Grant resources will finance the foreign exchange costs related to the construction and consulting services which still need to be contracted under the project. The following describes the activities to be financed with the additional resources provided under Amendment 2.

B. Construction

Sludge Management Facilities (US \$36.9 million, LE 105.3 million)

- 2.03 The Sludge Management Facilities will include the West Plant sludge pumping facilities, the sludge force mains and the dewatering and composting facilities. Under the proposed sludge management system, dilute primary sludge from the treatment plants will be collected at the West Treatment Plant. A blended sludge pump station at the West Plant will inject primary effluent into the sludge force mains to maintain an effective pipeline velocity. The blended sludge will then be pumped continuously through two 450mm force mains until it arrives at the 12 hour capacity equalization storage tanks located at a remote desert site about 29 km southwest of the west plant. At this site, dewatering and composting of the sludge will be carried out. Sludge dewatering will consist of conventional sand drying beds. Composted sludge will be used as a soil amendment on farm land.
- 2.04 Project resources will finance four construction activities:
- The Blended Sludge Pump Station at the West Treatment Plant;

- An approximately 2km long embankment along the north shore of Lake Maryout to support the force main;
- The force main between the West Treatment Plant and Sludge Processing Site; and
- The Sludge Processing Facility, including sludge equalization tanks, drying beds, filtrate treatment, composting facilities, operation and maintenance buildings, housing and other site improvements.

Abu Qir Pump Station (US \$1.82 million, LE 490,000)

- 2.05 The Abu Qir pump station will be the outermost pump station within the east zone wastewater collection system. The station will include: four constant speed, submersible pumps with a total design capacity of 23 ML per day; main power supply and backup power source equipment; on-site service and housing buildings; and security fencing. Approximately 70% of the foreign exchange costs of this activity will be provided under Amendment 2 and 30% will be provided from the previously authorized grant resources.

Tunneling (US \$6 million, LE 3.49 million):

- 2.06 Amendment 2 will finance the construction of approximately 4500 meters of wastewater collectors tunnels. This will include the installation of necessary piping and manholes using earth pressure balance construction technologies.

Engineering Design Services (US \$1.33 million):

- 2.07 Amendment 2 will provide resources to finance the services of an engineer consultant to prepare a Basis of Design Report (BODR) for the construction of wastewater collection systems for the currently unsewered area of Dekheila. It is estimated that approximately 80 person-months of technical assistance will be needed.

Contingency (US \$11.21 million LE 24.08 million)

- 2.08 A great deal of the project resources finance underground construction work and rehabilitation work which has not yet been carried out. Accordingly, there still exists a significant amount of uncertainty as to what the precise construction needs will be when the work is actually performed. Amendment 2 provides resources for a 10% contingency for the work still to be contracted and a 7% contingency for the work currently under contract.

C. Institutional Development

- 2.09 Under Amendment 2, four institutional development activities will be financed which build on BEC/AYC's previous analyses and recommendations and are closely coordinated with the facility-specific O&M assistance activities currently programmed under the project. The funding estimated herein for each of the TA components may need to be reallocated among the various activities or to further fund the O&M contracts included as part of the construction, depending upon progress being made by AGOSD management personnel in acquiring the needed skills and capabilities. An amplified description is included in Annex I.

Development of an Operations and Maintenance Training Department
(US \$3.2 million)

- 2.10 This activity will include AGOSD's designation of a Training Department Director, training staff (representing all of AGOSD's Operation and Maintenance branches) and administrative staff; provision of building space appropriate for offices, classrooms, and workshops, and provision of necessary budgetary resources. Following these initial actions, technical assistance will be provided under the grant and will focus on hands-on training for O&M personnel (including the collection system, treatment facility, transport/vehicle and equipment divisions) in the design, delivery and monitoring of standard procedures, maintenance scheduling and safety procedures. Working in a team approach, the consultant trainers and the AGOSD trainees will design, implement and institutionalize an O&M training program appropriate to AGOSD.

At the conclusion of this activity, AGOSD will have a functioning O&M training department staffed with personnel able to adapt and expand the training programs as conditions warrant. The operations and maintenance training activity will require consultant assistance to include a Wastewater Training Coordinator, and Operations, Electrical, and Mechanical Training Specialists. To support the development of the training program, project funds will be made available to procure equipment, vehicles and supplies to implement the training program.

Material and Equipment Management Systems Development
(US \$ 500,000)

- 2.11 This project activity will assist AGOSD in procurement and inventory control of construction materials, spare parts, supplies, equipment and vehicles. Technical assistance will be provided to develop: (a) procurement procedures and procurement tracking systems compatible with GOE regulations and requirements; and (b) inventory control procedures and systems. This activity will require Procurement and Inventory Control Specialist manpower assistance and commodities to include equipment and computer hardware and software.

Management Information Systems Development (US \$1.3 million)

- 2.12 This project activity will include the identification, design and implementation of appropriate Management Information Systems for AGOSD in the following areas: personnel administration; accounting; budgeting; auditing; and a user data base (e.g. hookups and consumption). Project assistance will include identification of appropriate manual and automated system requirements, conceptual design of the MIS, development and procurement of data processing equipment, and hands-on training in the application and use of the systems and equipment. This activity will require consultants experienced in Information Systems/Data Processing Management, equipment, computer hardware, and computer software.

Utility Management Assistance (\$1 million)

- 2.13 This activity will make available on an "as needed basis" short-term assistance to address relatively specific problems which AGOSD is confronting in several management areas. Examples of this activity, might include an updated study on Alexandria's excluded waste problems, a wastewater user rate analysis, the design of a wastewater public awareness program, the design and implementation of rapid, low cost social impact studies; and an observational tour of sludge composting systems in the US and developing nations for the sludge system management staff. This activity will be managed by the TA project director, a wastewater utility management specialist, and will be closely monitored by the AGOSD Chairman and the USAID Project Officer. In addition to consultant technical assistance, this activity will also include limited commodity procurement to support the subtask activities.
- 2.14 In an effort to effectively meet AGOSD's needs as a developing wastewater service utility, the technical assistance provided will include integrated sets of incountry consultant advisor assistance and long-term "twinning" or on-the-job working relationships involving key operational personnel from AGOSD and a well managed wastewater utility in the United States. These "twinning" relationships will provide opportunities for AGOSD personnel to travel to the US utility and to learn new technologies in structured, observational and hands-on activities. Likewise, selected US utility specialists from the US utility "twin" will be selected to travel to Alexandria to work directly with AGOSD counterparts to transfer skills and new technologies.

D. Project Administration (US \$360,000)

2.15 Funding will also be provided under Amendment 2 to: carryout audits of all AID Grant financed contracts; and contract a full time Project Assistant to support USAID's day-to-day monitoring requirements.

2.16 The project cost estimate is summarized in Table 2.

TABLE 2
SUMMARY OF COST ESTIMATES
(THOUSANDS)

Activity	Current Project Budget		Amendment 2		Revised Project Total	
	US\$	LE	US\$	LE	US\$	LE
A. Construction Services	124,350	181,470	56,010	133,390	180,360	314,810
B. Engineering	68,350	25,560	1,330	-	69,680	14,000
C. Management Services	6,000	500	6,360	-	12,360	500
Total	198,700	195,970	63,700	133,390	262,400	329,360

III. PROJECT COST ESTIMATE AND FINANCIAL PLAN:

A. Project Cost Estimate:

3.01 In developing the project cost estimate, information was obtained from AGOSD, the project engineering consultants and USAID files. Significant reliance was placed upon the capabilities of the project engineering consultant who has been working in Alexandria for almost eight years. The Consultant has already completed the detailed designs for the construction work to be carried out under Amendment 2. Furthermore, since much of the project financed construction work is already under contract, it was possible to collect cost information which reflects of actual field experience for work similar to the construction activities to be financed under Amendment 2. Finally, the amount allocated for contingency is consistent with industry practices for underground construction and rehabilitation work and reasonable for the project when taking into consideration the relatively advanced stage of implementation.

3.02 It is the conclusion of the Project Committee that the requirements of Section 611(a) of the Foreign Assistance Act of 1961, as amended, have been satisfied. The project is based upon sound engineering analysis provided in large part by WCG and CDM. The Mission finds this analysis to be acceptable and has reviewed the cost estimate and finds them reasonably firm within the meaning of the statutory requirements.

B. Financial Plan:

3.03 The sources and uses of project funds are summarized in Table 3. The disbursement of the Grant resources is summarized in Table 4. A more detailed presentation is included in Annex G.

3.04 Included in the undisbursed funds which are already obligated and budgeted for engineering services is \$7 million for local currency costs. This estimate was made using the previous official exchange rate of \$US1.00 = LE 1.35. Using the projected market rates of exchange it is estimated that about 3.7 million will be needed to meet these same local currency expenditures associated with the engineering services work currently under contract.* It is anticipated, however, that associated with the construction work to be financed under Amendment 2, there will be a need for continued consultant engineering services which will require additional local

* US \$7,000,000 x 1.35 = LE 9,450,000

FY 87 LE 3,000,000 - 2.17 = US 1.4 million

FY 88 LE 3,450,000 - 2.63 = US 1.3 million

FY 89 LE 3,000,000 - 3.15 = US 1.0 million

Total LE 9,450,000 US 3.7 million

TABLE 3

PROJECT FINANCIAL PLAN

	US DOLLARS (MILLIONS)		EGYPTIAN POUNDS (MILLIONS)	
	AMENDMENT 2	PROJECT TOTAL	AMENDMENT 2	PROJECT TOTAL
<u>I. Funding Source:</u>				
A. AID Grant				
B. GOE Contribution	63.7	262.4	133.39	329.36
TOTAL	<u>63.7</u>	<u>262.4</u>	<u>133.39</u>	<u>329.36</u>
<u>II. Funding Utilization:</u>				
<u>A. Construction</u>				
- Collector and Conveyance Sewers	6.0	46.6	3.49	172.13
- Pumping Stations and Forcemains	1.82	24.31	.49	12.17
- Treatment Facilities	-	60.95	-	23.7
- Sludge Management Facilities	36.98	36.98	105.3	105.3
- Contingency	11.21	11.21	24.11	-
- Engineering Services	1.33	69.99	-	15.56
<u>B. Institutional Development</u>				
- Technical Assistance	6.36	12.36		.5
TOTAL	<u>63.7</u>	<u>262.4</u>	<u>133.39</u>	<u>329.36</u>

TABLE 4

DISBURSEMENT SCHEDULE

(\$US 000 THOUSANDS)

ACTIVITY	1979-86	1987		1988		1989		1990		1991		TOTAL	
	PROJECT TOTAL	AMENDMENT 2	PROJECT TOTAL										
<u>Construction:</u>													
- Collector and Conveyance Sewers	21769	402	9838	3198	10667	2400	4037	--	290	--	--	6000	46601
- Pumping Stations and Force Mains	10749	764	10602	1011	2407	45	552	--	--	--	--	1820	24310
- Treat. Facilities	--	--	11580	--	24592	--	20824	--	2169	--	1784	--	60949
- Sludge Management Facilities	--	1925	1925	14114	14114	18290	18290	2654	2654	--	--	36983	36983
- Contingency	--	2806	2806	3780	3780	3113	3113	908	908	600	600	11207	11207
- Engineer Services	42611	500	9080	500	8730	330	6900	--	2669	--	--	1330	69990
<u>Institutional Development</u>													
Technical Assistance	6000	--	--	3340	3340	2660	2660	--	--	300	300	6360	12360
TOTAL	81129	6397	45831	25943	67630	26838	56376	3562	8690	960	2744	63700	262400

currency expenditures. Furthermore, it is anticipated that inflation during this period of implementation will result in additional needs for local currency expenditures for this same work. There will also be a limited amount of local currency expenditures associated with the engineering design and consultant assistance to be financed under Amendment 2. Given this situation it was decided to maintain the \$7 million budget level for local currency expenditures and, should conditions warrant, to reprogram any uncommitted funds to supplement the project contingency line item for construction activities.

C. AID Financing Procedures:

- 3.05 The US dollar costs for the procurement of construction services and materials financed by this grant will be disbursed under AID Direct Letters of Commitment (L/Comms). Based upon executed contracts acceptable to AID and a request from AGOSD, AID will issue Direct L/Comms to the US Construction firms. AGOSD will issue appropriate Egyptian Pound Letters of Credit. The required engineering and consultant services will be provided under direct AID contracts and will not require additional financing mechanisms. Annex G illustrates the expected methods of financing.

IV. PROJECT IMPLEMENTATION

A. Implementation Responsibilities:

- 4.01 The Alexandria General Organization for Sanitary Drainage (AGOSD) will have the ultimate responsibility for the overall management of the project. However, AGOSD's demonstrated lack of contract administration and construction management capabilities, has made it necessary for USAID and the project financed consulting engineers to take on increased responsibilities. In order to facilitate the timely provision of the required engineering consulting services USAID has entered into a direct contract with the consulting firms. USAID therefore oversees the execution of these consulting contracts, certifies the provision of related services and approves the invoices for payment.
- 4.02 Since the initiation of the project the responsibilities of the engineering consultants have remained essentially as an advisor to AGOSD. With the execution of Amendment 2 the responsibilities of the engineering consultants will be broadened to permit the consultant to actually manage more of the day-to-day project construction activities. AGOSD and USAID have held discussions regarding the transfer of additional construction supervision activities to WwCG under its AID direct contract. This will be accomplished by including FIDIC General Conditions in the construction contracts and via PIL 31-1 which will grant the engineering consultants approval authority over invoices and change orders - similar to AMBRIC/Cairo GOSD arrangements. It has been pointed out to AGOSD that this was one of the conditions for USAID's agreement to seek additional funding in amendment 2. PIL 31-1 may need to become an annex to the Grant Agreement. AGOSD will continue to have sole responsibility for the construction inspection and monitoring of most LE funded project construction activities. (A more detailed discussion of AGOSD's capability to manage the project is included in the Section VI, Project Administrative Analysis).

B. Project Procurement:

4.03 Design and Construction Supervision Services

WwCG and CDM will continue to provide the necessary design, engineering, construction supervision, testing, and O&M start-up and training services. The services will be provided under the existing AID direct contracts with WwCG and CDM.

4.04 Construction Service

The construction of the collector and conveyance sewer facilities is being completed under existing host country contracts. Under Amendment 2 the construction of the additional tunneling will be included as an amendment to AGOSD's ongoing contract with Maclean Grove & Co. The current contract clearly provides for ordering additional tunneling work through change orders. The additional work is within the broad scope of work of the contract and within the area of additional work envisioned in the IFB.

- 4.05 Except for the Abu Qir station, host country contracts have already been executed for the construction of all project financed pumping stations. Under Amendment 2 the construction of the Abu Qir pumping station will also be carried out under a lump sum host country contract. The contracting will follow normal AID Handbook 11 procurement procedures. Invitations for Bid will be issued to all qualified firms and the award will be made to the lowest responsive bidder.
- 4.06 The construction of the East and West Treatment Plant is being carried out under AGOSD's ongoing contract with Fru-Con. Under this lump sum contract, Fru-Con will provide the required start-up operations and maintenance assistance to be carried out upon completion of the construction of both the treatment plants and the sludge handling facility. The construction of the sludge pump station at the West Treatment plant will also be included in the Fru-Con contract. This pump station was contemplated in the original IFB for the construction of the East and West treatment plants and the Fru-Con contract for these plants provides for the ordering of such additional work through change orders.
- 4.07 The construction of the sludge disposal facilities will be carried out under lump sum host country contracts. These contracts will be awarded following normal AID Handbook 11 procedures (i.e. competitive procurement through the issuance of IFB's.)
- 4.08 The GOE Fisheries Department will construct the embankment along the north shore of Lake Maryout to support the force main. AGOSD will enter into an interagency agreement with the Fisheries Department for the construction of the embankment. This work is financed 100% by AGOSD in LE.

4.09 Institutional Development

The technical services to be financed under Amendment 2 will be provided under one direct AID Contract with a US consulting firm or joint venture. Under WACG's current contract with AID, assistance will be provided to assess AGOSD's institutional needs and to prepare a detailed scope of work. A notice in the CBD will be

published and expressions of interest and prequalification data will be solicited. All qualifying firms responding to the RFP must be able to demonstrate an ability to establish a close working relationship between AGOSD and a US wastewater utility. The selected firm must be able to provide all the needed advisors in a timely manner and be able to match up key AGOSD staff members with similar level personnel in a US utility for long-term "twinning" or co-worker counterpart training experiences.

It is anticipated that the selected firm or joint ventures would probably develop specifications for the procurement of commodities to support the implementation of the institutional development activities. Such procurements would be made in accordance with AID Handbook 11 Chapter 3.

The contract with the selected firm will require USAID approval of detailed annual training plans prior to the commitment of contract funds or the initiation of training activities each year. This contract will also require that AGOSD candidates nominated to participate in the "twinning" arrangement satisfy all of USAID's Participant Training (Handbook 10) regulations, and receive USAID approval prior to the finalization of travel scheduling.

Should AGOSD fail to develop satisfactory training plans, the funds allocated within the Institutional Development activity may be reallocated to fund additional O&M work or other contingencies.

C. Assessment of AGOSD's Contracting and Voucher Examination Capabilities

- 4.10 In accordance with the requirements of the Payment Verification Policy Statements Nos. 5 and 9, an evaluation of AGOSD's contracting and voucher examination capabilities was carried out by USAID/FM in January 1986. (A copy of the evaluation can be found in the project files). USAID/FM found that AGOSD had significant deficiencies in voucher examination and monitoring of contract implementation. To address these deficiencies certain actions have occurred or are planned. The engineering consulting contract was switched to an AID direct contract. In that contract, construction supervision and an expanded program management role were included. Complete contract administration assistance to AGOSD was included in that program management role. This assistance will continue under Amendment 2. In conclusion, it was determined that with contracting, training, and management support from the engineering and technical contractors, AGOSD could adequately administer contracts and examine invoices from U.S. construction companies.

D. Implementation Schedule:

4.11 The implementation schedules for the project construction activities (Annex H) were prepared by WTCG as a part of their ongoing construction management responsibilities to AGOSD. These tables present the current status and anticipated completion of major implementation milestones for all US Dollar financed construction activities. The following is a summary schedule for the implementation of the activities to be financed under Project Amendment 2.

SUMMARY IMPLEMENTATION SCHEDULE

ACTIVITY	Completed by Month/Year
- Amendment 2 signed	July 1987
- Initial CP's satisfied	July 1987
- IFB Issued for Abu Qir Pump Station	August 1987
- IFB for Sludge Mgt. Facility Issued	August 1987
- Contract for additional Tunneling signed	August 1987
- Contract for Sludge Pump Station signed	Sept. 1987
- Contract for Sludge Mgt. Facilities Signed	Oct. 1987
- Institutional Needs Assessment Completed	Dec. 1987
- Construction of Abu Qir Pump Station Initiated	Jan. 1987
- Construction of Sludge Mgt. Facilities Initiated	Dec. 1987
- Contract for Institutional Development TA signed	April 1988
- Construction of Abu Qir Pump Station Complete	June 1989
- Construction of Sludge Mgt. Facilities Completed	May 1990
- Construction of Tunneling Completed	Dec. 1989
- Institutional Development TA completed	Dec. 1992
- All O&M Assistance completed	Dec. 1992

- 50% of O&M Expenses by 31 Dec. 1989
- 60% of O&M Expenses by 31 Dec. 1990
- 80% of O&M Expenses by 31 Dec. 1991
- 100% of O&M Expenses by 31 Dec. 1992

F. Terminal Dates:

- 4.17 Project Assistance Completion Date. The project assistance completion date will be December 31, 1992.
- 4.18 Terminal Disbursement Date. The terminal disbursement date will be 15 months after completion of all contract services to allow for final payments due after expiration of the 12 month warranty period used in the construction contracts.

G. Monitoring and Evaluation:

- 4.19 Throughout the life of the project, the U.S. engineering consultant will monitor the project construction activities, bringing all the routine problems, together with recommended solutions, to the attention of AGOSD and USAID in the form of monthly progress reports. These progress reports will compare implementation progress with the project schedule. During actual construction, frequent progress review sessions will be held with the contractors, AGOSD and, as appropriate, USAID staff to closely monitor project progress. A project steering committee, chaired by AGOSD and including the engineering consultant and USAID will meet weekly to review implementation actions. A meeting between all US contractors (USAID will attend as an observer) will take place monthly to discuss implementation progress and difficulties. An indepth review by AGOSD of each contractor's work will take place annually. Problems requiring immediate action, will be monitored by members of the USAID/Alex Project Committee through frequent and timely periodic visits to the project site and meetings with AGOSD management and site personnel. Daily monitoring will be performed by a resident AID FSN engineer assigned full time to the project.
- 4.20 It is anticipated that all project evaluation activities will be carried out as an integral and regular part of the Missions' ongoing monitoring and management activities described above. Project implementation will follow normally accepted management and evaluation practices currently being used worldwide for engineering and construction projects of a similar nature and size. Execution of these procedures should adequately assure an early identification of implementation problems and timely management actions to make necessary design changes and achieve the project purpose.

- 4.21 The consultant firm providing assistance in institutional development will be required to provide detailed monthly progress reports. Progress in institutionalizing the new programs, systems and procedures will be reported on. In addition, detailed reports on incountry and US training activities will be provided. These reports will indicate the status of all participants, verify the return of each participant and review the effectiveness of the training provided. Monthly progress meetings will be convened with the consultant firm, AGOSD and USAID staff to review implementation plans and progress.
- 4.22 The consultant firm providing assistance in institutional development will also be responsible for designing monitoring and evaluation systems to provide some measure of social impact and differential access. Working with AGOSD's Public Relations Department, the consulting firm will design and supervise the implementation of rapid, low cost impact studies which produce indicative evidence of how the project financed system improvements have impacted the residents of Alexandria. These studies will include a particular focus on how the upgraded and expanded system impacts the lives of women. The consulting firm will also design and establish AGOSD information systems which can effectively monitor household and industrial hookups and consumption.
- 4.23 The consultant and contractor progress reports, discussed above, should provide useful information on the provision of inputs and outputs and for measuring purpose and goal level achievement. In addition, the progress review meetings should permit AGOSD to carefully examine contractor progress and compare actual progress against anticipated progress. In this manner, any stoppages or delays from the planned schedule should be quickly identified, possible impacts discussed and solutions explored. At least once every six months it is expected that senior level officials from AGOSD, the consultant and contractor firms and USAID will meet to review overall progress and discuss major implementation problems. USAID/UAD will work closely with appropriate MOHR and AGOSD officials to gather information on beneficiary access and use, tariff rates charged, revenues collected and AGOSD's operating expenses. Senior level officials from MOHR, AGOSD and USAID will meet at least once a year to review GOE progress in increasing household and industrial hookups and in implementing needed tariff reforms.
- 4.24 Evaluation Responsibilities:

The consultant firm providing assistance in institutional development will have primary responsibility for design and implementation of a monitoring and evaluation system. The consultant will submit a detailed evaluation plan, including a

brief description and schedule of key evaluation events and reports, for USAID approval. Upon USAID approval, the consultant will proceed to implement the plan. The consultant will subcontract the services of an Egyptian social research firm to assist in preparing the evaluation plan and to conduct social impact studies as needed.

4.25 Evaluation Strategy:

Evaluation activities will focus on two major areas:

- the overall social and environmental impact of improvements to wastewater infrastructure in Alexandria financed by USAID since the inception of the project.
- changes in AGOSD management systems resulting from institutional development activities financed under this project amendment.

(i) Social and Environmental Impacts: The consultant, with the assistance of the subcontract Egyptian social research firm, 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.

(ii) Institutional Changes: The consultant will develop and implement a system for tracking changes in AGOSD management practices resulting from project institutional development activities. The consultant will identify key performance indicators to monitor outcomes of USAID assistance in the areas of training, commodity management and information systems development,

as well as ad-hoc short-term assistance in utility management. The consultant will measure and report progress against these indicators on a regular, periodic basis (six monthly or annually) to USAID.

H. Audit Coverage:

- 4.26 Funds provided by Amendment 2 will be used to finance host country contracts with U.S. construction companies. Amendment 2 resources will also finance AID Direct contracts for engineering services and technical assistance. Since the construction contracts are lump sum, competitively bid, fixed price contracts they are not subject to audit of costs except for any cost-reimbursement items. These contracts are, however, subject to audit for compliance with other AID regulations. Accordingly, \$60,000 in project funds will be budgeted to audit the two AID direct contracts with U.S. A&E firms, \$30,000 will be budgeted to audit the direct AID contract with a U.S. management consulting firm and \$10,000 will be used for audits of the various construction contracts.

V. SUMMARY OF TECHNICAL ANALYSIS

A. Identified Needs:

- 5.01 The project as originally conceived was primarily to address public health concerns attributable to flooding of wastewater into the city's streets during inclement weather and pollution of recreational beaches attributable to the raw wastewater being discharged into the sea via extremely short outfalls.
- 5.02 As a result of a recommendation in the Environmental Impact Statement (EIS) to upgrade the proposed treatment facilities from preliminary to primary level, a sludge management requirement has been created in Alexandria. Sludge is that residue from the wastewater treatment process that accumulates at the bottom of the settling tanks. Though mainly liquid in nature, sludge has a higher concentration of solids than the raw wastewater. The volumes of sludge that will be produced by the Alexandria system will begin at about 188.4 dry tons per day in 1990 and will grow to 324.3 dry tons in 2000. To illustrate the magnitude of the sludge management problem -- immediate sludge production would be enough to cover a hectare of land (more than two football fields) to a depth of one meter daily.

B. Basis of Technical Evaluation:

- 5.03 From its inception, the Alexandria Wastewater Project has been the subject of rigorous technical review. The Alexandria Wastewater Master Plan was prepared by Camp Dresser & McKee Inc. in 1978. Wastewater alternatives were reevaluated in the Review and Update of the 1978 Alexandria Wastewater Master Plan prepared by WWC in 1981. Numerous subsequent studies and reports have been prepared by WWC in the course of implementing project activities. The technical analysis in the original Project Paper evaluated the major disposal options for wastewater in Alexandria.
- 5.04 In conjunction with the preparation of this amendment to the Project Paper, a decision was made by the project committee in 1987 to prepare a new technical analysis which would evaluate the sludge management alternatives for Alexandria. This analysis is based primarily on the Implementation Plan for Off-Site Sludge Management Facilities, Site 9N, Phase 1 and the Evaluation and Selection of Apparent Best Alternative for Sludge Management both prepared by WWC in 1986 and 1987 respectively.

C. Evaluation of Technical Alternatives:

- 5.05 The original technical analysis identified four major regional wastewater alternatives which were categorized by disposal options. These alternatives were:
- SEA DISPOSAL FOLLOWING PRIMARY TREATMENT,
 - LAKE DISPOSAL FOLLOWING SECONDARY TREATMENT (an interim solution),
 - EFFLUENT REUSE FOR CROP IRRIGATION FOLLOWING SECONDARY TREATMENT,
 - EVAPORATION IN THE DESERT FOLLOWING PRELIMINARY TREATMENT.
- 5.06 The sea disposal alternative was identified as the preferred plan in the original Project Paper. This preferred plan was selected largely on the basis of the following five interrelated criteria:
- environmental impact,
 - economics,
 - reliability,
 - flexibility,
 - social acceptability (both domestic and international).
- 5.07 The evaporation alternative was eliminated primarily due to its high capital cost and its high annual operation and maintenance cost. The lake disposal alternative was eliminated in large part due to concerns regarding the reliability of the proposed secondary treatment facilities and the ecological stability of the lake. Though the sea disposal alternative and the effluent reuse alternative have roughly equal present worths, the sea disposal alternative was preferred due to the lower initial investment required to implement the plan and concern that the revenues attributable to the crops on the irrigated land would never be realized. Other key considerations in the selection of the sea disposal alternative were the ease of implementation and the operational simplicity.
- 5.08 Included in Annex F is a technical analysis which summarizes a number of studies, reports, and other documents prepared by WWCG regarding the sludge management facilities. This supplemental technical analysis identifies the major sludge disposal options. These alternatives are:
- NO ACTION,
 - SEA DISPOSAL,
 - INCINERATION,
 - LANDFILL,
 - COMPOSTING.

- 5.09 "No action" is obviously not a viable alternative for sludge management given the fact that the treatment plants are being rehabilitated and expanded under an existing AID-financed contract. Sludge will be produced by these plants and there will be a requirement to dispose of this sludge.
- 5.10 "Sea disposal" would involve pumping a liquid sludge from the treatment plants to an outfall pump station via approximately 10 kilometres of pipeline and dispersing the sludge off-shore via two 10-kilometre outfalls. Sea disposal can be a cost-effective and environmentally sound option if the off-shore geology is such that a relatively short outfall can discharge the sludge into currents which provide adequate dispersal of the sludge and minimize the formation of sludge banks. However, the EIS prepared for this project recommended that the proposed treatment level of the wastewater plant be upgraded from preliminary treatment to primary treatment; one of the main reasons for this recommendation was concern regarding the possibility of sludge bank development in the vicinity of the outfall. The EIS acknowledged that this upgrading would substantially increase both capital costs and operation and maintenance costs, but considered this acceptable. Obviously, the use of a sea disposal option for disposal of sludge would negate the benefits derived from upgrading proposed treatment levels from preliminary to primary.
- 5.11 "Incineration" would involve the burning of mechanically dewatered sludge and the landfilling of the resultant ash. The principle advantage of this option is that the bulk of the disposal operation could take place at the existing treatment plant sites with transportation of only the ash to a remote location. Other advantages include the relatively small land area required as opposed to the landfilling and composting alternatives and the complete destruction of pathogens. Environmentally acceptable incineration requires adequate air pollution abatement devices. The mechanical dewatering equipment and the multiple hearth furnaces require a high degree of skills for proper operation. The present worth of the incineration option is the highest of the four major options.
- 5.12 "Landfilling" involves pumping the liquid sludge to a remote site and partially air drying the sludge in open pits and then covering it with earth. The main attractions of this alternative are its simplicity and low cost. Disadvantages include the temporary loss of use of large areas of land, possible pollution of groundwater, and loss of a valuable resource (sludge as a soil conditioner). Pollution of the groundwater is not a major environmental concern in the remote areas outside of Alexandria and the land that is landfilled can ultimately be reclaimed for other uses; however, the GOE does believe that the sludge is a valuable resource which they should utilize in the reclamation of desert areas for

agricultural use. The GOE is opposed to this option and has expressed concern regarding possible odors and health hazards from pathogens in the landfilling operation; the use of a landfilling operation has been prohibited on Site 9N by the Ministry of Defense.

- 5.13 "Composting" involves pumping the liquid sludge to a remote site and dewatering it on open drying beds and then stabilizing the sludge by means of a simple composting process. In order to prevent possible pollution of the groundwater by filtrate from the sludge drying beds, WTCG has proposed that the beds be lined and that drains collect the filtrate for treatment and discharge to a local agricultural drain. The main advantage of this alternative is that it produces a stabilized organic material with a low pathogen content of some nutritional value to plant life; this stabilized sludge can be used as a soil amendment in sandy soils to increase the water-holding capacity and nutrient content of the soil. Though the composting alternative is not as land efficient as sea disposal or incineration, it utilizes substantially less land than the landfilling option. Management and operational requirements for this alternative are substantially below those for the incineration option, but higher than the landfilling option; moreover, the proposal to treat the filtrate will increase operation and maintenance requirements even further. The major disadvantage of this option is the high cost associated with the initial investment. Major concerns include possible introduction of heavy metals and toxic wastes to agricultural lands due to industrial contributions to the public sewers, potential health hazards to agricultural workers due to improperly composted sludge, and inability of market to absorb the large quantities of composted sludge to be generated by this project as well as the composted solid waste generated by others. This option is heavily favored by the GOE.
- 5.14 The composting alternative is presented as the preferred alternative for sludge management. This alternative was selected largely on the basis of the following interrelated criteria:
- economics,
 - environmental impact,
 - reliability,
 - flexibility,
 - ease of operation,
 - land requirements,
 - political considerations.

5.15 SUMMARY COST-EFFECTIVENESS EVALUATION OF SLUDGE DISPOSAL ALTERNATIVES

<u>Criteria</u>	<u>Alternatives</u>			
	<u>Sea Disposal</u>	<u>Incineration</u>	<u>Landfilling</u>	<u>Composting</u>
Relative Present Worth*	1.0	3.8	3.0	3.2
Environmental Impact	unacceptable	minimal	acceptable	acceptable
Reliability	fair	poor	good	fair
Flexibility	limited	limited	good	good
Ease of Operation	very easy	complex	easy	fair
Land Requirements	minimal	minimal	high	moderate
Political Considerations	unacceptable	acceptable	resistance	favorable
OVERALL RANKING	4	3	2	1

* Discounted at 6% over 30 years; 1.0 represents lowest present worth.

5.16 The technical analysis reviews the site selection process and also evaluates alternatives for transporting the sludge from the wastewater treatment facilities to the sludge handling facilities. The site selection process took nearly five years and included the investigation of 25 different sites. A screening analysis reduced the number of potential sites to 15. These 15 sites were eventually reduced to four promising sites which were studied in depth. Ultimately, Site 9N was selected. The major transportation alternatives were pipeline and truck fleet. The pipeline alternative was preferred over a truck fleet. The pipeline alternative was further broken down into considerations regarding the pump types, number of pump stations, line sizes, and optimum solids concentration of sludge. After exhaustive analysis, it was concluded that dual 450 mm diameter pipelines with a single high pressure pump station using diaphragm pumps with a sludge solids concentration of 2.0 to 2.5% would be the most cost-effective transportation alternative. Additionally, WWC prepared another cost comparison that was site specific for Site 9N. Given the prohibition of on-site disposal of the sludge via landfilling, it was assumed that it would be necessary to dispose of the dewatered sludge at a site 25 kilometres from Site 9N. This site specific cost comparison indicated that composting would be the least cost alternative when compared to either landfilling or incineration.

D. Proposed Actions:

- 5.17 AID has previously endorsed a wastewater master plan for Alexandria which includes the provision of primary level treatment facilities with discharge of the treated effluent to the Mediterranean Sea via a long outfall. As a result of continued controversy over the issue of land disposal versus sea disposal of the wastewater effluent, the GOE has delayed construction of the proposed outfall system which would dispose of the treated effluent into the Mediterranean Sea. AID has amended the project to include only those portions of the approved wastewater master plan that are compatible with both a land disposal alternative and a sea disposal alternative.
- 5.18 Under the proposed sludge management scheme, primary sludge from the East Plant will be discharged to the West Zone Collection System where it will then travel to the West Plant. The primary sludge from the West Plant which will include the solids contribution of the East Plant will enter equalization tanks where the first effort to control solids concentration will be made. A blended sludge pump station at the West Plant will withdraw sludge from the equalization tanks and blend primary effluent with this sludge to control the solids concentration. The blended sludge will be pumped via dual 450 mm diameter steel pipelines about 29 kilometres southwest to Site 9N. At Site 9N, the blended sludge will be dewatered on conventional sand drying beds. The dewatered sludge will then be composted on-site using a simple windrow process. It is envisioned that land owners will haul the composted sludge from the sludge management site.
- 5.19 In order to reduce the possibility of groundwater pollution in the vicinity of the sludge management site, drying beds will be lined to collect the filtrate from the dewatering process and this filtrate will be treated and then discharged to a drain. The proposed treatment process will use minimal mechanical equipment and design will utilize appropriate technology to the extent feasible. Though no stream analysis has been performed regarding the discharge of the filtrate to the drain, it is not anticipated that an effluent meeting GOE effluent quality standards, or even not meeting these standards, will have a significant impact on the agricultural drain.
- 5.20 This project will include substantial management, operation, and maintenance training activities to ensure that the proposed sludge management facilities function in an acceptable manner. Laboratory facilities will be located at Site 9N to monitor the quality of the sludge. A data management system will include the recording of application rates and allocations of composted sludge to individual farms.

5.21 A major concern regarding the sludge composting operation is the ultimate disposal of the end product. Preliminary indications are that there is an existing demand for sludge in Cairo and Alexandria. Dried, unstabilized sludge from the Abu Rawash facility in Cairo is given to farmers while the compost from the Alexandria Solid Waste Composting Facility is sold for about LE 6/m³. One public sector agricultural production company has expressed a strong interest in using the composted sludge in its operations. One aspect of the institutional support efforts will be to promote the use of the composted sludge on agricultural lands. In the event that the market cannot absorb the quantities of composted sludge generated by the proposed facilities or heavy metals content renders the composted sludge undesirable for use on agricultural lands, contingency plans will be developed as part of the proposed institutional support efforts. These contingency plans will include trucking the dewatered sludge to another site for landfilling.

E. Conclusion:

5.22 The technical analysis indicates that the proposed sludge management system is feasible and technically sound. Based on this technical analysis and the cost estimates developed, we conclude that the requirements of Section 611(a) of the Foreign Assistance Act have been satisfied.

VI. ADMINISTRATIVE ANALYSIS

A. Introduction:

6.01 In determining the administrative feasibility of the project a detailed examination of the capacities of AGOSD and AID to meet their assigned responsibilities was carried out. This examination included a review of AGOSD's early history as a general organization, as well as the initial engineering and management advisory project assistance initiated in 1981. Project progress through the mid-1980's and the current administrative arrangements were also reviewed. Finally, the feasibility of the proposed administrative arrangements for the implementation and monitoring of the project and the institutional development activities proposed as part of Amendment 2 were examined. In carrying out this analysis, the project committee utilized the extensive information available in USAID files and the experiences of the project financed consultants and contractors and USAID project officers. The following summarizes the results of this analysis.

B. Background:

6.02 Establishing an effective project implementation arrangement has always been a serious problem. At the inception of this project, the GOE implementing agency was the national wastewater authority, the General Organization for Storm and Sanitary Drainage (GOSSD). In August 1979 the national authority was restructured and the responsibility for the operations and construction of the water and wastewater systems in the major cities of Alexandria and Cairo was delegated to new wastewater and water organizations within the respective governorates. In Alexandria the new wastewater organization became the Alexandria General Organization for Sanitary Drainage (AGOSD). Thus, AGOSD assumed project implementation responsibilities in August, 1979.

6.03 Due to the magnitude of the construction plans and the organization's new responsibilities as a wastewater utility, USAID determined that AGOSD needed assistance to design, manage and monitor construction activities, and also needed on-going assistance to manage, operate and maintain the ailing Alexandria Sewerage System. Accordingly, USAID required, as a condition precedent to disbursement (PIL NO. 1), that AGOSD contract with a U.S. Consultant for project management and engineering services for a period of several years.

C. Early Project Technical Assistance Efforts:

6.04 AGOSD executed a contract with Boyle Engineering Corporation in association with Arthur Young & Company (BEC/AYC) for the provision of consulting engineering and management advisory services, beginning February 1981. BEC/AYC provided technical services to AGOSD in three functional areas, including (a) a Review of AGOSD's organizational, technical, administrative and managerial systems, and preparation and

implementation of plans for recommended improvements; (b) assistance to AGOSD in the technical review of designs, plans and specifications submitted by engineering design consultants; and (c) day-to-day advice and recommendations to AGOSD as to administration, management, accounting, budgeting, training, project management and facility operations and maintenance.

- 6.05 BEC/AYC's work progressed through three major stages beginning with a diagnostic review and assessment of AGOSD's systems, continuing with the development of an implementation plan of recommended improvements, and concluding with the implementation of selected tasks, systems, training and assistance activities. BEC/AYC's contract was terminated on March 30, 1984, as AGOSD reached the decision that consultant advisory services were no longer required by AGOSD.
- 6.06 The impact of BEC/AYC's assistance to AGOSD did not result in sweeping organizational policy reforms. AGOSD management agreed in principle to many of the consultant's policy and system recommendations, but would not implement or allow the implementation of the recommendations. BEC/AYC produced many organizational analyses, implementation plans and reports which remain relevant today. BEC/AYC had its greatest impact assisting AGOSD on a daily basis with the technical review of designs and specifications, small projects and with classroom and hands-on training activities. The consultant assisted AGOSD in the actual technical review of designs and plans submitted by CDM, WWCG and the contractors, and provided structured classroom and field training for AGOSD's inexperienced design and construction engineering and inspection staff. In the area of operations and maintenance, the consultant staff (a) provided hands-on training assistance in the operation, maintenance and troubleshooting of new USAID-procured mechanical sewer maintenance equipment; (b) performed special projects with AGOSD staff to resolve collection system flooding and pump station operations problems; and (c) provided formal training to O&M personnel in collection system O&M, equipment/vehicle operations and personnel safety.
- 6.07 While BEC/AYC's activities helped AGOSD resolve immediate needs and crises, not much of the assistance had a long-term impact on the organizational structure and systems. The training programs trained operations staff to properly operate the equipment, but supervisory behavior was not changed, nor proper management systems applied to evaluate performance and retrain personnel when necessary. Although some individual managers did apply the consultant's recommendations within their own divisions (case in point, the clean-up and reorganization of the Monarram Bey Garage facility), AGOSD management was neither willing nor exhibited any interest in implementing organizational change prior to 1985.
- 6.08 In 1984 when a new AGOSD Chairman terminated BEC/AYC's contract, it was USAID's position that the action was premature given the Alexandria wastewater project needs and implementation status, but that the

decision would provide AGOSD with the opportunity to determine its own ability to manage itself with its new Chairman. It was also USAID's view that the termination of BEC/AYC's contract did not mean the end of technical support for the project, particularly since the majority of BEC/AYC's analyses, recommendations, and reports would provide appropriate frameworks in which follow-on or similar activities could be programmed.

D. Post-1984 Project Progress:

6.09 Beginning in 1984 numerous delays hampered progress on implementation of the project. AGOSD delayed the procurement of major construction, engineering design and construction supervision elements including the East and West Treatment plants and the sludge facilities. AGOSD exhibited great difficulties and delays in reviewing vouchers, authorizing payments and administering contracts. It was clear that the vast Phased Implementation Plan project administration responsibilities were beyond the means of AGOSD's limited contract management, construction management and supervision, and project review personnel's abilities. AGOSD's inability to effectively administer the project-financed contracts was again highlighted during the extended negotiation period with WWCG for a contract extension for additional project design and construction supervision services. WWCG worked without a contract for almost one year, and the situation became very critical when both WWCG and the construction contractors began demobilization procedures in late 1985.

E. Current Administrative Arrangements:

6.10 In January 1986 USAID executed a direct AID contract with WWCG to provide the required services to AGOSD through June 1989. The scope of the contract is to provide AGOSD with engineering, construction management, operations and maintenance, training and start-up services for the project. WWCG's role, as defined in Project Implementation Letter No. 31 (November 1986) is to act on behalf of the Owner as well as to advise and assist AGOSD in all engineering and construction matters related to the project. More specifically this includes:

- (a) acting as the Owner's Agent in observing, inspecting and monitoring Contractor work, submittal review, and the issuance of instructions to the contractors;
- (b) informing AGOSD of project progress and problems in scheduled meetings, correspondence and reports;
- (c) the submittal of designs, reports, manuals and specifications for AGOSD review;
- (d) the preparation and submission of construction bid analysis with recommendations to AGOSD for review, approval and award;

- (e) coordination with AGOSD on all construction projects;
- (f) providing AGOSD with copies of all construction contractor correspondence;
- (g) coordination with AGOSD's two area managers; and
- (h) the identification of project real estate requirements and assisting AGOSD with property rights acquisition and documentation.

F. Proposed Administrative Arrangements:

- 6.11 The expansion of WWC's role as the project engineer, and the clarification of its role in PIL No. 31 relieved AGOSD of many project responsibilities which it neither had the resources nor ability to effectively control. Since mid-1986 project implementation progress has improved. The IFB for the East and West Treatment Plant Rehabilitation was released in July 1986, the contract awarded to Fru-Con, and signed in January 1987. Nevertheless AGOSD still does not appear capable to effectively handle the project management responsibilities, particularly in light of the increased level of construction activities proposed under Amendment 2. Accordingly, USAID proposes to amend PIL No. 31 and issue PIL 31-1 (Annex J) which will expand WWC's role as the sole Engineer and Program Manager for all contracts for which it is, or will be responsible under the Project. WWC will therefore, advise and assist AGOSD on all engineering planning, design, construction execution, operations, maintenance and training matters, and on matters of contractual and budget planning and implementation. WWC will be AGOSD's exclusive Construction Manager for supervising, monitoring, observing, testing, inspecting, rejecting, directing and approving all contractually-related work and actions of the contractors for which WWC is responsible. The objective of PIL 31-1 is to transfer the day-to-day PIP construction issues and problems to the consultant and thereby allow AGOSD to focus more of its efforts on overall system planning and operational issues.
- 6.12 With the commissioning of the Sporting and Ras El Soda pump stations in late 1986, AGOSD has finally become aware of the need to improve its overall capability to manage Alexandria's massive wastewater systems. The new Chairman has made numerous personnel changes within AGOSD's management structure with the replacement and retirement of inefficient managers. This change with relatively new and inexperienced management staff comes during a period of time in which AGOSD will lose many of its older, experienced (former GOSSD) technical and engineering personnel to retirement. It appears that AGOSD's changing physical assets and personnel has signaled to the Chairman the need to focus on AGOSD's organizational requirements to effectively plan, manage and operate an expanded wastewater system.

G. Proposed Institution-Building Activities:

- 6.13 In January 1987 AGOSD's Chairman requested USAID to fund technical assistance to address four major organizational constraints. This includes:
- (a) AGOSD's lack of institutional capability to train and upgrade the supervisory and/or technical skills of staff assigned to manage, operate or maintain AGOSD's facilities or equipment;
 - (b) an inability to effectively manage, organize, and support AGOSD's massive material and equipment procurement and inventory systems;
 - (c) an inability to effectively and efficiently manage and utilize AGOSD's administrative, financial and organizational information systems; and
 - (d) an inadequate understanding among many AGOSD managers regarding systematic utility operations.
- 6.14 In February 1987 the Chairman initiated preliminary investigations to identify AGOSD's technical assistance needs with the appointment of a Training Committee. The Training Committee commenced its study of AGOSD's long-term training needs with a visit to Cairo GOSD's Syphon Pump Station Operation and Maintenance Training Program. The Syphon demonstration activity showed the AGOSD committee that with limited technical assistance, staff and budgetary resources, AGOSD has the potential to develop an Operations and Maintenance Training Department capable of (a) assessing on-going training needs, (b) developing appropriate training curriculums and materials, (c) delivering training, and (d) conducting performance evaluations of trained personnel.
- 6.15 Further analysis and identification of AGOSD's training and institutional needs will be jointly conducted by WWC and selected AGOSD representatives beginning in 1987. During the Needs Assessment BEC/AYC's recommendations and accomplishments will be reviewed, and a thorough analysis of AGOSD's manpower requirements for the expanded system identified. A final Needs Assessment Report will present a training plan with training and technical assistance strategies to meet AGOSD's long-term organizational needs. The final report will serve as the basis for the competitively selected technical assistance contract requested by AGOSD.
- 6.16 In addition to the traditional form of consultant assistance with long-term technical advisors working directly with AGOSD, an alternative form of technical assistance has also been requested by AGOSD. This alternative assistance involves a long-term twinning relationship between AGOSD and a similar wastewater utility in the United States.

- 6.17 As AGOSD begins to commission and takeover parts of its expanded wastewater facilities, AGOSD management sees the need for specific assistance from working wastewater utility practitioners. It is envisioned that the "Twinning" activities of the technical assistance contract will involve long-term on-the-job working relationships between key AGOSD personnel and selected US wastewater utility counterparts.
- 6.18 The TA contractor will identify appropriate short-term twinning activities between functional counterparts in Alexandria and the US. The twinning arrangements will provide opportunities for AGOSD personnel to travel to the US utility and to learn new technologies and systems in structured observational training activities. Following the US visit, selected American utility specialists will travel to Alexandria to work alongside their AGOSD counterparts to transfer new skills, implement new methodologies, or assist AGOSD in solving particular technical problems.
- 6.19 Based on past institutional and training analyses carried out by BEC/AYC, and AGOSD's stated priority to upgrade its operations and maintenance systems, the proposed institutional development activities will center around the development of AGOSD's Operations and Maintenance Training Department. The three other major institution-building components will include: (a) Material and Equipment Management Systems Development; (b) Management Information System Development; and (c) Utility Management Assistance. (Annex H presents an amplified description of the proposed institution-building activities).

H. USAID:

- 6.20 The Office of Urban Administration and Development (UAD) within the Development Resources Directorate will have the monitoring responsibilities for AID. UAD currently has one USDH engineer and one FSN engineer assigned full-time to the Alexandria Wastewater project. These assigned professional staff have extensive experience in the design, construction, operations and maintenance of wastewater systems projects. In order to provide the required level of monitoring during the increased period of construction work associated with the Amendment 2 financed activities, UAD has decided to assign one FSN Project Assistant to the project. The contract for this position will be financed with Amendment 2 Grant resources. These staff resources should provide adequate AID monitoring support for this project.

I. Conclusion:

- 6.21 Given AGOSD's current receptivity towards institution building activities and the organizational emphasis on improving operations and maintenance systems, it is clear that AGOSD is committed to organizational development. With the engineer's assumption of the primary construction responsibilities, AGOSD will be in a position whereby it can concentrate on the development and application of appropriate wastewater utility management systems to effectively and efficiently manage the expanded Alexandria wastewater system. At the same time, the proposed level of USAID/UAD staff should be sufficient to provide the necessary AID monitoring support. Accordingly, the project appears to be administratively feasible.

VII. ECONOMIC ANALYSIS

A. Methodology:

- 7.01 Wastewater treatment projects like most Public Health Projects are traditionally evaluated using cost effective analysis because pollution control benefits are largely non-monetary in nature and extremely difficult to quantify to any degree of significance.
- 7.02 A cost-effectiveness analysis considers both quantitative and qualitative factors. For this project, each viable overall alternative was analyzed in terms of:
- o Feasibility
 - o Environmental and social concerns
 - o Reliability
 - o Flexibility
 - o Constructibility
 - o Operability
 - o Maintenance needs
 - o Future Expansion
 - o Future Upgrading
 - o Energy consumption
 - o Capital cost
 - o Operation and maintenance cost
 - o Present worth
- 7.03 Quantitative comparisons include:
- o Capital cost
 - o Operation and maintenance cost
 - o Present worth
 - o Sensitivity to changed costs
- 7.04 Qualitative comparisons include:
- o Environmental concerns
 - o Socio-political concerns
 - o Technical concerns
 - o Energy consumption
- 7.05 The alternatives were analyzed and compared as to their sensitivity to changed costs and the effect of changed costs on both present worth and operation costs.
- 7.06 Both the 1978 Master Plan and the 1981 updated Master Plan performed in depth Cost Effective Analysis for the feasible alternatives of meeting the sewage treatment objectives of the project. Three such alternatives were analyzed and the analysis identified the cost effective alternative of primary treatment followed by composting of sludge and sea disposal of effluent.

- 7.07 Since the Phase I activities being funded are identical to all three of the alternatives analyzed and are common to either sea disposal or land application of effluent, the original analysis is relevant to a decision to add funds to complete the work anticipated.
- 7.08 In addition to the economic analysis already performed for the three alternatives, each sub-system or component of the overall project has been subjected to in depth cost effective analysis of the viable alternatives for that particular component as part of the standard engineering design procedures.
- 7.09 The selected alternative resulting from this process, drying beds followed by composting and land application, is cost effective, meets project objectives and is consistent with Egyptian resource policy.
- B. Basis for Additional Funding:
- 7.10 As stated previously in Section I, Project Description, the reasons for the need to increase funding are:
- 1) Delays in project completion caused by implementation problems resulting from implementing agency ineptitude.
 - 2) Delays in bidding project elements due to excessive review time or lack of Rights of Way.
 - 3) Change in construction technology from open cut to tunneling methods due to extremely poor soils in much of the project area.
 - 4) Extended engineering and construction supervision services required due to all delays encountered.
 - 5) Dollar payment for the LE engineering costs from grant dollars at the request of the GOE.
- 7.11 Although adding to the total project cost, these reasons do not invalidate the criteria and methods used to analyze the original project as presently amended. The following discusses the major findings of the analysis.
- C. Jobs Provided:
- 7.12 The Phase I facilities are expected to provide approximately 3000 local construction jobs during construction and 400 + permanent jobs for operating and maintaining the constructed works. Of the total LE costs estimated for the Phase I facilities, about 40% is estimated for the labor component, therefore, approximately LE 150

million at current exchange rates will be put into the local economy by contractor payrolls. With the addition of the \$63.7 million, the total jobs anticipated to be created from Phase I activities will in fact occur.

D. Effect on Tourism:

- 7.13 Due to a series of events in 1985 and 1986, including unfavorable publicity about sewage pollution of the tourist beaches in Alexandria, the Governorate of Alexandria experienced a drop in tourism of 500,000 tourists(1). As the normal stay in Alexandria is estimated at 4 days with the average tourist spending 25LE/day for the 4 month tourist season, the Egyptian economy lost roughly LE 50 million each of those years from tourists. Although beach pollution was only one of the contributing factors in this most recent experience, these events do point out the magnitude of loss to the Egyptian economy that could result from a major health epidemic caused by sewage pollution in Alexandria.

E. Cost per Capita

- 7.14 The \$63.7 million increase in project cost translates into approximately \$13 per person. From Table 2, the total project costs are estimated at LE 389 Million and \$262 Million. Based upon the projected 5 Million ultimate users, the incremental \$13 per capita cost results in a \$90 or 180 (2) LE per capita total cost for Phase I. Typical worldwide costs for acceptable urban wastewater collection and treatment schemes range between \$300 to \$800 per capita for total completed systems. Considering the estimated costs of the pre-project collection system and the costs to complete Phase II of the Alexandria system, total wastewater system costs fall in the middle of this range.

F. Conclusion:

- 7.15 In view of the money returned to the economy during construction and the positive role the project plays in protecting the tourism income of Alexandria and Egypt, the additional cost of completing Phase I is prudent.

(1) As estimated by the Alexandria Chamber of Commerce.

(2) Dollar/LE conversions at LE 2 = 1 US Dollar

VIII. FINANCIAL ANALYSIS

8.01 The original project paper analyzed the Revenues, Operating Costs and Capital Costs for AGOSD through the year 2000. Included are Projected Income Statements, Projected Cash Flow Statements and Projected Balance Sheets. Amendment 2 is essentially a completion of the same facilities originally analyzed, therefore the original analysis is still relevant for the period through the year 2000.

8.02 Update of Recurrent Costs

Updated estimates for the recurrent costs have been prepared by the consultants, WwCG. Present and future estimated recurrent costs are shown in Tables VIII-1, 2, 3 & 4.

As a result of AID concern over the GOE's prior commitments to O&M, an agreement was reached in 1984 between AID and the GOE. The Memorandum of Understanding dated 22 Jan. 84 between the GOE (represented by the Minister of Reconstruction, Housing and Land Reclamation and the Minister for Investment Affairs and International Cooperation) and USAID, establishes a schedule of tariff increases to cover wastewater system Operations and Maintenance costs. By 1985, AGOSD was to have had a water rate structure sufficient to provide revenues covering 10% of their O&M costs exclusive of debt service. Pro-rating the agreed upon annual increases to the present indicates that AGOSD needs to reach a revenue to O&M cost ratio of 26% by 1987. Even with AGOSD's 1 January 87 rate increase, they are only at present covering 5% of their expected 1987 O&M costs.

In addition, beginning in 1987 and continuing through 1991, O&M costs are expected to begin accelerating as the USAID grant funded facilities (pump stations, force mains, treatment plants and sludge composting facilities) come on line. The consultant has prepared an estimate of the additional operation and maintenance costs expected to be incurred by AGOSD as a result of these new facilities. These cost increases (shown in table VIII-3) indicate a 91% increase in O&M costs by the end of 1992. To assist AGOSD, present and future construction contracts include O&M assistance for periods up to 3 years. This provides a time period to allow gradual rate increases by AGOSD which should soften the financial impact of the new facilities becoming operational.

TABLE VIII-1
FY 86 O&M EXPENDITURES BY CATEGORIES

CATEGORIES	AGOSD LE (,000)	%
Chapter I		
. Salaries	1,872	
. Overtime, Incentive Pymts Benefits	4,568	
Subtotal	6,440	87.5
Chapter II		
. Replacement Parts	338	5.2
. Equipment, Tools, Instrum.	36	.5
. Fuel: Diesel Oil, Gasolin	101	1.3
. Electricity & Other Utilit.	88	1.2
. Materials, Chemicals,	29	.4
. Taxes, Fees	1	.0
. Rent & Contract Services	48	.6
. Interest Payments	240	3.3
. Misc./Overhead	1	.0
Subtotal	932	12.5
Total Expenditures	7,372	100%

TABLE VIII-2
SUMMARY OF COST-REVENUE RELATIONSHIP
FY 1986/87
LE (,000)

Organi- zation	Expenditures:			Income:			Operating Deficit/ Gov't Transfer	Coverage Ratio (%)
	Manpower Salaries	Goods Services	Total O&M Costs	Sale of Water	Fees & Charges	Total Revenue		
<u>Water:</u>								
AWGA(USAID)	8,730	55,522	64,252	25,100	1,500	26,700	37,552	42.0
AWGA(IBRD)*	(6,850)	(8,085)	(14,935)	(20,017)	(5,070)	(25,087)	(10,152)	(60.0)
<u>Wastewater:</u>								
AGOSD	8,204	1,003	9,207	-	500	500	8,707	5.0

Source: Budget Data submitted by AGOSD Finance Officers.

Note: AWGA data shown in parthensis was taken from the IBRD/EMENA Staff Appraisal Report of the Second Alexandria Water Supply Project, October 10, 1985.

TABLE VIII-3
ADDITIONAL ANNUAL O&M COSTS, 1000 LE

FACILITY	1987	1988	1989	1990	1991	1992
Treatment Plants						
- East Plant			37	* 772	1,536	1,689
- West Plant w/Sludge			21	* 523	1,059	1,165
Sludge Management Facility						
- Force Mains			3	* 196	418	460
- Site 9 N				*1,204	2,640	2,912
Pump Stations						
- Sporting	* 35	53	58	64	71	78
- Ras El Soda	7	10	* 77	158	174	192
- Maamoura		5	* 61	140	154	170
- Sidi Bishr		115	* 127	139	153	168
- Smouha		10	* 150	319	351	386
- East Zone		10	* 368	799	878	966
- Abu Qir		2	* 29	31	35	38
Collection System		2	6	33	148	162
TOTALS	42	207	937	4,378	7,617	8,386

* Begin operation of Facility (assumes pump stations can by-pass E. Plant)

- Notes:
1. Non-operating costs assumed at 1/2 normal labor costs
 2. Costs escalated at 10% per year after start of operation
 3. Collection system O&M estimated at 0.2% of capital cost/year

TABLE VIII-IV
TARIFF INCREASES REQUIRED
(X1000 LE)

	1986	1987	1988	1989	1990	1991	1992
% Population on Sewers	40%	40%	50%	60%	70%	80%	80%
Projected Total O&M Costs (without debt service)	9207	9249	9414	10144	13585	16824	18593
Expected Tariff Revenue at 10% of Total Water Tariff Revenue	500	1004	1381	1819	2335	2935	3229
EXPECTED TARIFF SHORTFALL	8707	8245	8033	8325	11250	13889	15364
Tariff Shortfall as % of 1986 Water Tariff Revenues	35%	33%	32%	33%	45%	55%	61%
At 10% yearly rate increase, Tariff Shortfall	35%	23%	12%	3%	5%	5%	1%

Note: Assumes 10% yearly revenue growth based on population growth. Assumes no additional population is connected other than that by sewers built under Project 263-0100.

8.03 Accordingly, the grant agreement will include a covenant requiring the GOE to budget the expected O&M shortfalls until AGOSD reaches 100% coverage of O&M expenses, exclusive of debt service. Details concerning progress in this regard will be discussed at least annually within the context of review of the Memorandum of Understanding between MOHPU and USAID dated January 1984 and related benchmark matrices. It is considered important that this be accomplished because of the heavy capital expenditures which will be required in order for AGOSD to complete the future Phase II works. These capital expenditures will be a heavy burden on the AGOSD budget over the next 10 year period, leaving little room to supplement O&M expenses from their capital expense budget.

IX. SOCIAL ANALYSIS

- 9.01 Since the basic objective of the project remains unchanged (i.e. to complete the phase I activities), the social soundness analysis which was prepared for the original project paper is still valid. Accordingly, no additional analysis has been conducted for Amendment 2.
- 9.02 It is worth noting that certain social concerns related to the sludge facility site have been addressed in the Technical Analysis (Section V). Given the fact that AGOSD needs to treat and dispose the sludge, the proposed composting facility will provide added social benefits through the re-use of a resource. This will also support current GOE land reclamation and crop productivity improvement programs.
- 9.03 The project design for Amendment 2 includes specific monitoring and evaluation activities which should produce some indication of the differential social impact of USAID assistance in upgrading the wastewater network in Alexandria (See Section II C and IV G). Particular focus will be given to examining how the upgraded and expanded system impacts the lives of women.

X. ENVIRONMENTAL CONSIDERATIONS

A. Background:

- 10.01 From its inception, the Alexandria Wastewater Project has been the subject of extensive environmental review. The Alexandria Wastewater Master Plan was prepared by Camp Dresser & McKee Inc. in 1978. This master plan included a program of marine studies which examined the feasibility of large-scale disposal of wastewater into the Mediterranean Sea. As a result of the marine studies, the consultant recommended preliminary treatment facilities with disposal of effluent to the sea. In accordance with "AID Environmental Procedures", the Agency prepared in 1979 an Environment Impact Statement (EIS) which included extensive marine investigations. The EIS recommended that the proposed preliminary treatment facilities be upgraded to primary treatment facilities. As sludge is a by-product of primary treatment facilities, the EIS recommendation resulted in a requirement for sludge management facilities.
- 10.02 With the concurrence of the Bureau Environmental Coordinator and in conjunction with the preparation of this amendment to the Project Paper, a decision was made in 1987 to prepare an amendment to the original EIS which would cover the additional issues raised by the requirement for sludge management facilities. WWCG prepared a report using the format of an environmental assessment which addressed the potential environmental effects of the proposed sludge management facilities and which is included as Annex L.

B. Anticipated Benefits:

- 10.03 As originally conceived, anticipated benefits of the project included significant improvements in environmental quality and public health in the project area. These improvements were to be obtained through provision of increased and improved wastewater infrastructure capable of serving approximately 81% of the Year 2000 population.

C. Environmental Issues:

- 10.04 As a result of continued controversy over the issue of land disposal versus sea disposal of the wastewater effluent, the GOE has delayed construction of the proposed outfall system which would dispose of the treated effluent into the Mediterranean Sea. This has resulted in the interim disposal of wastewater into Lake Maryout; until such time as a final decision is reached regarding the disposal alternatives, discharge of primary effluent into the lake can be expected to reduce somewhat the benefits originally anticipated. The amended project no longer includes funds for the construction of an outfall system.

10.05 The original EIS identified a number of major issues. These included the following:

- The Appropriateness of Sea versus Land Disposal,
- Level of Treatment Required,
- Management of Industrial and Toxic Wastes,
- Operator Training,
- Sewer Laws,
- Solid Waste Management,
- Environmental Monitoring.

10.06 Additional significant issues identified which relate to the proposed sludge management facilities include:

- Displacement of Families,
- Loss of Agricultural Land,
- Pollution of Groundwater and Surface Waters by Sludge Bed Filtrate,
- Excessive Heavy Metals in Composted Sludge,
- Pathogens in Composted Sludge,
- Relocation of Cemetery,
- Encroachment into Lake Maryout to Accommodate Sludge Pipeline.

D. Recommended Environmental Plan of Action:

10.07 AID has previously endorsed a wastewater master plan for Alexandria which includes the provision of primary level treatment facilities with discharge of the treated effluent to the Mediterranean Sea via a long outfall. AID has amended the project to include only those portions of the approved wastewater master plan that are compatible with both a land disposal alternative and a sea disposal alternative.

10.08 The Industrial Pollution Control segment of the AID-funded Industrial Production Project is making plant process modifications in a large number of industries and is providing pre-treatment facilities for three industries to reduce the impact of wastewater discharges from those public sector industries in Alexandria which have the greatest loadings on the public sewer system.

10.09 Operator training is an integral element of the project as designed. This amendment proposes even greater training efforts than included in the original project design.

10.10 AGOSD should continue its efforts to enforce the requirements of the Sewer Law with regard to standards for discharge of industrial wastes to the public sewers. Increased efforts on the part of AGOSD have reduced problems associated with the disposal of solid wastes into the public sewer system.

- 10.11 AGOSD will reimburse or relocate to equivalent quarters about 18 families of squatters who are illegally living at the site of the proposed sludge processing facilities.
- 10.12 Approximately 250 feddans of productive agricultural land will be lost as a result of the proposed sludge handling facilities. The use of sophisticated mechanical dewatering facilities could reduce land area requirements; however, the operation and maintenance requirements associated with such facilities are not considered to be appropriate to current conditions.
- 10.13 The proposed sludge handling facilities will include secondary level treatment facilities which are capable of treating filtrate from the sludge drying beds to a level which would minimize any potential pollution to the groundwater and adjacent surface waters.
- 10.14 Activities being conducted under the Industrial Production Project should significantly reduce the amount of heavy metals entering the public sewer system. In addition, it is proposed that AGOSD will routinely measure the concentrations of zinc, cadmium, copper, lead, aluminum, chromium, and boron in the sludge. Records will be maintained as part of the sludge management system to control application rates and allocations of composted sludge to individual farms.
- 10.15 Pathogens in sludge can be inactivated with proper composting. The project design includes training components designed to ensure that AGOSD properly operates the sludge facilities and that the operation is adequately monitored.
- 10.16 AGOSD will either relocate the cemetery which is presently at the site of the proposed sludge facilities or will provide permanent access with visual screening and landscaping at the option of the family owning the cemetery.
- 10.17 About 2 kilometres of the proposed sludge pipeline will be on an embankment to be constructed along the shoreline of Lake Maryout. In order to ensure that the encroachment is kept to a minimum and that construction techniques have minimal impact on the lake, the Department of Fisheries will perform the actual construction of the embankment.

E. Environmental Clearances:

- 10.18 The project as currently designed is in conformance with the requirements of "AID Environmental Procedures" (22 CFR 216) and will provide significant improvements in environmental quality and the public health in the project area. It is important to note that the disposal of primary effluent into Lake Maryout represents an interim solution; ultimately, the GOE will have to make a choice between land disposal and marine disposal of the effluent and complete the wastewater system for Alexandria.

- 10.19 The Bureau Environmental Coordinator has delegated responsibility for issuing environmental clearance for the Project Paper Amendment to the Mission Environmental Officer (see Annex M). The Mission Environmental Officer has conducted an extensive review of this project and issued environmental clearance for same by means of the memorandum included as Annex N.

V #

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05/18/87 DATE 4/30

05/18/87 INITIALS CAE

Alexandria General Organization
for Sanitary Drainage
90 El Horreya Avenue
Alexandria , A.R.E.

Mr. Frank B. Kimball
Director
USAID/Cairo
Egypt

16th April 1987

16 April 1987.

A / 118 / 87.

Dear Mr. Kimball:

This is to request USAID funding in the amount of \$ 63.7 million for Alexandria Wastewater System Expansion project (263-0100).

The \$63.7 million incremental obligation in FY 1987 will increase funding to complete activities financed under Phase I of the Alexandria Wastewater System Expansion project phased implementation plan.

The Government of Egypt (GOE) contribution of cash and inkind assistance to this project totals 302 million Egyptian Pounds.

This project will improve the quality of life of low income residents in unsewered areas of Alexandria and eliminate sewage flooding of streets and beaches by upgrading and expanding the wastewater system of Alexandria.

Sincerely,

Alexandria General Organization
for Sanitary Drainage

By: A. A. Alfa
Ahmed Ahmed Abu Alfa, Chairman

Rec'd 4/22
DR Nk

THIRD AMENDMENT

TO

PROJECT AUTHORIZATION

Name of Country: Arab Republic
of EgyptName of Project: Alexandria
Wastewater
System ExpansionNumber of Project: 263-0100

Pursuant to Part II, Chapter 4, Section 531 (Economic Support Fund) of the Foreign Assistance Act of 1961, as amended, the Alexandria Wastewater System Expansion Project (the "Project") was authorized on August 27, 1979. That authorization is hereby amended as follows:

1. Funding Level and Life of Project. Concerning the first unnumbered paragraph under Section 1 of the First Amendment to the Project Authorization, dated September 28, 1983:

(a) The level of approved planned obligations of Grant funds is hereby increased from One Hundred Ninety-Eight Million, Seven Hundred Thousand United States Dollars (\$198,700,000) to Two Hundred Sixty-Two Million, Four Hundred Thousand United States Dollars (\$262,400,000).

(b) The planned life of the project is increased from eight years to fourteen years, measured from date of initial obligation.

2. Source and Origin of Commodities, Nationality of Services. The following is added to the statement in the original Authorization, as modified by the Second Amendment thereto, concerning eligible uses of A.I.D. Project funds: "In addition, with the agreement of both Parties, A.I.D. funds may be applied to the cost of selected goods of Egyptian source/origin and selected services of Egyptian nationality"

3. Condition Precedent to Funds Available Hereunder. Prior to any disbursement or to the issuance by A.I.D. of any commitment documents pursuant to this Third Amendment to the Project Authorization, the Grantee shall, except as the Parties may otherwise agree in writing, furnish to A.I.D., in satisfactory form and substance, an executed loan agreement between the Grantee and A/GOSD covering the additional funds provided by this Third Amendment to the Project Authorization and containing terms of payment acceptable to the Grantee and A/GOSD.

4. Condition Precedent to Disbursement for Training Activities. Prior to any disbursement or to the issuance by A.I.D. of any commitment documents for the purpose of funding technical assistance for the training of A/GOSD personnel, the Grantee shall, except as the Parties may otherwise agree in writing, furnish to A.I.D., in satisfactory form and substance, evidence of establishment within A/GOSD of a Training Department for personnel to be trained under the Project, together with a statement of A/GOSD's planning for timely staffing of that Department.

5. Covenants. The Amendment to the Grant Agreement shall contain covenants in substance as follows:

(a) Role of the Engineer. New construction contracts financed under the Project shall contain a delegation to the U.S. engineering consultant of the authority to carry out certain duties as specified for "the Engineer" in Parts I and II of standard "FIDIC" terms*. In addition, A/GOSD will exert its best efforts to amend already executed construction contracts to the same effect.

(b) Provisional Sums. New construction contracts financed under the Project shall call for provisional sum arrangements acceptable to A.I.D. In addition, A/GOSD will exert its best efforts to amend already executed construction contracts to the same effect.

(c) Social Insurance. Egyptian social insurance premiums assessable on any new construction contracts financed under the Project shall be cost-reimbursable expenditures to each such contractor and shall be payable by A/GOSD, as a Grantee contribution to the Project.

(d) A/GOSD Contribution. The financial contributions of A/GOSD to the local currency costs of construction contracts shall be met through use of Egyptian pound letters of credit.

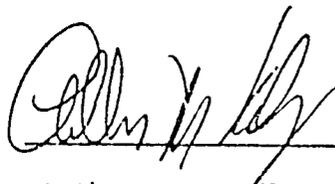
* "Conditions of Contract for Works of Civil Engineering Construction", published by the Federation Internationale des Ingenieurs Conseils (FIDIC); 3rd Edition (March 1977).

(e) Contract Close-out Procedures. A/GOSD will exert its best efforts promptly to complete close-out responsibilities, and to meet payment responsibilities thereunder, with respect to the following project-funded contractors: Perini International Cooperation; Boyle Engineering Corporation/Arthur Young & Company; Wastewater Consultative Group; and Camp, Dresser and McKee.

(f) Wastewater Tariffs. The Grantee agrees to exert its best efforts, over time, to increase wastewater tariffs in Alexandria so as to cover operating and maintenance costs of Project-funded infrastructure. Details concerning progress in this regard will be discussed at least annually within the context of review of the Memorandum of Understanding between the Parties dated January 1984 and related benchmark matrices.

6. Continuation in Force of Previous Authorization Documents. Except as specifically amended above, the original Authorization, as previously amended, remains in full force and effect in accordance with its terms.

Approved: _____



Arthur M. Handly

Acting Director

USAID/Egypt

Date: _____

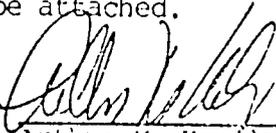
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ANNEX C

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

I, Arthur M. Handly, Acting Director, the Principal Officer of the Agency for International Development in Egypt, having taken into account, among other things, the maintenance and utilization of projects in Egypt previously financed or assisted by the United States, do hereby certify that in my judgment Egypt has both the financial capability and the human resources to effectively install, maintain and utilize the capital assistance to be provided for the Alexandria Wastewater Stage I Expansion Project, as amended.

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



Arthur M. Handly
Acting Director

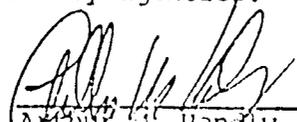
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Date

CERTIFICATION PURSUANT TO
GRAY AGREEMENT

As Acting Director and Principal Officer of the Agency for International Development in Egypt, I certify that full consideration has been given to the potential involvement of small and/or economically and socially disadvantaged enterprises, historically black colleges and universities and minority controlled private and voluntary organizations covered by the Gray Amendment.

The project procurement plan is based on the need to utilize contractors with specific substantial knowledge and technical competence as discussed in Section IV of the Project Paper to which this certification is attached. The necessary knowledge and expertise is not available, to the best of our knowledge, from minority and women-owned firms, historically black colleges and universities and minority controlled private voluntary agencies.



Arthur W. Handy
Acting Director

8/3/87

Date

*

PROJECT CHECKLIST (FY 1987)

Listed below are statutory criteria applicable to projects. This section is divided into two parts. Part A. includes criteria applicable to all projects. Part B. applies to projects funded from specific sources only:
B.1. applies to all projects funded with Development Assistance loans, and
B.3. applies to projects funded from ESF.

CROSS REFERENCES: IS COUNTRY CHECK-
LIST UP TO DATE? Yes
HAS STANDARD ITEM
CHECKLIST BEEN RE-
VIEWED FOR THIS
PROJECT? Yes

A. GENERAL CRITERIA FOR PROJECT

1. FY 1987 Continuing Resolution
Sec. 523; FAA Sec. 634A.

Describe how authorizing and appropriations committees of Senate and House have been or will be notified concerning the project and any change in the project.

Congress has been notified

2. FAA Sec. 611(a)(1). Prior to obligation in excess of \$500,000, will there be (a) engineering, financial or other plans necessary to carry out the assistance and (b) a reasonably firm estimate of the cost to the U.S. of the assistance?

The necessary planning and cost estimate have been completed

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

No further legislative action is required

4. FAA Sec. 611(b); FY 1987 Continuing Resolution Sec. 501. If for water or water-related land resource construction, has project met principles, standards, and procedures established pursuant to the Water Resources Planning Act (42 U.S.C. 1962, et seq.)? (See AID Handbook 3 for new guidelines.)

Yes

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

The Mission has so certified, see annex

6. FAA Sec. 209. Is project susceptible to execution as part of regional or multi-lateral project? If so, why is project not so executed? Information and conclusion whether assistance will encourage regional development programs.

No

7. FAA Sec. 601(a). Information and conclusions whether project will encourage efforts of the country to:
(a) increase the flow of international trade; (b) foster private initiative and competition; and (c) encourage development and use of cooperatives, and credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture and commerce; and (f) strengthen free labor unions.

The project will not impact significantly on items (a) through

8. FAA Sec. 601(b). Information and conclusions on how project will encourage U.S. private trade and investment abroad and encourage private U.S. participation in foreign assistance programs including use of private (trade channels and the services of U.S. private enterprises).

All funds will be expended for goods and services from private US concerns
9. FAA Sec. 612(b), 636(h); FY 1987 Continuing Resolution Sec. 507. Describe steps taken to assure that, to the maximum extent possible, the country is contributing local currencies to meet the cost of contractual and other currencies owned by the U.S. are utilized in lieu of dollars.

The Project Grant Agreement and the GOE has certified all local currency funds required will be provided by the COE
10. FAA Sec. 612(d). Does the U.S. own excess foreign currency of the country and, if so, what arrangements have been made for its release?

No
11. FAA Sec. 601(e). Will the project utilize competitive selection procedures for the awarding of contracts, except where applicable procurement rules allow otherwise?

Yes
12. FY 1987 Continuing Resolution Sec. 521. If assistance is for the production of any commodity for export, is the commodity likely to be in surplus on world markets at the time the resulting productive capacity becomes operative, and is such assistance likely to cause substantial injury to U.S. producers of the same, similar or competing commodity?

N/A

13. FAA 118(c) and (d). Does the project comply with the environmental procedures set forth in AID Regulation 16. Does the project or program take into consideration the problem of the destruction of tropical forests?
- c. Yes
d. N/A
14. FAA 121(d). If a Sahel project, has a determination been made that the host government has an adequate system for accounting for and controlling receipt and expenditure of project funds (dollars or local currency generated therefrom)?
- N/A
15. FY 1987 Continuing Resolution Sec. 532. Is disbursement of assistance conditioned solely on the basis of the policies of any multilateral institution.
- No
16. ISDCA of 1985 Sec. 310. For development assistance projects, how much of the funds will be available only for activities of economically and socially disadvantaged enterprises, historically black colleges and universities, and private and voluntary organizations which are controlled by individuals who are black Americans, Hispanic Americans, or Native Americans, or who are economically or socially disadvantaged (including women)?
- N/A
17. FY 1987 Continuing Resolution Sec. 559. Will this assistance be obligated or expended to procure directly studies or project profiles, or assist directly in the establishment of facilities specifically designed for the manufacturer for export to the United States (or to third countries in direct competition with U.S. exports) of import-
- No

sensitive articles as defined in Section 503(c)(1)(A) and (E) of the Tariff Act of 1930 (19 USC 2463(c)(1)(A) and (E)) (e.g., most textiles, apparel, footwear, handbags, luggage, flat goods, work gloves and leather wearing apparel).

B. ECCONOMIC SUPPORT FUND PROJECT
CRITERIA

1. FAA Sec. 531(a). Will this assistance promote economic and political stability? To the maximum extent feasible, is this assistance consistent with the policy directions, purposes, and programs of part I of the FAA? Yes

2. FAA Sec. 531(c). Will assistance under this chapter be used for military or paramilitary activities? No

3. ISDCA of 1985 Sec. 207. Will ESF funds be used to finance the construction of, or the operation or maintenance of, or the supplying of fuel for, a nuclear facility? If so, has the President certified that such country is a party to the Treaty on the Non-Proliferation of Nuclear Weapons or the Treaty for the Prohibition of Nuclear Weapons in Latin America (the "Treaty of Tlatelolco"), cooperates fully with the IAEA, and pursues nonproliferation policies consistent with those of the United States? No

4. FAA Sec. 609. If commodities are to be granted so that sale proceeds will accrue to the recipient country, have Special Account (counterpart) arrangements been made? No

64

STANDARD ITEM CHECKLIST (FY 1987)

Listed below are the statutory items which normally will be covered routinely in those provisions of an assistance agreement dealing with its implementation, or covered in the agreement by imposing limits on certain uses of funds.

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

A. Procurement

1. FAA Sec. 602. Are there arrangements to permit U.S. small business to participate equitably in the furnishing of commodities and services financed?
Use of small business procedures will be considered if appropriate to the nature and magnitude of procurements
2. FAA Sec. 604(a). Will all procurement be from the U.S. except as otherwise determined by the President or under delegation from him?
Yes
3. FAA Sec. 604(d). If the cooperating country discriminates against marine insurance companies authorized to do business in the U.S., will commodities be insured in the United States against marine risk with such a company?
Egypt does not so discriminate
4. FAA Sec. 604(e); ISDCA of 1980 Sec. 705(a). If off-shore procurement of agricultural commodity or product is to be financed, is there provision against such procurement when the domestic price of such commodity is less than parity? (Exception where commodity financed could not reasonably be procured in U.S.)
There will be no such procurement

5. FAA Sec. 604(g). Will construction or engineering services be procured from firms of countries which receive direct economic assistance under the FAA and are otherwise eligible under Code 941, but which have attained a competitive capability in international markets in one of these areas? Do these countries permit United States firms to compete for construction or engineering services financed from assistance programs of these countries? No
6. FAA Sec. 603. Is the shipping excluded from compliance with requirement in section 901 (b) of the Merchant Marine Act of 1936, as amended, that at least 50 per centum of the gross tonnage of commodities (computed separately for dry bulk carriers, dry cargo liners, and tankers) financed shall be transported on privately owned U.S. flag commercial vessels to the extent such vessels are available at fair and reasonable rates? No
7. FAA Sec. 621. If technical assistance is financed, will such assistance be furnished by private enterprise on a contract basis to the fullest extent practicable? If the facilities of other Federal agencies will be utilized, are they particularly suitable, not competitive with private enterprise, and made available without undue interference with domestic programs? Yes
N/A

8. International Air Transportation Fair Competitive Practices Act, 1974. If air transportation of persons or property is financed on grant basis, will the U.S. carriers be used to the extent such service is available? Yes

9. FY 1987 Continuing Resolution Sec. 504. If the U.S. Government is a party to a contract for procurement, does the contract contain a provision authorizing termination of such contract for the convenience of the United States? Yes

- B. Construction
 1. FAA Sec. 601(d). If capital (e.g., construction) project, will U.S. engineering and professional services be used? Yes

 2. FAA Sec. 610(c). If contracts for construction are to be financed, will they be let on a competitive basis to maximum extent practicable? Yes

 3. FAA Sec. 620(k). If for construction of productive enterprise, will aggregate value of assistance to be furnished by the U.S. not exceed \$100 million (except for productive enterprises in Egypt that were described in the CP)? Yes

C. Other Restrictions

1. FAA Sec. 122(b). If development loan, is interest rate at least 2% per annum during grace period and at least 3% per annum thereafter? N/A

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

3. FAA Sec. 620(h). Do arrangements exist to insure that United States foreign aid is not used in a manner which, contrary to the best interests of the United States, promotes or assists the foreign aid projects or activities of the Communist-bloc countries? Yes

4. Will arrangements preclude use of financing:
 - a. FAA Sec. 104(f); FY 1987 Continuing Resolution Sec. 540, Sec. 525
 - (1) To pay for performance of abortions as a method of family planning or to motivate or coerce persons to practice abortions; 1. Yes
 - (2) to pay for performance of involuntary sterilization as method of family planning, or to coerce or provide financial incentive to any person to undergo sterilization; (3) to pay for any biomedical research which relates, in whole or part, to methods or the performance of abortions or involuntary 2. Yes
 3. Yes

- sterilizations as a means of family planning;
(4) to lobby for abortion? 4. Yes
- b. FAA Sec. 488. To reimburse persons, in the form of cash payments, whose illicit drug crops are eradicated? Yes
- c. FAA Sec. 620 (g). To compensate owners for expropriated nationalized property? Yes
- d. FAA Sec. 660. To provide training or advice or provide any financial support for police, prisons, or other law enforcement forces, except for narcotics programs? .Yes
- e. FAA Sec. 662. For CIA activities? Yes
- f. FAA Sec. 636 (i). For purchase, sale, long-term lease, exchange or guarantee of the sale of motor vehicles manufactured outside U.S., unless a waiver is obtained? Yes
- g. FY 1987 Continuing Resolution, Sec. 503. To pay pensions, annuities, retirement pay, or adjusted service compensation for military personnel? Yes
- h. FY 1987 Continuing Resolution, Sec. 505. To pay U.N. assessments, arrearages or dues? Yes

10

- i. FY 1987 Continuing Resolution, Sec. 506. To carry out provisions of FAA section 209 (d) (Transfer of FAA funds to multilateral organizations for lending)? Yes

- j. FY 1987 Continuing Resolution, Sec. 510. To finance the export of nuclear equipment, fuel, or technology? Yes

- k. FY 1987 Continuing Resolution, Sec. 511. For the purpose of aiding the efforts of the government of such country to repress the legitimate rights of the population of such country contrary to the Universal Declaration of Human Rights? Yes

- l. FY 1987 Continuing Resolution, Sec. 516. To be used for publicity or propaganda purposes within U.S. not authorized by Congress? Yes

- 5. FY 1987 Continuing Resolution, Sec. 544. If project provides funds to a private voluntary organization, has such PVO failed to provide upon timely request any document, file or record necessary to AID's auditing requirements? N/A

TECHNICAL ANALYSIS

I. BACKGROUND

AID involvement with the upgrading and expansion of the Alexandria wastewater system began in 1977 with the financing of a master plan. This plan was completed in 1978 by CDM and identified numerous rehabilitation and expansion activities. At that time, the sewerage system in Alexandria was overloaded and in poor condition resulting in significant problems with flooding. Not only would the collection system require attention but also the treatment plants would need to be upgraded and expanded and an effective effluent disposal system provided.

The Master Plan recommended rehabilitation of the existing system, extensions to the existing system and the addition of preliminary treatment to the system. After an extensive evaluation of the technical, economic and environmental merits of a variety of alternatives the Master Plan recommended that sewage effluent be disposed through marine outfalls after preliminary treatment (screening and grit removal). Although there was heavy GOE interest in agricultural reuse of the effluent, the economics at the time were such that reuse was not attractive relative to marine disposal. Following a major environmental review of this scheme in 1979 it was decided to upgrade the treatment of the effluent prior to marine disposal to primary treatment from preliminary treatment. (Primary treatment includes the screening and grit removal associated with preliminary treatment plus provides for settling of solids thereby generating sludge.)

AID signed a grant agreement based on the above strategy with AGOSD in FY 1979 and authorized \$167 million to be used to upgrade and expand the collection system and treatment plants and to provide disposal of effluent by marine outfall. Upon initiation of the project, AGOSD recommended that the Master Plan be reviewed by a new consulting consortium (WWCG) who would, because of strong local opposition to marine discharges as well as GOE policy which encourages water reuse, more critically examine the effluent disposal question. The result of the review was that WWCG reiterated the recommendation in the original plan but did suggest that reuse may become economical in the future when the demand for water resources became greater. Even with this review, the debate on effluent disposal continued and an incremental implementation plan was adopted so that the non-controversial elements could be completed. The provision of effluent disposal would be deferred to the future.

The phased implementation plan specifically provided for:

- (a) immediate initiation of collection system improvements,
- (b) subsequent upgrading of the East and West treatment plants including sludge disposal and

- (c) deferral of the effluent disposal system construction to Phase II which is not funded by the present project. (Items (a) and (b) are included in Phase I while item (c) is in Phase II.)

The implication of the above strategy is that the present discharge of raw sewage to the sea by inadequate outfalls would cease and the sewage would be transported to the treatment plants after the collection system improvements are completed. The treatment plant discharge would be to Lake Maryout which is inferior to land or sea disposal but is considered to be an interim measure. It has the merit that the pecuniary economic cost is minimal although environmental damage to the lake is substantial while the GOE is finalizing its strategy for effluent disposal. Meanwhile, the plant would provide the primary treatment that will be required regardless of the decision of land versus sea disposal.

It should be noted that the delays which have occurred resulted in cost increases which necessitated a prior amendment (Amendment I) to the project, increasing the funding level to \$198.7 million. The present status is that the collection system improvements and sewage treatment rehabilitation is fully funded and the work is proceeding. What is not funded is the sludge disposal system and additional institutional development activities which should be carried out if the utility is to efficiently operate and maintain the system. As stated previously, effluent disposal is not part of Phase I and therefore no funding will be provided for this component under this project.

The following technical analysis will focus on the issue of sludge disposal by examining the decisions which have been made which support the consultant's recommended plan. Institutional development, economic and social analyses and a detailed environmental analysis are found in other annexes although cost and environmental factors will be introduced where appropriate into the following technical analysis.

II. SLUDGE MANAGEMENT ALTERNATIVES

The East and West Sewage Treatment Plants will produce an estimated combined weight of 188.4 metric dry tons of sludge each day under Phase I flows (410 and 175 million liters per day for the East and West plants, respectively). Sludge production will increase to 324.3 dry tons per day under Phase II flows. The volume of sludge produced depends on the concentration. For the purposes of visualization of the magnitude, at 2% solids concentration a 1 hectare field (100 meters x 100 meters) would be filled to a depth of almost one meter with sludge every day under Phase I flows. The object of the sludge management strategy is to dispose of this sludge in the most cost effective manner while at the same time protecting the environment of Alexandria and, if possible, recycle the organic sludge as a resource.

The following sections will describe the various major options and then analyze the major decisions which have been made resulting in the recommended plan. Options will be examined based on economic, technical, environmental and human factors.

A. Major Options for Sludge Disposal

The practical options for Alexandria are:

1. Incineration
2. Landfill
3. Composting

No action is obviously not a viable alternative given the fact that the treatment plants are being rehabilitated and expanded under an existing contract. Sludge will be produced and therefore, will need disposal. Also considering the requirements of the Environmental Impact Statement as prepared for the original project, Sea Disposal is not a viable alternative on environmental grounds. Cost data which follows have been taken from EPA sources (ref. 1). Although these costs are for the U.S., the relative comparison between options should be approximately the same for Egypt.

1) Incineration:

This option requires the sludge to be mechanically dewatered to 20 to 40% dry solids concentration. This is usually accomplished with a belt press or vacuum filter. Environmentally acceptable incineration requires adequate air pollution abatement devices and proper disposal of sludge ash in a sanitary landfill. The estimated cost in dollars are:

	<u>Capital (\$x10⁶)</u>	<u>Annual O&M (\$x10⁶)</u>
Belt filter dewatering	16.2	2.5
Multiple hearth furnace	22.0	3.2
Ash Disposal	2.0	0.2
Total	<u>\$40.2</u>	<u>\$5.9</u>

Incineration requires a high degree of management and maintenance in order to function economically and is generally usually only indicated for applications which have large volumes of sludge and an absence of available land for landfill and/or land application.

2) Landfill:

This has been the most popular option in the United States for disposal due to its simplicity and inexpensiveness. It now is becoming less attractive due to the concern for groundwater pollution and the desire to recycle sewage sludge to land as a soil amendment. Landfilled sludges are usually digested or lime stabilized prior to disposal in the landfill. Lime stabilization is more attractive than digestion for operational, cost and foreign exchange considerations. It is assumed that lime stabilized sludge is landfilled after pumping 30 kilometers to the site. The cost of land is assumed to be negligible. The estimated costs for the landfill option are:

	<u>Capital (\$x10⁶)</u>	<u>Annual O&M (\$x10⁶)</u>
Land	-	-
Pipeline	22.7	0.7
Line Stabilization	0.5	2.4
Landfill	2.0	2.0
Total	\$25.2	\$5.1

The main disadvantage to landfill disposal is that there is no use of the sludge. This is counter to the Egyptian experience where organic materials such as sludges are normally utilized as soil amendments.

3) Composting:

This process is becoming more popular world-wide as experience has increased with the operation of this relatively simple process. Composting produces a stabilized organic material which has a low pathogen (disease-causing organism) content and a substantial nutrient composition (nitrogen, potassium, phosphorous, trace metals, etc.). The material is used as a soil amendment, particularly in sandy soils because of not only the nutrient content but also the need to increase the water-holding capacity of the soil. With sufficient application of sludge and time to mature, the treated soil can become more productive and develop the characteristics of a loamy soil.

For Alexandria it is assumed that the sludge will be transported by pipeline 30 kilometers to agricultural lands for composting. The final product will be given to farmers at no charge. The sludge would be dried on sand beds prior to window composting. Recycled compost would be used as a bulking agent. Land is evaluated at no cost.

Estimated costs are:

	<u>Capital (\$x10⁶)</u>	<u>Annual O&M (\$x10⁶)</u>
Pipeline	22.7	0.7
Sand Drying Beds	18.0	2.7
Composting	6.0	1.3
Total	\$46.7	\$4.7

Although the compost is assumed above to be given to farmers, it would be valid to assign a value to the compost due to its value as a recycled resource. The annual value of the compost is \$0.8 million assuming a unit value of 20 LE per dry ton. (0.5c/lb.)

B. Evaluation of Alternatives:

The identified alternatives can now be evaluated to determine which is most attractive for the Alexandria application. The alternatives are evaluated based on the following factors:

111

- . economic
- . environmental
- . appropriateness

Appropriateness is a catchall for considerations such as reliability, flexibility, ease of operation, ability to expand capacity and political factors.

The following is a summary of cost information:

	Cost (\$x 10 ⁶)		Present Worth (2)		
	Capital	Annual O&M	4%	6%	8%
Incineration	40.2	5.9	142.2	121.4	106.6
Landfill	25.2	5.1	113.4	95.4	82.6
Composting	46.7	4.7	128.0	111.4	99.6
Composting(1)	46.7	3.9	114.1	100.4	90.6

1. Considers economic value of composted product (\$0.8 million/year).
2. Evaluates all alternatives over 30 year period at three different interest rates. This assumes that the economic life of all options is the same.

The present worth analysis clearly indicates that based solely on cost, landfill is the least cost means of sludge disposal. However, this does not take into account site specific, environmental or political factors which will now be discussed for each alternative.

Incineration is the most expensive alternative and is also unattractive due to:

- 1) requires higher level of operator attention,
- 2) is not flexible,
- 3) increases air pollution problems,
- 4) creates ash disposal problems,
- 5) requires large amounts of energy.

It should not be considered further.

The landfill option is somewhat less expensive than composting (12-17% lower) if no credit is given for the value of the compost product. With this credit landfill is only slightly less expensive (1-9%). Landfilling and composting have roughly equivalent present worths. It should also be noted that the composting operation requires a much higher capital investment (\$46.7M versus \$25.2M) due to the cost of the composting process itself. However, one should compare this increased capital cost against the reduction in operation and maintenance cost taking the credit for the value of the compost into account. When this is done, the calculated rate of return on the additional capital investment is almost 4%. This is confirmed by inspection of the previous table when one compares the present worth sums at 4% interest rate (\$113.4 versus \$114.1 Million). The result is that composting is economically attractive if 4% is a satisfactory estimate of cost of capital.

Composting is also preferable to landfilling from an environmental viewpoint. There is a greater chance of groundwater pollution emanating from a landfill, particularly an unlined one as assumed here. Lining the landfill would be quite costly and cause it to be economically unattractive. In addition, for any particular site, total costs associated with either landfill or composting include transportation of the sludge to the site. For the Alexandria project, no suitable landfill site is available within an economically suitable distance, further increasing the landfill option cost for this particular project.

Composting allows an organic resource to be recycled and used in the reclamation of desert or sandy soils. Although substantial, the nutrient content of the sludge compost is not high. Solely based on nitrogen and phosphorous content, it is generally true that chemical fertilizers are a more economic source of these macro-nutrients, however, sludge compost also provides micro-nutrients, trace metals (necessary for plant growth) and organic matter. Chemical fertilizers do not provide such a wide range of beneficial substances. Sandy soils require that organic matter be incorporated into the soil matrix if the water-holding capacity is to be increased. For sandy soils, when one takes factors other than nitrogen and phosphorous into account, sludge compost is the economic choice relative to chemical fertilizers or should be applied in conjunction with chemical fertilizers.

The project should provide for monitoring of sludge heavy metal content. Application rates to soils can then be developed so that toxicity problems should not occur. Local government agencies should provide guidance to the users on techniques for incorporation of the sludge compost into the soil.

Composting and landfilling require similar levels of operator skill for efficient operation. Both processes are flexible and can be easily expanded. However, over the economic life of the operation land requirements are less for composting due to off-site transport of the product. Composting is considered politically more acceptable than landfilling particularly when one notes the successful operation of the World Bank funded solid waste compost plant in Alexandria. Observations indicate that this solid waste plant is efficiently operated and farmers are willing to purchase the compost for 4-6LE per cubic meter. It should be noted that, for political and institutional reasons, co-composting of solid waste and sludge does not appear to be attractive, however, it is an option which should be encouraged in the future.

The cost comparison of each sludge disposal alternative for Site 9N is as follows

	Composting at Site 9N	Land Disposal 25 Km from Site 9N	Incineration at Site 9N
Capita, 10 ⁶ LE:			
Phase I	12.7	19.0	39.6
Phase II	10.7	17.9	34.1
Annual O&M, 10 ⁶ IE/yr:	1.6	2.4	2.5
Present Worth, 10 ⁶ LE			
Phase I Capital	12.0	17.9	37.4
Phase II Capital	<u>9.0</u>	<u>15.0</u>	<u>28.6</u>
Capital Subtotal	21.0	32.9	66.0
Replacement	1.6	1.3	3.0
Salvage	(2.0)	(4.8)	(2.0)
O&M (x9.712)	<u>15.5</u>	<u>23.3</u>	<u>24.3</u>
Total Present Worth	36.1	52.7	91.3

Present worth includes allowances for amortized construction costs, equipment replacement, 15 years of operation and maintenance costs, and a credit for salvage values at the end of 15 years. All costs brought back to mid-1987 for the present worth analyses. Assumed interest rate of 6 percent. Phase 1 and 2 capital expenditures assumed July 1988 and July 1990, respectively. Phase 1 and 2 facilities assumed operational late 1989 and late 1991, respectively. Given Site 9N as the available, suitable, obtainable site, the composting alternative becomes the least cost option of the 3 viable methods.

C. Recommendation:

Alexandria Wastewater System should utilize composting as a means of sludge disposal. The compost should be used for the reclamation of sandy soils for productivity enhancement of existing agricultural lands, and for increasing agricultural acreage. It is crucial to the success of this strategy that adequate institutional/commercial arrangements be made to provide for transportation of the compost from the processing plant to the end-user and proper incorporation into the soil. If adequate attention is not given then it is likely that economic benefits will be reduced and environmental damage may occur.

III. ANALYSIS OF RECOMMENDED ALTERNATIVE

Composting has been shown to be the preferred method of sludge disposal for the Alexandria Wastewater System. Not only is it attractive from the technical/economic viewpoint, it is environmentally and socially sound as discussed elsewhere. With the GOE's need to reclaim sandy soils to increase agricultural production in response to population growth pressures, organic material should be recycled whenever feasible. The following analysis will focus on the major decisions made in the conceptual design of the composting system.

A. Site Selection:

Site selection for composting is the most fundamental decision because it will impact on the remaining decisions and affect overall process economics. Almost five years have elapsed since efforts to identify a site were initiated. The evaluation of sites is documented in references 2, 3, 4 and 5. Approximately 25 sites were evaluated with input from various ministries (Housing, Agriculture, Defense) and local government. They were studied in a comparative manner reducing the number to 15 which were then more intensively examined. The most promising sites after the intensive evaluation were sites 9N, 10, 12 and 18.

Site 10 is the furthest (45 kilometers) from the West Treatment Plant. Site 12 is at the West Treatment Plant, but would need to be built on reclaimed land. Site 18 is only 10 kilometers from the treatment plant, however it is next to the oil refinery in a wetlands, marsh area. Site 9N is about 30 kilometers from the treatment plant next to lands programmed for agricultural development.

The evaluation of sites should note the following considerations:

1. Compost will generally be transported to the south where it will be used in land reclamation.
2. Locating of the composting site closer to agricultural land reduces the hauling cost to farmers while increasing the sludge transport cost to the utility.
3. Making compost available closer to agriculture development lands may be necessary to entice farmers to make the investment in reclaiming land.
4. Site selection will affect the economics of sludge transport/processing.
5. Site selection should take into account environmental factors such as proximity to residential areas (flies, odors).
6. Site selection affects the managerial/supervisory requirements.

The site selection process as documented in references 2-5 have taken the above considerations into account. The documents demonstrate that a sufficiently rigorous process has been used to select site 9N. A synopsis of the site selection rationale follows.

Site 9N is in the outer fringe of urban/semi-urban development and close to agricultural lands, however, not as far away as site 10 which would require greater capital investment and operating costs and not yield any substantial advantage over site 9N.

Site 12 is next to the treatment plant and therefore transport cost to the utility is negligible. However, this savings is lost by the investment required to reclaim land next to the lake. Cost of special site development is LE 30 million versus LE 32 million for the pipeline. Consequently total cost is about the same, but the compost product is 30 kilometers further from the agricultural lands. Therefore farmer demand would be less due to higher transportation costs to the farmer. It might even be necessary for the utility to incur the additional cost of trucking the compost to distribution points near agricultural areas if the compost is to be fully utilized.

Site 18 is attractive in that it is in a relatively unpopulated industrial area near rail, road and canal transport. However, it is located in an area which is reserved for industrial expansion and the site would require substantial filling due to its low elevation near the lake. Taking into account the extra site work, these costs more than offset the transport savings (10 km versus 30 km pipeline). From reference 2:

	<u>Cost (in Millions of LE)</u>	
	<u>Site 9N</u>	<u>Site 18</u>
Sludge transfer between plants	2,920	2,920
Sludge pipeline to pump station	8,830	8,830
Booster Pump Station	3,730	3,360
Sludge Force Main	19,210	2,940
Special Site Preparation	--	25,440
Drying Beds and Compost Plant	44,150	44,150
Filtrate Disposal	4,085	4,085
Total Estimated Cost	82,925 LE	91,725 LE

It should be noted that the consultant also examined the impact of mechanical dewatering on the comparative economics of site selection. For site 12 some capital investment savings would result (about LE 7 million), however, O&M costs would be increased by LE 1.5 million each year. Only at interest rates of 20% or greater would this be an economic choice. The impact of dewatering on drying bed economics is examined later.

In summary, site 9N is the most attractive of available sites.

79

B. Composting Process:

Prior to composting, sludge dewatering is required. For site 9N, two methods of dewatering were analyzed - Mechanical Dewatering and Sand Drying Beds. Table 11 (following page) shows the cost of Sand Drying Beds to have the lowest present worth. Also, Sand Drying Beds are easier to operate, easier to maintain, require little foreign exchange and are easily expanded. Sand Drying Beds are the preferred option.

The two major composting options are aerated pile or windrow composting. Aerated pile composting is a higher rate process which requires careful operation but will produce a stabilized product of good quality in less time than windrow composting. Recognizing the absence of indigenous experience with the aerated pile process it is not recommended that the aerated pile process be used. For the future, it might be attractive to establish a small pilot facility.

To respond to the present needs, a windrow process is recommended. Composted sludge would be recycled as a bulking agent and to adjust water content. The World Bank funded solid waste composting facility (160 ton/day) at Alexandria has demonstrated that the windrow process can be operated satisfactorily. The key to successful operation is to keep the process design basic with a minimum of mechanical equipment. The consultant should study this operation as a basis of design for the sludge composting system.

C. Transportation:

Sludge must be transported from each of the sewage treatment plants to the composting plant site. It is assumed that no transport of compost from site 9N will be provided under the project. For this application the decision is between pipeline transport of undewatered sludge versus truck transport of dewatered sludge (Dewatering would be done at the sewage treatment plants). The truck option was indirectly evaluated when the site 12 option was examined in the previous section. If sludge were dewatered at the plants it would be logical to then compost as well at the plant site even with transport of liquid sludge from the East to the West site. Transport of uncomposted cake to a remote site such as site 9N for composting would be even more expensive than the basic site 12 option which is already as expensive as transporting liquid sludge by pipeline to site 9N. (Obviously, the site 12 option plus transportation of compost to site 9N for distribution is also more expensive than the basic site 9N or site 12 options.) Therefore, it can be concluded that given site 9N, sludge transport should be by pipeline.

5

TABLE 11
COST COMPARISON OF SLUDGE MANAGEMENT ALTERNATIVES
(WITH PRIMARY TREATMENT)

O&M AND PRESENT WORTH, MILLION LE

	<u>Mechanical Dewatering At WTP & Composting at Site 12</u>	<u>Mechanical Dewatering At WTP & Composting at Site 9N</u>	<u>Sand Drying Beds and Composting at Site 9N</u>
<u>Annual Operation and Maintenance</u>			
Sludge Pumping	0.2	0.2	1.9
Sand Bed Dewatering	-	-	-
Mechanical Dewatering	4.3	4.3	4.3
Filtr./Supern.Disp.	0.1	0.1	0.5
Composting	1.6	1.6	1.6
Trucking	0.5	1.7	-
O&M Total LE	6.7	7.9	5.7
<u>Present Worth</u>			
Phase I Construction	105.5	90.9	137.6
Phase II Construction	<u>84.7</u>	<u>68.6</u>	<u>61.4</u>
Total Construction	190.2	159.5	199.0
Replacements	9.3	10.3	4.5
Salvage	(13.8)	(13.8)	(33.4)
O&M (x.9.712)	65.1	76.7	55.4
Present Worth Total LE	250.8	232.7	225.5

NOTE:

Present worth includes allowances for amortized construction costs, equipment replacement, 15 years of operation and maintenance costs, and a credit for salvage values at the end of the 15 years. All costs brought back to mid-1987 for the present worth analyses. Assumed interest rate of 6 percent. Phase 1 and 2 capital expenditures assumed July 1988 and July 1990, respectively. Phase 1 and 2 facilities assumed operational late 1989 and late 1991, respectively.

The consultant presented a proposed design for the pipeline transport system on 8 December 1986 with the minutes documented as reference 6. In brief, the consultant proposed the following:

1. Sludge from the East sewage treatment plant will be discharged to a collector for resettling at the West Plant.
2. Primary sludge at the West Plant will be pumped to equalization tanks and blended to 2.0-2.5% solids concentration.
3. Blended sludge will be pumped using a single positive displacement pump station through a 29 kilometer welded steel high pressure force main to site 9N.

Reference 6 is an attachment to this annex and the reader is free to consult it for details. The following will address several issues raised by the consultants recommended design.

Design capacity of pipeline - The pipeline is designed to handle Phase II flows (year 2000) although the treatment plants are only upgraded to Phase I flows (year 1990). Shouldn't the incremental pipeline capacity be provided later, thereby delaying some investment and reducing today's cost? This is not recommended for the following reasons:

1. Phase II (year 2000) is for planning purposes very near and therefore, the present worth of the cost savings is small. Further, the cost to install a second pipeline later will be high as an incremental cost. In other words, it is cheaper to do the job once providing reasonable future capacity now.
2. Having a dual pipeline allows for greater operation and maintenance flexibility. Present flows would only require one line in operation. Phase II would require both. Under Phase II conditions, therefore, if one pipeline was shutdown for repair, the other could still pump. The consequence is that sludge would buildup at this treatment plant and storage capacity must be provided to handle this event.

Sludge transfer from East to West Plants - The consultant recommends discharge of settled sludge at the East Plant to a collector for resettling at the West Plant. Although this on the surface appears odd, it is justified. The alternative would be a sludge force main to the West Plant for repumping to the composting site. This cost is substantial (\$6-8 million). The recommended means will only result in the increased cost of providing adequate solids handling capacity in the primary settling system at the West Plant.

The primary settling tanks would not require upsizing because it is the hydraulic (clarification) component which usually affects cross-sectional area requirements. What would be required is

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approximately an extra meter of depth to provide for the increased solids influx. Also the sludge removal pumps will need to be increased in capacity to handle the 240% surcharge. It has been estimated that this cost will be less than the cost of a sludge transfer force main. Operationally, it will also be easier to resettle the sludge than to use a force main and provide a receiving station at the West Plant.

Sludge Force Main Pump Station - The consultant originally based his design on using centrifugal pumps with a booster station and 600 mm ductile iron pipe. It is now possible to obtain quality welded steel pipe of 450mm maximum diameter locally. This will result in higher operating pressures if the number of pipes is held to two. Reference 7 describes the revised recommended design.

The consultant, through a computerized optimization procedure, recommended that sludge be pumped at 2.0-2.5% solids concentration. This results in minimum head loss (lower energy costs) given use of the 450mm steel pipe. Use of this solids concentration also eliminates the need for thickening at the sand dewatering beds at site 9N. Based on the consultant's analysis, the cost of thickening the sludge from the incoming 2-2.5% concentration does not provide sufficient savings in drying bed cost to justify the additional cost for thickeners and the added complexity of operation.

There are two major options for sludge pumping:

1. High pressure diaphragm pumps which do not require intermediate booster stations.
2. Centrifugal pumps which require two booster stations.

Lower pressure with the centrifugal pumps does not allow any savings due to change in pipeline materials of construction. Further, diaphragm pumps have an advantage over centrifugal pumps if solids concentration at the blending facility is not carefully controlled. The diaphragm pump output is essentially insensitive to moderate changes in operating pressure (solids concentration affects operating pressure). Centrifugal pump output is relatively sensitive to operating pressure. Therefore if centrifugal pumps are used then the equalization tanks would need to be expanded to allow for greater variability of pump discharge.

The most useful comparison is that of cost:

<u>Pipeline Pumping System</u>	<u>Capital Cost (\$ x 10⁶)</u>
Diaphragm pump system	\$5.9
Centrifugal pump system	\$7.9



It should be pointed out that the centrifugal pumping system would also require higher O&M costs, be less flexible due to the need to coordinate the operation of a main and two booster pump stations and be more susceptible to shutdowns due to the increased number of components. In summary, the diaphragm pump system is technically and economically more attractive.

D. Filtrate Treatment:

Filtrate from the drying beds and run-off from the composting area will be collected and treated biologically to meet GOE standards of 60 mg/l BOD and 50 mg/l suspended solids prior to discharge into an irrigation drain. Plastic media filters followed by rapid sand infiltration is the proposed system. The consultant also states that mechanically aerated polishing lagoons can be substituted for the rapid sand infiltration system.

Either system should provide adequate treatment of the wastewater. The system incorporating the lagoon is preferred for operational reasons. A lagoon is less prone to upset and requires less operational attention.

IV. SUMMARY

This analysis has concluded that a compost system for wastewater sludge treatment in Alexandria is technically sound. A cursory economic analysis has likewise indicated that it is also the preferred option taking into account GOE policy objectives concerned with desert reclamation. Table 13 presents a tabulation of the evaluation factors used for each of the viable alternatives. The proposed Sand Drying Bed and Composting at Site 9N is the APPARENT BEST ALTERNATIVE.

Composting, however, does require that AGOSD take special measures to insure that benefits will be accrued and environmental damage is minimized. These include:

- o completion of process plant flow changes reducing the strength of industrial waste discharges presently underway by GOFI;
- o enforcement of existing pre-treatment standards;
- o providing effective training to it's operational personnel so that the system is operated correctly;
- o making appropriate institutional arrangements to distribute and utilize the compost product;
- o monitoring the application sites to ensure that the compost is being effeciently utilized and environmental problems do not develop.

TABLE 13

SUBJECTIVE EVALUATION OF SLUDGE MANAGEMENT ALTERNATIVES (WITH PRIMARY TREATMENT)

<u>Evaluation Factors</u>	<u>Sand Drying Beds & Composting at Site 9H</u>	<u>Mechanical Dewatering with Vacuum Filters at the Treatment Plants & Composting at Site 12</u>	<u>Mechanical Dewatering with Vacuum Filters at the Treatment Plants & Composting at Site 9H</u>
Phase 1 Construction Cost	High	Low	Low
Phase 2 Construction Cost	Low	High	High
Operation & Maintenance Cost	Medium	High	High
Total Present Worth	Low	Medium	High
<u>Constructability</u>			
Time for Design	Short	Long	Long
Soil Type at Site	Calcareous Silty Loam	Organic Lake Deposits and Soft Clay Subsoils	Calcareous Silty Loam
Depth to Groundwater	>10 meters	-2 meters	>10 meters
Average Site Elevation	40 meters	-4 meters	40 meters
Special Foundations Required	No *	Yes	No *
Site Preparation	Simple	Difficult	Simple
Time for Construction	Medium	Long	Medium
<u>Land Acquisition</u>			
Site Ownership	Governorate	Governorate	Governorate
Land Area Required	500 HA	45 HA	125 HA
Force Main Length to Site	29 Km	N/A	N/A
Conflict with Land Use Plans	No	Yes	No
Proximity to Agricultural Land	Excellent	Poor	Excellent
<u>Process Operability</u>			
Ease of Operation	Moderate	Difficult	Difficult
Energy Requirements	Medium	Medium	Medium
Reliability	Good	Fair	Fair
Annual Polymer Use	None	High	High
Polymer Availability	Not Required	High Risk	High Risk
Repair/Replacement Requirements	Low	High	High
Labor Requirements	High	High	High
Sludge Transport Visibility	Minimal	High	High

(APPARENT BEST ALTERNATIVE)

* Special Foundations are required for all work at the West Plant or Site 12.

DETAILED COST FORECAST

<u>Project Cost Forecast Phase I</u>				
Contract No.	Project Title	LE x,1000	USD x,1000	Basis
17-81/82	Abu Qir Ph. I	200	----	As Bid
34-81/82R	Smouha - Phase I	6,400	----	As Bid and Change Order
02&03-82/83	Pump Station Rehab.	1,800	----	As Bid
41-82/83	FM - PS 6, 7 & 8E	300	----	As Bid
39-82/83	Blower Installation	200	----	As Bid
45-82/83	Sidi Bishr Collector	5,110	----	As Bid
31-82/83	FM - PS 11E	168	----	As Bid
08-82/83	Abu Qir Collector and Force Main	5,536	----	As Bid and Change Order
07-82/83	Smouha Ph. 4 Lats.	1,848	----	As Bid
55-82/83	Sidi Bishr Conv.	1,099	----	As Bid
08-83/84	Abu Qir Maamoura Lts.	7,847	----	As Bid
09-83/84R	Siouf Kebliia Ph. 3&4	4,000	----	As Bid
22-83/84	WTP Fill & Surcharge	1,027	----	As Bid
01-AID-83/84	New Pump Stations	10,070	24,310	As Bid
02-AID-83/84	W.Z, & Siouf ** Tunnels	11,390	37,700	As Bid + Estimate
03-AID-83/84	E/W Treatment Plants	23,700	61,000	As Bid
06-84/85	Hydrodrome Drain	924	----	As Bid

* Includes allowance of \$1.82M and LE 0.49 M for revised Abu Qir P.S.
 ** Includes allowance for West Zone Collector Extension at LE 3/49M and \$6.0M.

Contract No.	Project Title	LE x,1000	USD x,1000	Basis
07-84-85	Smouha & E.Z. Under-Xing	22,600	----	Estimate
08-84/85	Smouha Force Main	8,100	----	As Bid
09-84/85	East Zone Force Main	21,000	----	Estimate
	Sludge Disposal Facilities	105,300	36,900	Estimate
	CDM Construction Contracts	2,500	8,800	Bid
	SUBTOTAL	241,090	168,710	
	Construction Contingencies	24,110	11,207	10% & 7%
	SUBTOTAL CONSTRUCTION	265,200	179,917	
	Dekheila Area BODR Management Serv. - Boyle	--	1,330	Estimate
	Training Services	500	6,000	Consultant
	Engineering Services:	--	6,000	Estimate
	. CDM	2,600	2,500	Contract Amt
	. WWCG	12,960	66,293	Contract Amt
	Land Acquisition/mapping	10,000	---	Estimate
	Road Department-Repaving	4,000	---	Estimate
	RR Undercrossings	1,000	---	Estimate
	Owner Furnished Pipe & Mats	6,100	---	Estimate
	TOTAL ESTIMATED PHASE I COSTS	302,360	262,040	
	Other Project Related Costs**	<u>87,000</u>	<u>360</u>	Estimate
	Total Funds to be Committed	389,360	262,400	

** Other project related costs consist of:

- o LE 60,000,000 for emergency wastewater facilities
- o LE 25,000,000 for sewer projects done under AID Loan
- o LE 2,000,000 for owner furnished pipe and materials
- o Project funded Audit, Evaluation and Project Assistant

CASH FLOW - PHASE I
US. DOLLARS
X 1000

COMPONENT	CONTRACT NUMBER	1987	1988	1989	1990	1991	PROJECT SUB-TOTAL	PROJECT TOTAL
Pump Stations	01-AID-83/84	9838	1396	507	0	0	11741	22490
Abu Qir Pump Station		764	1011	45	0	0	1820	1820
Tunnels	02-AID-83/84	9436	7469	1637	290	0	18832	31700
W.Z. Extensions		402	3198	2400	0	0	6000	6000
E&W STP Upgrade	03-AID-83/84	11580	24592	20824	2169	1784	60949	61000
W. Plant Sludge Mod.		285	3015	1700	0	0	5000	5000
Sludge EM & Lake Fill	04-AID-86/87	1640	2946	3508	0	0	8094	8094
Sludge Processing	05-AID-86/87	0	8153	13082	2654	0	23889	23889
Other AID Projects	AID	0	0	0	0	0	0	8800
Sub-Total	-----	33945	51780	43703	5113	1784	136325	168793
Contengency	-----	2806	3780	3113	908	600	11207	11207
Sub-Total Construct Costs	-----	36751	55560	46816	6021	2384	147532	180000
Engineering Services	-----	9080	8730	6900	2669	0	27379	69040
Related Costs	-----	0	0	0	0	0	500	8500
Technical Assistance	-----	0	3340	2660	0	0	6000	6000
Other Project Costs	-----	0	0	0	0	360	360	360
Sub-Total	-----	9580	12070	9560	2669	360	33739	83400
Grand Total	-----	45831	67630	56376	8690	2744	181271	262400

Note: The difference between the Sub-Total and the Total Column is the amount paid to date.

CASH FLOW - PHASE I
Egyptian Pounds
X 1000

COMPONENT	CONTRACT NUMBER	1987	1988	1989	1990	1991	PROJECT SUB-TOTAL	PROJECT TOTAL
Pump Stations	01-AID-83/84	3331	1001	237	0	0	4569	9580
Abu Qir Pump Station		227	253	10	0	0	490	490
Tunnels	02-AID-83/84	3241	2017	387	93	0	5738	7900
W.Z. Extensions		211	1675	1255	349	0	3490	3490
EGW STP Upgrade	03-AID-83/84	7150	9861	6233	270	216	23730	23730
W.Plant Sludge Mod.		102	1086	762	50	0	2000	2000
Sludge FM & Lake Fill	04-AID-86/87	6860	11088	15666	686	0	34300	34300
Sludge Processing	05-AID-86/87	0	22220	31676	12744	1360	68000	68000
Smouha Combined Collectors Phase I	34-81/82-R	1035	1029	0	0	0	2064	6400
Abu Qir Collectors Phase II	08-82/83	947	1248	1166	0	0	3361	5536
Smouha FM & Drain	08-84/85	2111	2037	3421	461	86	8116	8100
Smouha & East Zone Undercrossings	07-84/85-R	4776	10384	6790	650	0	22600	22600
East Zone Force Main	09-84/85	0	9235	10085	1575	525	21420	21000
Siouf Keblia & Hagar El Nawatiya Ph. 3 & 4	09-83/84-R2	1005	1962	912	99	0	3978	3978
Sidi Bishr Collect.	45-82/83	321	742	742	508	0	2313	5110
Smouha Ph. 4 Lats.	07-82/83	48	112	170	0	0	330	1840
Sidi Bishr Convey.	55-82/83	23	0	0	0	0	23	1099
A.Q. Maamoura Lats.	08-82/83	2418	4030	785	0	0	7233	7847
Maryout Lakeshore Fill	AGOSD	1000	0	0	0	0	1000	1000

CASH FLOW - PHASE I (Con't)
Egyptian Pounds

UNITS X 1000

COMPONENT	CONTRACT NUMBER	1987	1988	1989	1990	1991	PROJECT SUB-TOTAL	PROJECT TOTAL
Other LE Projects	AID	0	0	0	0	0	0	7120
Sub-total	-----	34806	79980	80297	17485	2187	214755	241120
Contingency	-----	3903	8968	9004	1961	245	24080	24080
Sub-Total Construct Costs	-----	38709	88948	89301	19446	2432	238835	265200
Land Acquisition	-----	2144	2856	0	0	0	5000	10000
Engineering Services	-----	0	0	0	0	0	0	16060
Repaving/Under'xing	-----	501	1172	827	0	0	2500	5000
Owner Furnished Mat'l.	---	0	0	0	0	0	0	6100
Sub-Total	----	2645	4028	827	0	0	7500	37160
Grand Total	----	41354	92976	90128	19446	2432	246335	302360

Note: The difference between the Sub-Total and the Total Columns is the amount paid to date.

TECHNICAL ASSISTANCE BUDGET

<u>TRAINING*</u>	<u>US Dollars</u>	
-Project Manger, 48mm	960,000	
-Project Assistant Manger, 48mm (E)	120,000	
-Support Staff and Vehicles	222,000	
-Training Coordinator, 30mm	600,000	
-Training Specialist I, 30mm	600,000	
-Training Specialist II, 30mm	600,000	
-Commodities	150,000	
		<u>3,252,000</u>
<u>MATERIAL AND EQUIPMENT MANAGEMENT</u>		
-Specialist, 18mm	360,000	
-Commodities	140,000	
		<u>500,000</u>
<u>MANAGEMENT INFORMATION SYSTEMS</u>		
-Specialist I, 24mm	480,000	
-Specialist II, 12mm	240,000	
-Commodities	550,000	
		<u>1,270,000</u>
<u>UTILITY MANAGEMENT</u>		
-Short-term US Professionals 48mm x 7000	336,000	
-Short-term US Professional Travel 48mm x 4000	192,000	
-Egyptian Participant Costs 80mm x 5000	400,000	
-Commodities	50,000	
		<u>978,000</u>
	<u>TOTAL</u>	<u>\$6,000,000</u>

* Training element includes Project Management and miscellaneous costs

Methods of Implementation and Financing

In accordance with the requirements of the Sixteen Payment Verification Policy Statements No. 5 and 9 the following table illustrates the methods of implementation and financing for AID funds currently in use and to be continued in this project paper amendment.

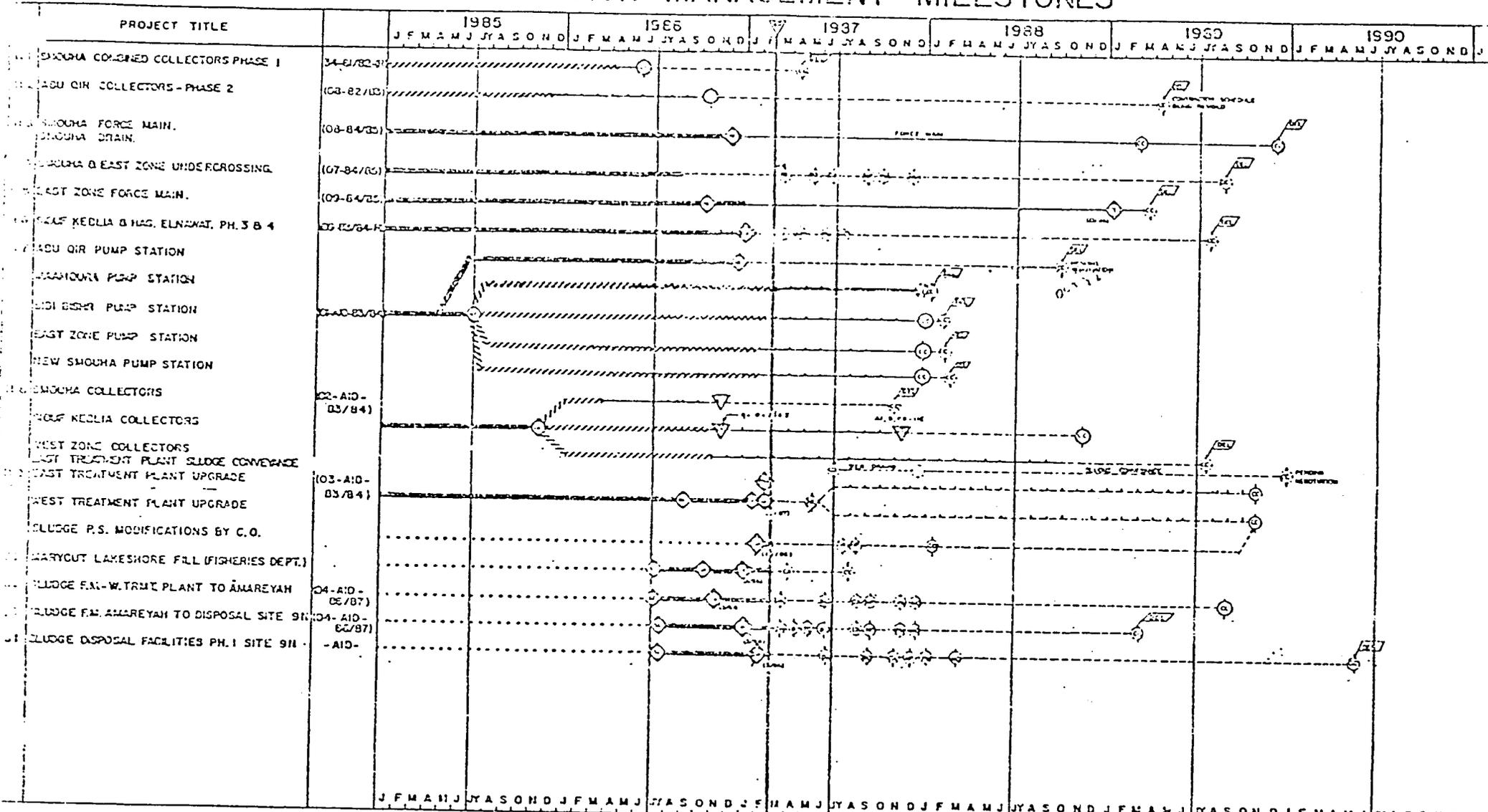
<u>Activity</u>	<u>Methods of Implementation</u>	<u>Methods of Financing</u>	<u>Approximate Cost (\$1000)</u>
Engineering Services	AID Direct Contract	Direct Reimbursement	\$1,330
Technical Assistance	AID Direct Contract	Direct Reimbursement	6,000
Construction	Host Country Contract	Direct L/Comm*	54,710
Evaluation & Audit	AID Direct Contract	Direct Reimbursement	360
			<u>63,700</u>

* Justification:

The justification for use of the Direct L/Comm is that the GOE does not have the financial resources to make dollar payments to contractors because of a severe shortage of foreign exchange.

92

CONSTRUCTION MANAGEMENT MILESTONES



LEGEND:

- [Hatched] EXHAUST PROGRAM (UPPER 42)
- [Dashed] STATUS LINE (HOW FAR FROM SET TARGET)
- [Circle with dot] ENGINEER'S FORECAST
- [Diamond] SET TARGET (SHORTER DURATION FORECAST)
- [Square with dot] SCHEDULE CHANGE (DELAY / ADVANCE) - SINCE LAST REVISION
- [Triangle up] LATEST CONTRACT EXECUTION DATE (ACTUAL)
- [Diamond] ACTUAL COMPLETION DATE
- [Triangle down] CONTRACTUAL MILESTONE DATE
- [Circle] CONTRACTUAL COMPLETION DATE

MILESTONE SYMBOLS:

- SD - START BY DATE
- DA - DESIGN APPROVAL
- IB - INVITATION TO BID
- TC - PM - FORMAL CONFERENCE
- BO - BID OPENING
- BT - BIDDING TARGET (10% / 15%)
- MP - REQUEST FOR PROPOSAL
- CC - CONTRACT UNDER
- CE - CONTRACT EXECUTION
- MP - NOTICE TO PROCEED
- PM - PRECONSTRUCTION MEETING
- NC - NOTICE TO ADVANCE CONSTRUCTION
- CC - CONSTRUCTION COMPLETE

REVISION NO. 10
STATUS: DCL 28 JAN 88
BASELINE LINE:

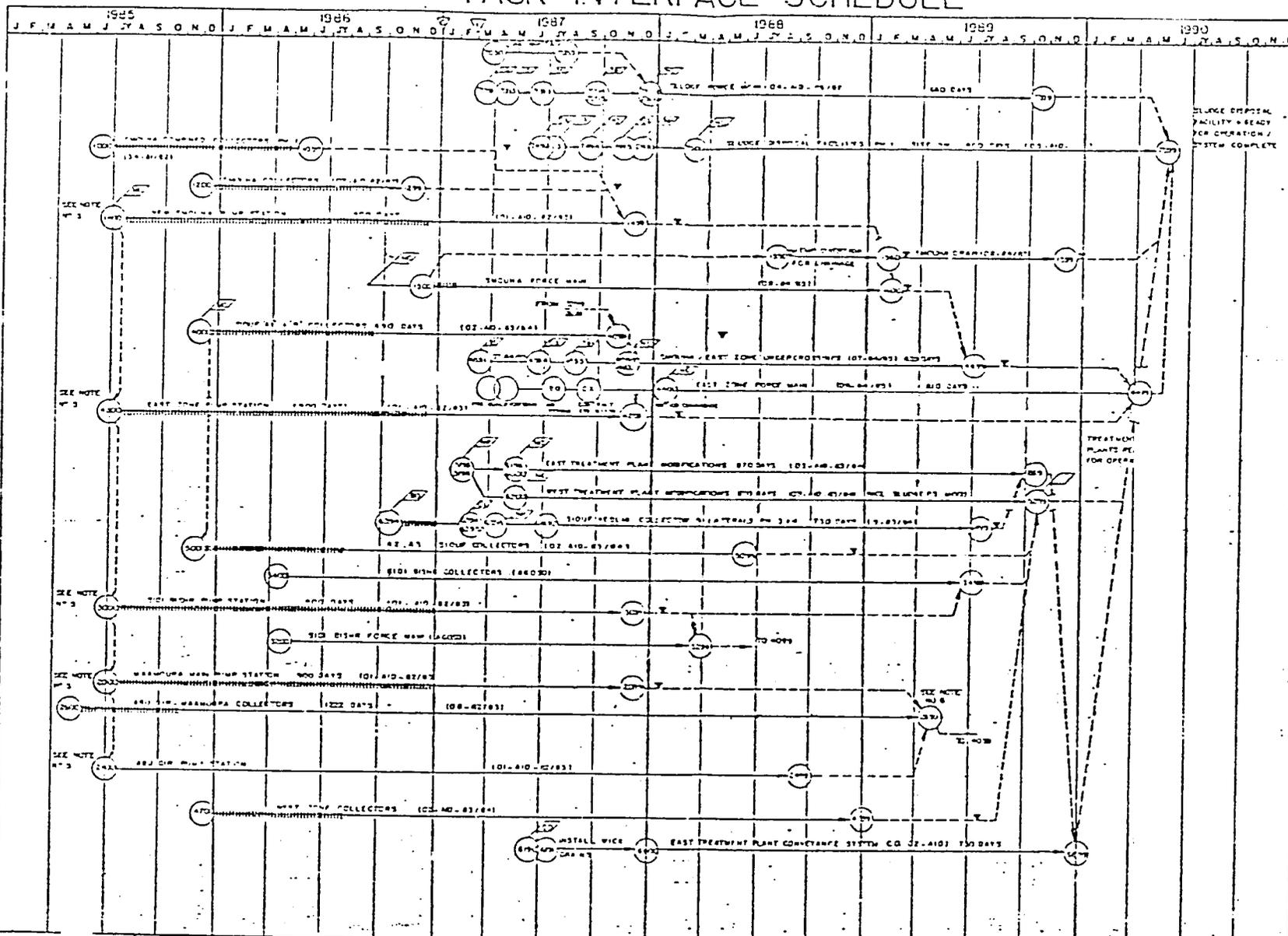
WASTEWATER CONSULTANTS GROUP
W.W.C.G.
WARITH/EGC

ALEXANDRIA GENERAL ORGANIZATION FOR SANITARY DRAINAGE
ARAB REPUBLIC OF EGYPT
الهيئة العامة للأشرف الصحي لمحافظة الإسكندرية
محافظة مصر الغربية

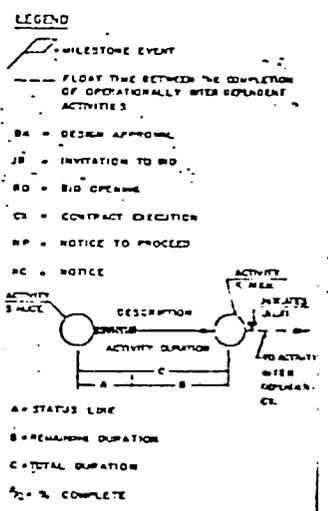
ALEXANDRIA WASTEWATER SYSTEM
UPGRADE & EXPANSION
W.W.C.G. PROJECTS PHASE I

SCALE:
DATE: _____
SHEET / OF: 1 / 1
DWG NO: _____
CIA-O: _____

ALEXANDRIA WASTEWATER SYSTEM EXPANSION PHASE I TASK INTERFACE SCHEDULE



- NOTES:**
1. COMPLETION DATES AND DURATIONS ARE FOR AWARDED CONTRACTS ENGINEER ESTIMATES AND ESTIMATED DURATIONS USED FOR UNAWARDED WORK.
 2. INTERDEPENDENCIES SHOWN ARE OPERATIONAL AND THE COMPLETE SCHEDULE IS LAD OUT TO SHOW TOTAL SYSTEM OPERATION THROUGH BOTH TREATMENT PLANTS AND SLUDGE FACILITIES.
 3. SCHEDULE SHOWS WWCC MANAGED WORK ONLY EXCEPT IN CASES WHERE WORK BY OTHERS IS REQUIRED TO PUT WWCC PERSONNEL INTO OPERATION.
 4. THIS SCHEDULE IS COMPUTERIZED ON WWCC PROJECT CONTROL AND IS SCHEDULED BY MONTH UNDER FILE NUMBER. A COMPUTER PRINT-OUT OF SCHEDULE COMPUTATIONS CAN BE USED AS A CROSS-REFERENCE FOR CORRECT INTERPRETATION OF THE SCHEDULE.
 5. IN ADDITION SCHEDULE STATUS DOES INCLUDE CONTRACTOR SUBMITTED REVISED BASELINE SCHEDULE MODIFICATIONS THROUGH AND ON PER ESTIMATED COMPLETION DATES.
 6. ANY OF UNAWARDED PROJECTS COMPLETION DATES AFFECTING OF CONTRACTS WILL BE SHOWN UNDER REVISIONS.
 7. DETAILED SCHEDULING EQUIPMENT CASES OF CLEAN RELIABLE UNITARY.
 8. EAST TOWN FORCE MAIN FORECASTED COMPLETION BASED UPON A TYPICAL SCENARIO.



REVISIONS BY CHK DATE	DESIGNED DRAWN CHECKED DATE	WASTEWATER CONSULTANTS GROUP WWCC WARITH/ECG	ALEXANDRIA GENERAL ORGANIZATION FOR SANITARY DRAINAGE ARAB REPUBLIC OF EGYPT الهيئة العامة للصرف الصحي لمحافظة الاسكندرية جمهورية مصر العربية	APPROV REG NO SCALE DATE SHEET / OF 1 / 1	DWG NO. CPM-01
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INSTITUTIONAL DEVELOPMENT
SCOPE OF WORK

1.10 Definition of Services:

The purpose of the consultant's services is to provide Operations Management Services to AGOSD to develop the organization's ability to address the management and operation needs of the new and existing facilities of the Alexandria Wastewater System.

To achieve this purpose the consultant will provide the services outlined in Section 1.2, and equipment to be procured in support of these services as outlined in Section 1.6.

1.20 Operations and Maintenance Training

As stated in the Project Agreement, AGOSD will have identified a Training Department Director; adequate training staff representing AGOSD's Operations and Maintenance divisions for the Collection System, Pump Stations, Treatment Plants, and Sludge Facilities, the Transportation Department and the Equipment Department; administrative and support staff; building space appropriate for offices, classrooms and workshops, and sufficient budgetary resources.

Working in a counterpart, team relationship with AGOSD's identified training personnel, the consultant will develop a comprehensive O&M Training Department Development Plan. At a minimum the plan will include five major activities, including: Trainer Training, Program Planning and Identification, Program Development, Program Implementation, and Monitoring and Evaluation.

1.21 As a first stage, the consultant will conduct short-term Trainer Training for identified AGOSD training staff. This activity will introduce and acquaint the training staff to O&M training skills. During the subsequent phases, the AGOSD trainers will have an opportunity to implement, test, and develop these skills.

1.22 During the second stage, Program Planning and Identification, the consultant will work with AGOSD's Training staff to develop and furnish a centralized and/or satellite training center(s), conduct personnel skill and facility/equipment performance testing throughout AGOSD's O&M divisions to determine training needs, and develop a detailed training development schedule.

1.23 Based on the identified field training needs and priorities, the consultant/AGOSD team will develop appropriate supervisory, operations, maintenance and safety training curriculums, and supporting training manuals/handbooks, reference cards, standard procedures, preventive maintenance checklists, training aids, cutaways and audio-visual aids. During the Program Development stage, the consultant/AGOSD team will coordinate with the

facility-specific pre start-up and start-up training efforts provided by the engineer and construction contractor to ensure standardization of methodology and terminology, and to develop appropriate training programs integrating W&CG's and Fru-Con's facility-specific O&M procedures.

- 1.24 During the Program Implementation stage training delivery will occur. The AGOSD trainers will deliver technical and supervisory training modules to field personnel. Trainer skills and the developed curriculums and materials will be field tested. The consultant will advise AGOSD in the revision/refinement of training delivery and supporting materials.
- 1.25 The fourth stage, Monitoring and Evaluation, will begin following the completion of initial training deliveries, with the development of performance evaluation systems to test the skills of trained personnel, and the O&M performance of facilities/equipment with trained personnel. The performance evaluation systems will be implemented as required, and the results will determine the appropriate follow-up training response. Training follow-up and retraining curriculums will be designed and developed as are required.
- 1.26 The consultant will procure the required equipment and supplies required for this activity.
- 1.27 Anticipated Output:

At the conclusion of this activity, AGOSD will have an operational training department with the staff, equipment and budgetary resources to support the long-term training needs of AGOSD's operating divisions. AGOSD's Training Department will have the expertise and skills to develop and modify O&M training courses, standard procedures, maintenance systems, and performance evaluation systems to meet AGOSD's future O&M training needs.

1.30 Material and Equipment Management Systems

Plan and develop with AGOSD a Material and Equipment Management Plan which will provide for the systematic development of AGOSD's capability to plan, procure and manage its construction materials, spare parts, supplies, equipment and vehicles.

- 1.31 The Material and Equipment Management Plan will include: (1) an analysis of AGOSD's current procurement systems, and the development of simplified and automated procurement planning and tracking systems and procedures compatible with GOE regulations and requirements; and (2) assistance to AGOSD in the identification and analysis of materials/equipment handling storage issues, the compilation of a complete inventory, and the development of

at

simplified inventory control procedures and automated inventory control systems. The consultant will procure the required equipment, and train AGOSD's staff in its use and application.

1.32 Anticipated Output:

At the conclusion of this activity AGOSD will have a simplified material/equipment procurement tracking system in place, a complete inventory of AGOSD's material/equipment resources, and personnel trained in the application of the automated inventory control system.

1.40 Management Information Systems:

Plan and develop with AGOSD a Management Information Plan which will provide for the development of appropriate management information systems required to manage the expanded Alexandria Wastewater System.

1.41 The Management Information Plan will assess AGOSD's information needs in the areas of personnel administration, accounting, budgeting, auditing, beneficiary access and use (e.g. hookups and consumption), and general administration. The plan will design conceptual-level system improvements, and identify and develop appropriate manual and automated systems. The consultant will procure the required hardware and software, and train AGOSD's staff in the application and use of the systems and equipment.

1.42 The consultant will also be responsible for the design of monitoring and evaluation systems which provide some measure of social impact and differential access. Working with AGOSD's Public Relations Department, the consulting firm will design and supervise the implementation of rapid, low cost impact studies which produce indicative evidence of how the project financed system improvements have impacted the residents of Alexandria. These studies will include a particular focus on how the upgraded and expanded system impacts the lives of women.

1.43 Anticipated output:

At the conclusion of this activity AGOSD will have new and simplified manual and automated management information systems in place, and personnel trained in the application of the systems.

1.50 Utility Management Assistance:

The consultant will plan and develop an annual Utility Management Assistance Plan with AGOSD management staff. The plan will identify specific management, administrative, and technical areas within AGOSD in need of technical assistance. Based on AGOSD's

needs, the consultant will develop an annual activity schedule for technical assistance to be conducted in the United States and in Egypt utilizing long-term "twinning" or on-the-job working relationships between key AGOSD personnel and counterparts from an American wastewater utility.

The consultant will be required to ensure that AGOSD staff participating in this activity fulfill USAID's Handbook 10 requirements, have the proper USAID and AGOSD approvals, and that twinning activities in the US and follow-up activities in Alexandria are closely monitored and reported.

1.51 Anticipated Output:

It is expected that approximately 20 AGOSD personnel will participate in twinning activities in the US and approximately 12 US utility specialists will work with AGOSD counterparts in Alexandria on an annual basis.

1.52 Reports:

The consultant firm will be required to provide detailed monthly progress reports. Progress in institutionalizing the new programs, systems and procedures will be reported on. In addition, detailed reports on incountry and US training activities will be provided. These reports will indicate the status of all participants, verify the return of each participant and review the effectiveness of the training provided.

1.53 The consultant will develop specifications for the procurement of commodities to support the implementation of the institutional development activities. Such procurements would be made in accordance with AID Handbook 11 Chapter 3.

1.6 Illustrative Commodity Procurement

OPERATIONS AND MAINTENANCE TRAINING

Training vehicle(s)
Reproduction equipment
Bilingual Computer software and hardware
Audio visual equipment
Demonstration tools & equipment
Mockups/Cutaways
Training Reference Materials
Safety equipment
Training center furnishings
Supplies, consumables and processing/printing

MATERIAL AND EQUIPMENT MANAGEMENT SYSTEMS

Bilingual Computer hardware and software
Miscellaneous office equipment

MANAGEMENT INFORMATION SYSTEMS

Bilingual Computer hardware and software
Miscellaneous office equipment

UTILITY MANAGEMENT ASSISTANCE

Miscellaneous Equipment

5 May 1987

Subject: Project Implementation Letter No. 31-1
Alexandria Wastewater System Expansion
Project No. 263-0100

Dear Mr. Chairman:

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1. Introduction.

This is a revision of PIL No. 31 dated 24 November 1986. It reflects the sharing of duties and responsibilities between AGOSD and WWCG, as the Engineer, as embodied in the Fourth Amendment to the Project Grant Agreement (PGA).

2. Background.

a. USAID is partially financing the Alexandria Wastewater System Expansion (AWSE) Project for the Government of Egypt (GOE), which is represented by AGOSD as the GOE's Contracting Agency. Pursuant to the PGA, USAID has contracted with WWCG to provide the engineering design, construction management, training and program management to AGOSD for the Project.

b. Prior to 1 January 1986, the engineering services provided by WWCG to AGOSD were performed under a Host Country Contract (HCC) partially financed by USAID.

c. Effective 1 January 1986, USAID agreed to a direct contract between USAID and WWCG (Contract 263-0100-C-00-6051-00, executed on 10 June 1986) for these services. Consequently, USAID will oversee WWCG's execution of its duties for AGOSD through at least mid-1989.

d. The scope of that contract will benefit AGOSD primarily by providing WWCG's engineering, construction management, operations and maintenance, assessment of training needs, training, and startup services to AGOSD.

e. The contract between USAID and WWCG will provide to AGOSD the means to insure that the design and construction of the improvements under the Project will meet the needs and standards of both AGOSD and USAID.

f. This PIL is issued pursuant to the first sentence of Article A of Annex 2 to the PGA. It sets out the intentions of USAID regarding the provision of these services to AGOSD by WWCG, and the exercise of certain powers by WWCG. This letter also establishes WWCG's authority to act on behalf of AGOSD and USAID.

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g. The powers and authority granted to WWCG by this letter shall be reflected in all future construction contracts awarded by AGOSD for the AWSE Project and for which WWCG is to be AGOSD's Engineer, and all such contracts currently in force shall be modified to conform to the terms of this letter.

h. WWCG shall be liable to AGOSD only for damages arising from WWCG's sole negligence. If WWCG receives from a third party a claim arising from WWCG's performance of the duties and responsibilities stated in this letter or stated in the construction contracts for which WWCG is acting or has acted as the Engineer, WWCG shall immediately report the same to AGOSD; and thereafter AGOSD shall defend and negotiate the settlement of and pay all sums due in respect of such claim and shall indemnify WWCG in respect thereof and in respect of all claims, proceedings, costs, charges, expenses and fees in relation thereto, including attorney's fees, except insofar as such claim or such other claims, proceedings costs, charges, expenses and fees have arisen from the sole negligence of WWCG.

3. AGOSD responsibilities.

a. Act as the contracting agency for all construction contracts awarded for execution of the AWSE Project. In this capacity, cooperate fully with WWCG and the construction contractors, to facilitate and expedite the work:

1) Recognize WWCG as AGOSD's sole Program Manager and principal engineering consultant for AWSE, with full authority to act in this capacity pursuant to the terms of its contract with USAID.

2) Allow to WWCG the freedom of action to serve as

a) Contractor to USAID as the funding agency,

b) Consultant to AGOSD as the contracting agency, and

c) Supervisor of the execution of construction by individual USAID-financed and GOE-financed construction contractors.

3) Except as otherwise stated herein, communicate with contractors supervised by WWCG only through WWCG. Refer contractors to WWCG if they attempt to communicate directly with AGOSD.

4) Act as the Engineer for all contracts being executed under the direct supervision of AGOSD. Coordinate with WWCG, and keep WWCG fully informed regarding the activities

of AGOSD-supervised contractors in order to minimize interferences among the various contractors.

b. Obtain in a timely manner all real estate, easements, rights of way, traffic and street closure permits, and any other permits, clearances, licenses or performances of functions required by AWSE contractors. All matters of property ownership and rights of way are to be resolved before the Invitation for Bids is released to prospective tenderers.

c. Prepare correspondence, as requested by WWCG, for delivery to appropriate Government agencies by WWCG and the U.S. construction contractors in connection with their obtaining visas and entry, exit and residence permits for their personnel, and the permits, clearances and licenses referred to in Paragraph 3b above. Provide a copy of such correspondence to WWCG.

d. Assist WWCG and the U.S. construction contractors, by personal appearances where required for expeditious action, in obtaining customs clearance for AWSE equipment and materials and for the personal effects and household goods of their personnel.

e. Observe the completion and final inspections conducted by WWCG, and accept all work completed in accordance with the terms of the construction contracts.

f. Pay any amounts due to the construction contractors that are certified by WWCG and that are not paid or to be paid by USAID, within 21 days after receipt of the payment request from WWCG, unless within 14 days after receiving the request from WWCG AGOSD has advised WWCG in writing of its intent to withhold all or part of the payment requested and the contractual justification for withholding payment. Pay any such withheld amounts pursuant to WWCG's findings on the matter.

1) WWCG will be USAID's sole agent for certification of contractors' requests for dollar payments. Requests so certified will be forwarded directly to USAID for action. AGOSD will receive a copy for information only. If AGOSD questions any payment so certified, AGOSD may advise WWCG of the contractual basis for its concern, and provide USAID with an informational copy of its letter.

2) Interest on delayed or improperly withheld payments shall accrue at the rate of 9% per year.

g. Act on all other WWCG requests or recommendations for AGOSD approval or other action, within 30 calendar days after receipt of WWCG's written communication. Failure to respond to a recommendation within 30 days shall constitute acceptance of the recommendation. Failure to take a

requested action may be cause for WWCG's finding merit in a contractor's claim arising from or related to that failure.

h. Furnish equipment, materials and services to contractors in a timely manner in accordance with contract terms, where a contract calls for such Owner-furnished items.

i. Provide two full-time Area Managers acceptable to USAID, to act as liaison officers between AGOSD and WWCG, between WWCG and the Contractors who are supervised directly by AGOSD, and between WWCG and other Government agencies whose support is required by WWCG or by contractors who are supervised by WWCG. Delegate to these Area Managers the authority to act for AGOSD as required. These Area Managers shall be engineers with at least 12 years of post-graduate engineering experience. They will work directly with WWCG's Resident Engineers, one on USAID-financed contracts and one on Egyptian-pound-only contracts. Other than as requested or permitted by the WWCG Resident Engineer in question, the Area Manager shall have no direct authority over any contractor who is being supervised by WWCG.

j. Assign, at AGOSD's discretion, up to one Site Engineer at each Site where a WWCG-supervised contractor is actively executing construction, to observe WWCG's performance. These Site Engineers shall have at least 8 years of post-graduate engineering experience. They may observe tests and inspections conducted by WWCG personnel. They will not be responsible for conducting tests or inspections, and shall not issue instructions to the contractors or communicate officially with the contractors' personnel without the express permission of the senior WWCG representative then present at the Site.

k. Assign, at AGOSD's discretion and in addition to the Site Engineers described in Paragraph 3j above, the following trainee field engineers:

- One at each Pump Station
- Three for the Tunnels contract
- Two at each Treatment Plant
- One for each pound-only pipeline contract
- Two for the Sludge Force Main (when active)
- Two for the Sludge Management Facility (when active)

These trainees shall each have a minimum of 4 years of post-graduate engineering experience. Each shall be approved by USAID, which shall have sole discretion in accepting them for training. They shall report directly to, perform at the direction of, and be under the full-time operational control of, the WWCG Resident Engineer or the person designated by that Resident Engineer, who will render bi-monthly reports to USAID and AGOSD on their performance and potential.

DRAFT

m. Establish a Technical Guidance Committee that will provide WWCG the direction and assistance needed during the development of feasibility studies, preliminary and final designs. This committee shall keep abreast of the technical work as it develops, sign the minutes of meetings when called upon to do so, and be prepared after a final review to accept and sign the completed design documents, including those related to changes that exceed WWCG's approval authority for Change Orders.

n. Supply to WWCG all available data on a requested subject from AGOSD's files, provide design standards or standards details and advise of preferred methods of operation, site orientation, and other architectural and engineering requirements in a timely manner.

o. Participate and cooperate with WWCG in its performance of the training assessment, startup services and O&M manual preparation requirements stated in Paragraphs 7a and 7b below. Nominate and provide qualified and willing Training Officers and trainees; relieve them of their other duties as required for the preparation and conduct of training. Provide the facilities (classrooms, desks etc.) for the training. Provide timely and complete review comments on draft manuals and other documents forwarded to AGOSD by WWCG.

4. WWCG general responsibilities.

a. WWCG is AGOSD's Engineer and Program Manager for all contracts for which WWCG is or will be responsible under this Project. In this role, WWCG advises and assists AGSOD on all engineering planning, design, construction execution, operations, maintenance and training matters, and on matters of contractual and budget planning and implementation.

b. WWCG is AGOSD's exclusive Construction Manager for supervising, monitoring, observing, testing, inspecting, rejecting, directing and approving all contractually-related work and actions of the contractors whose contracts WWCG is responsible for.

c. The scope of the proposed work by WWCG shall be stated in a Scope of Services statement that will be agreed upon by AGOSD, USAID and WWCG before the work begins. The Scope of Services shall include the following specific duties and responsibilities where applicable:

1) Coordinate with AGOSD, and keep AGOSD fully informed, regarding the activities of the contractors whose actions are being supervised by WWCG. Prepare agenda for, participate in, and keep minutes of, weekly Coordination Meetings with the Chairman of AGOSD and members of his staff.

DRAFT

104

- 2) Communicate with the contractors who are being supervised directly by AGOSD, only through AGOSD; such communication will normally be effected through the Area Managers assigned to WWCG by AGOSD.
- 3) Advise AGOSD of all requirements for real estate, easements, rights of way, traffic and street closure permits, and any other permits, clearances or licenses required by contractors being supervised by WWCG.
- 4) Advise AGOSD of all correspondence that WWCG or the contractors for which WWCG is the Engineer require to be prepared by AGOSD, and of the pertinent contractual, PGA or Economic Assistance Agreement provisions to be relied upon or cited.
- 5) Insure that where the personal appearance of a member of AGOSD's staff at another Government agency is required to achieve expeditious resolution of any matter of concern to WWCG or a contractor being supervised by WWCG, a representative of the affected party is also in attendance.
- 6) Accept AGOSD's representative as an integral member of the Project team that accomplishes the completion and final inspections of the work, and respond to any reasonable comments, suggestions or recommendations put forth by that representative in connection with such inspections.
- 7) Respond within 30 days to any questions put forth by AGOSD regarding payment certifications; take such questions into account when certifying future payment requests.
- 8) Train AGOSD's trainee engineers; use them beneficially, so that they will be capable of replacing WWCG after the construction contracts have been completed. Advise AGOSD and USAID of the trainees' performance through periodic performance evaluations, to enable the individuals to improve themselves.

5. WWCG planning and design responsibilities.

- a. Conduct feasibility studies, and preliminary and final designs; prepare topographic maps; establish survey control networks; investigate existing utilities and geotechnical conditions; prepare the reports, final design drawings and specifications, all as requested by AGOSD and authorized by USAID.
- b. Feasibility studies shall be conducted beginning from the data supplied by AGOSD and supplemented by data from any sources available to either AGOSD or WWCG. Close liaison shall be maintained with AGOSD's Technical Guidance Committee

so that upon completion of the studies, the conclusions will have been discussed and understood in advance by AGOSD. Studies shall be formally presented in final draft form and, upon AGOSD's review and approval and with the concurrence of USAID, be published and distributed for use.

c. Preliminary designs shall be conducted in close liaison with AGOSD and shall conclude with a Basis of Design Report (BODR). The BODR shall be presented in draft and shall be finalized upon receipt of concurrence by both AGOSD and USAID. The purpose of the BODR is to establish the basis for planning and costing the final design effort. Any variance from the BODR may result in additional cost and time during the final design process.

e. WWCG shall provide specialized review of designs developed locally by WWCG, through Technical Review Committees drawn from the joint venture firms' resources or from specialty consultants if needed. These reviews will be provided at appropriate times during the development of the work. The findings of these reviews will be presented in an oral presentation followed by a written set of minutes that can be signed by all participants.

f. In general, WWCG will maintain close contact with AGOSD throughout the design process, with meetings becoming more frequent as milestones approach; take into account all requests from AGOSD that are stated in writing and timely received; and review and explain technical aspects and cost implications of the design as it develops.

6. WWCG construction management responsibilities.

a. Prior to advertisement.

- 1) Schedule pre-advertisement activities; assign responsibilities.
- 2) Determine the appropriate Time for Completion of the work.
- 3) Prepare the Order of Magnitude Estimate (OME); establish the Provisional Sum at 20% of OME.
- 4) Write the contract and sign the drawings.
- 5) Prepare the Invitation for Bids (IFB); secure approval of AGOSD and USAID.
- 6) Pre-qualify prospective tenderers; advertise for prequalification statements if required.
- 7) Prepare the Budget Estimate; adjust the Provisional Sum (both dollars and pounds) to a round

106

figure in the range of 12-24% of the Budget Estimate; maintain strict need-to-know confidentiality of the estimate and the true percentages, so that tenderers cannot "bid to the estimate".

- 8 Determine that sufficient funds are available, and that all matters of real estate acquisition and rights of way are satisfactorily resolved.
- 9) Recommend advertisement, where applicable; obtain approval of AGOSD and USAID.

b. From advertisement to commitment of funds.

- 1) Advertise or prepare advertisements for AGOSD; distribute the IFB's.
- 2) Act as the single point of contact for inquiries, and for responses to same.
- 3) Conduct the Pre-tender Conference at AGOSD; AGOSD and USAID to attend.
- 4) Issue addenda as required. Advise AGOSD and USAID of all changes that are being contemplated, and invite comment. Formal concurrence by AGOSD is required only for substantial, policy-related changes to the General Conditions. USAID may disapprove any change to the IFB.
- 5) Prepare the final Engineer's Estimate.
- 6) Receive two copies of tenders (three, for USAID-financed contracts); send a copy to USAID if applicable.
- 7) Analyze and evaluate the tenders; obtain additional information as required; secure USAID's informal approval of the tender to be recommended for award.
- 8) Recommend award (AGOSD to approve award within 30 days); AGOSD and USAID (where applicable) may adjust the Provisional Sum upward as they see fit, but downward no further than to 15% of the successful tenderer's Tender Price exclusive of the Provisional Sum.
- 9) Communicate AGOSD's decision to USAID and to planholders.
- 10) Receive post-tender submittals.

DRAFT

107

- 11) Prepare the Agreement.
 - 12) Receive, verify and approve post-award submittals (performance and mobilization guarantees, insurance, Project Control Components).
 - 13) Re-confirm AGOSD fund availability; for USAID financed contracts, confirm that USAID has tendered the Letter of Commitment (L/Comm) to the Contractor.
- c. Notice to Proceed (NTP), to first payment request.
- 1) Assist AGOSD to issue the Notice to Proceed.
 - 2) Certify mobilization payments.
 - 3) Monitor mobilization, and social insurance determination.
 - 4) Develop Project Control Components, and payment request format.
 - 5) Conduct the Preconstruction Conference; AGOSD and USAID to attend.
 - 6) Establish the monthly pay period.
 - 7) Issue the Notice to Commence.
 - 8) Certify the first payment request.
- d. To completion of construction.
- 1) Watch and inspect the execution of the work; test and examine materials and workmanship. Explain and adjust ambiguities and discrepancies in the Contract Documents. Be the sole source of instructions to the Contractor, who must execute the work to the satisfaction of WWCG. WWCG's instructions to the Contractor bind AGOSD.
 - 2) Approve subcontracts. The concurrence of USAID or AGOSD is required if the price of a subcontract exceeds one million dollars or pounds, respectively.
 - 3) Approve the Contractor's local representative; direct the removal of any Contractor employee without citing cause; approve the replacement for that employee.
 - 4) Provide original points, lines and levels of reference, and additional survey requirements, as stated in the construction contract.
 - 5) Certify the reasonable cost and profit that must be paid to the Contractor on account of works, goods or

16

property of the Contractor that are destroyed or damaged by reason of any of the Special Risks; same in respect of injury or loss of life; certify reasonable expenses of the Contractor in expectation of completing the Works, prior to termination of the Contract on account of the occurrence of a Special Risk.

6) Certify the allowance or reimbursement to be made by AGOSD for fees paid by the Contractor to local authorities pursuant to local laws and regulations.

7) Instruct the Contractor to cooperate with other contractors and authorities working at or near the Site. Through AGOSD's Area Managers, coordinate the efforts of contractors who are being supervised by WWCG, with the efforts of contractors who are being supervised directly by AGOSD.

8) Recommend to AGOSD suspension of the work as warranted by the contracts; determine the extra payment and extension of time to be made to or allowed of the Contractor, on account of such suspension. Grant permission, where appropriate, for the removal of equipment, materials and temporary works from the Site.

9) Grant permission for work to proceed at night or on locally recognized days of rest, where the Contract Documents so provide or where circumstances so require. Direct the Contractor to expedite the work, at the Contractor's expense, if in WWCG's opinion the progress is insufficient or too slow.

10) Determine the extension of time to be granted to the Contractor on account of extra work, exceptional adverse climatic conditions, special circumstances, or other cause of delay allowed for in the Contract Documents; notify AGOSD accordingly.

11) Change the form, character, quality or quantity of the work, or order extra work, to the extent deemed necessary, in WWCG's opinion; take the value of such variations into account in ascertaining the amount of the Contract Price. Determine whether Contract rates and prices are applicable to additional or omitted work, and if so, apply them; if not, negotiate suitable rates and prices with the Contractor. If negotiation fails, fix such rates and prices as are reasonable and proper.

12) Use the Provisional Sum for resolution of claims and Change Orders; require the Contractor to account for such expenditures, where appropriate. Issue all necessary Change Orders and resolve all contractor's claims, including negotiating any change to Contract Price and Time for Completion.

- a) USAID approval is required if a claim settlement or change order
 - 1) changes the dollar portion of the Contract Price by more than \$500,000 or 5% of the original Contract Price, whichever is smaller,
 - 2) increases the Contract Price to an amount greater than the amount of the L/Comm, or
 - 3) changes the General Conditions.
- b) AGOSD concurrence is required if the Change Order
 - 1) changes the pound portion of the Contract Price by more than LE 500,000 or 5% of the original Contract Price, whichever is smaller, or
 - 2) requires the commitment of pounds in an amount greater than is then available in the Provisional Sum.
- c) No change involving a decrease in the Contract Price shall be used to offset a change involving an increase in the Contract Price, unless the former is incidental to the latter.

13) Determine the value of work done. With the assistance of the Contractor, prepare records of such work, month by month. Report progress monthly to AGOSD and USAID. Issue Certificates of Completion when the Works or parts thereof are substantially complete, in WWCG's opinion and to WWCG's satisfaction. Recommend acceptance to the Owner.

14) In event of default by the Contractor, evaluate the work then accomplished, and the materials and equipment left by the Contractor, and determine the amount then due to the Contractor; determine the expenses and damages due to AGOSD.

e. Guarantee Period to Final Account.

1) Supervise the execution of work that was outstanding (i.e., not finished) when completion was certified, and of such repair, replacement, amendment, reconstruction, rectification of defects, imperfections, or other faults as may be required as a result of one or more inspections by or on behalf of WWCG before the Guarantee Period expires.

2) Determine whether such outstanding work etc. is to be carried out at the Contractor's expense, or evaluated and paid for as if it were extra work.

3) Sign the Approval Certificate and deliver it to AGOSD within 28 days after the expiration of the Guarantee Period or as soon thereafter as all outstanding work and defects are finished and remedied, stating that the Works have been completed to WWCG's satisfaction.

4) Deliver the Record Drawings to AGOSD.

5) Verify the Contractor's statement of final account, which is to be submitted to WWCG not later than 45 days after the issue of the Approval Certificate; issue a certificate stating

a) the amount that in WWCG's opinion is finally due under the Contract, and

b) the balance due from AGOSD to the Contractor or from the Contractor to AGOSD.

Note: This certificate is WWCG's last act of formal supervision of the Contractor.

7. WWCG training, O&M and technical support responsibilities.

a. Training. (See also Para 3k re on-Site trainee engineer program during construction execution.)

1) Assess training needs.

a) Review, jointly with AGOSD, the increased range of responsibilities to be assumed by AGOSD personnel for the expanded facilities.

b) Participate with AGOSD in a department-by-department ("desk-by-desk") analysis of AGOSD's manpower requirements for the existing system, and in determination of how those requirements will change in phases as new facilities become operational.

c) Review AGOSD's nomination of personnel to serve as training cadre; monitor identification of Training Officers by selected key officers of AGOSD.

d) Perform a thorough analysis of AGOSD's manpower needs with the existing and expanded system.

e) Prepare a bilingual Training Needs Assessment Report, in draft for review by AGOSD and USAID and then in final form, addressing the following topics:

1) The effect of past training efforts by U.S. consultants and AGOSD-sponsored training efforts, on AGOSD's manpower development.

- 2] Present and proposed training programs and AGOSD's training needs.
- 3] Institutional expansion and the resulting personnel needs.
- 4] Training strategies to meet departmental personnel needs.
- 5] Training priorities and costs of program implementation.
- 6] Implementation plans for classrooms and on-the-job training, refresher training, seminars and observational visits.

The AGOSD Training Officers will participate in the Training Needs Assessment analysis.

2) Provide startup services.

The following startup services apply to five Pump Stations, two Treatment Plants, the Sludge Management Facility, and the pipelines and other appurtenances associated with those facilities.

- a) Pre-startup equipment checkout.
- b) Classroom and hands-on operations instruction for the AGOSD personnel assigned to perform mechanical, electrical and process control functions, beginning when the facilities are turned over to AGOSD by the contractors or when the facilities are about to be started up, and continuing for six weeks thereafter.
- c) Same as (b) above, for maintenance and preventive maintenance. This task will include development of input for, and instruction related to, a computerized maintenance scheduling program.
- d) Supervision of startup of the facilities, and advice and assistance related to mechanical, electrical and process control operations, and scheduling and coordination of services by representatives of the manufacturers and contractors.

b. Operation and maintenance.

1) Manuals (general).

a) Develop and prepare bilingual operation and maintenance manuals for five Pump Stations, two Treatment Plants, and the Sludge Management Facility. Each manual will be complete in itself and will stand on its own.

b) Drafts will be prepared in both English and Arabic. Relevant portions of manufacturer's literature that are included in the drafts will be translated into Arabic. Two copies of each draft will be provided to AGOSD, and three copies will be provided to USAID.

c) AGOSD and USAID will provide their comments on the drafts to WCG within 30 days after receiving the drafts. WCG will provide the final versions to the manuals to AGOSD and USAID within 90 days after receiving the comments of both AGOSD and USAID.

d) Five copies of each manual will be provided to AGOSD, and three copies will be provided to USAID. The final manual will be used for startup and reference purposes when available.

2) Manuals (facility specifics).

a) Pump Stations. A separate manual will be prepared for each of the five Pump Stations. It will include chapters on each of the following topics:

- 1] Operation of the pumps specific to the Station.
- 2] Preventive maintenance procedures.
- 3] Troubleshooting guides.
- 4] A simple maintenance guide for electrical and mechanical equipment.
- 5] Guidelines on when to seek specialized help.
- 6] Instructions on wet well cleaning and maintenance.
- 7] Safety.

b) Treatment Plants. The E/W Treatment Plant Upgrade contractor will provide a manual for each of the two Treatment Plants, in English only, at the time that each Plant is complete. WCG will review each submittal from that contractor, and will translate each manual into Arabic.

c) Sludge Management Facility. (The need for one or more SMF manuals will be outlined and more completely defined after it has been designed, so that all operational elements can be included.)

d) As an aid to hands-on operating and maintenance personnel, WCG will prepare a series of Standard

DRAFT

112

Operating and Maintenance Procedures, in Arabic and English. These will be simple, well-illustrated step-by-step procedures mounted on laminated cards and posted at the work stations.

c. Technical Support.

The following surveying, drafting and related technical support services will be provided to AGOSD by WCG as an integral part of and in conjunction with its other duties, responsibilities and functions:

1) Surveying.

- a) Locate topographic features and property boundaries required to design new facilities and prepare construction plans.
- b) Establish control points for the construction contractors.
- c) Establish base data for monitoring the construction Risk Management program, and review periodically the construction contractors' implementation of that program as required by the terms of their contracts.

2) Drafting.

- a) Construction plans for new designs.
- b) Reports and presentation graphics.
- c) Change Order sketches and drawings.

3) Related services.

- a) Computations and closures for field surveys and data.
- b) Maintenance of control data, notebooks, records and files.
- c) Logging, filing and maintenance of drawings.

d. Geotechnical Engineering.

1) Plan and conduct or supervise geologic mapping, subsurface investigations and soils tests in support of design; prepare geotechnical reports; prepare specifications for earthworks, piling and other geotechnical structures.

2) Review plans and specifications for consistency with proper geotechnical principles and practices; write risk

management instrumentation and reporting specifications for contracts.

3) Monitor contractors' compliance with geotechnical requirements; review submittals; analyze settlement and drawdown data; perform additional soil investigations during construction, as required.

4) Provide expert analysis and advice, to WWCG internally and to AGOSD, on geotechnical aspects of design changes, and claims against AGOSD by contractors or third parties.

5) Provide or arrange for drilling services, and laboratory facilities for testing of soil, rock and other construction materials, and for storage of soil and rock samples.

8. Accountability and possession of equipment.

a. Accountability for equipment and supplies purchased by WWCG under its HCC with AGOSD dated October 1980 as amended, the cost of which items was reimbursable by AGOSD or USAID, shall pass from that HCC to the direct contract now in force between USAID and WWCG.

b. The items defined in Paragraph 8a above shall remain in WWCG's possession until they are no longer needed by WWCG for execution of its direct contract with USAID, or until the completion of WWCG's work under Project 263-0100 or any successor Project, at which time WWCG shall surrender to AGOSD the possession of such items as have not been consumed or expended by use, or earlier disposed of pursuant to the terms of WWCG's direct contract with USAID.

I trust you will find the above arrangements to be satisfactory, and I look forward to our continued mutual cooperation during the successful completion of the Project over the next six years.

Sincerely yours,

Charles A. Scheibal, P.E.
Project Officer

cc: MRHPU
WWCG

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PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

ANNEX K
Life of Project:
From FY 70 to FY 01
Total U. S. Funding \$262.4M
Date Prepared: July 79
9/83 Amend 1

Project Title & Number: Alexandria Wastewater System Expansion 262-0100

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
<p>Program or Sector Goal: The broader objective to which this project contributes: (A-1)</p> <p>To improve the present and future public health and environmental situation for the inhabitants of the city of Alexandria by providing sewer facilities and services to meet the needs of the present and future population to the year 2000.</p> <p>To maintain and expand the city's infrastructure to allow Alexandria to continue to function as an important sea port, trade center, tourist center and a center for industrial expansion.</p>	<p>Measure of Goal Achievement: (A-2)</p> <p>Public health improvements related to sewerage system improvements and expansion of the collectors, conveyors, treatment facilities, and disposal facilities;</p> <p>Reduced contamination of streets, coastal beaches, lakes and bays surrounding city of Alexandria;</p> <p>Continued capability of Alexandria to function as a desirable trade center, tourist site, and an essential industrial center.</p>	<p>(A-3)</p> <p>Ministry of Health Records. WHO/World Bank Data; Statistics on water related diseases for Alexandria; Infant mortality rate in Alexandria; Incidence of cholera, typhoid and paratyphoid, infectious hepatitis dysentery; Surveys conducted by AGOSD by Water Pollution Control Dept. on beach, lakes, bay contamination.</p> <p>Reports from monitoring program studying ocean, beach and harbour contamination.</p> <p>Tourism Records</p>	<p>Assumptions for achieving goal targets: (A-4)</p> <p>Continued peace in the Middle East and continued political stability in Egypt.</p> <p>GOE continues to identify and support sewerage system expansion as a high priority social and economic goal.</p>
<p>Project Purpose: (B-1)</p> <p>Operating within the GOE's Alexandria Master Plan Expansion Program; to contribute to the expansion, improvement and upgrading of the existing sewerage collection, conveyance and disposal system with the purpose of providing adequate sewerage services for the present 2 million inhabitants of the city of Alexandria and for projected population to the year 2000 (est. 6 million).</p>	<p>Conditions that will indicate purpose has been achieved: End-of-Project status. (B-2)</p> <p>Satisfactory completion of A/E and construction contracts with final acceptance of work completed by GOE (AGOSD).</p> <p>Treatment plants and pump stations constructed and operating at design capacity effectively meeting environmental concerns. Force mains, sewers, reduced facilities to place.</p>	<p>(B-2)</p> <p>Reporting (monthly) of A/E and T/A firms progress. Progress reporting by GOE.</p> <p>Site visits by USAID</p> <p>AID's post evaluation reporting system.</p> <p>Site visits and inspection of upgraded elements of sewer systems.</p> <p>Site visits and inspection of area receiving sewerage service for the first time.</p> <p>Low-cost impact study.</p>	<p>Assumptions for achieving purpose: (B-4)</p> <p>A/E and construction contractors have capability to do the tasks.</p> <p>GOE Ministries and Agencies, etc. cooperate in implementing the project.</p> <p>AGOSD will continue to operate as viable organization particularly in area of operation and maintaining the sewerage system.</p>
<p>Project Outputs: (C-1)</p> <p>Completed treatment plants, collectors, pumping stations with approximately designed operating capacity functioning as a portion of an improved and expanded sewerage system adequately serving the target population (present population and projected pop. to year 2000).</p> <p>Upgraded sections of sewerage system contributing to operational efficiency within the prepared expanded system.</p> <p>Increased area and pop. of Alexandria served.</p>	<p>Magnitude of Outputs: (C-2)</p> <p>Degree of completion of scope of work of T/A and A/E firms.</p> <p>Degree of completion of scope of work of construction contractor.</p> <p>Percentage of treatment plants constructed and equipment and facilities installed.</p> <p>Percentage of force mains, sewers and related equipment installed.</p>	<p>(C-3)</p> <p>A/E monthly reports</p> <p>Construction contractors monthly report.</p> <p>Site inspection and above reports.</p> <p>TA monthly reports</p>	<p>Assumptions for achieving outputs: (C-4)</p> <p>Other project elements are in place and operating.</p>
<p>Project Inputs: (D-1)</p> <p>Consulting services (A/E) for design, engineering and construction supervision.</p> <p>Technical assistant consulting services for utility management and training development.</p> <p>Services of a U.S. construction firm.</p> <p>Materials and equipment required for construction of treatment plants, pump stations and other facilities. Supply of force main, sewerage and related equipment.</p> <p>Materials, equipment and supplies for upgrading the designated sections of the existing sewer system training.</p>	<p>Implementation Target (Type and Quantity) (D-2)</p> <p>Signed A/E contract for engineering and construction supervision A/E mobilized in Alexandria.</p> <p>Signed construction contract and construction team mobilized in Alexandria.</p> <p>Percentage of Sewers, Force Mains, Pump Stations, Treatment Facilities and Sludge Management Facilities under construction and completed.</p> <p>Signed TA contract</p> <p>Development of AGOSD's O&M Training Department.</p> <p>Number of AGOSD staff participants in twinning activities.</p>	<p>(D-3)</p> <p>AGOSD reporting system on materials received.</p> <p>Reports of GOE customs office and Ministry of Finance.</p> <p>USAID's Inspection - site visits.</p> <p>A/E, TA and construction contractors reports.</p>	<p>Assumptions for providing inputs: (D-4)</p> <p>A/E consultants and construction firms permitted to operate in Egypt vis-a-vis their relations with other countries in the Middle East.</p> <p>Port of Alexandria continues to operate effectively.</p> <p>No significant labor unrest causing Port of Alexandria to close down.</p>

116

ENVIRONMENTAL ASSESSMENT
REPORT OF THE
ALEXANDRIA WASTEWATER PROGRAM
SLUDGE MANAGEMENT SYSTEM

PREPARED ON BEHALF OF
THE
ALEXANDRIA GENERAL ORGANIZATION FOR
SANITARY DRAINAGE
FOR
USAID (GRANT NO. 263-0100).

WWCG
in association with
A. A. Warith and ECG

MARCH 1987

SECTION 1

SUMMARY

In accordance with environmental procedures of the United States Agency for International Development (USAID), as set forth in 22 CFR 216, this Environmental Assessment addresses the potential environmental effects of Alexandria General Organization for Sanitary Drainage's (AGOSD) proposed sludge management facilities.

This environmental assessment is an addendum to the Initial Environmental Impact Statement for the Alexandria Wastewater Master Plan study, October 1978.

Under the proposed sludge management system, dilute primary sludge from the treatment plants will be collected at the West Treatment Plant and pumped to a remote desert site for dewatering and composting. Sludge dewatering will consist of conventional sand drying beds. Composted sludge will be used as a soil amendment on farm land. Key elements of the Sludge Management Facilities include the West Plant blended sludge pump station, the sludge force main, and the dewatering and composting facilities (sludge processing site).

No major areas of controversy exist although there are specific issues which are yet to be resolved. Issues to be resolved include minor filling along the shoreline of Lake Maryout, the displacement of families now living on the sludge processing site and the presence of a cemetery on the site.

SECTION 2

PURPOSE

This Environmental Assessment is intended to address the potential environmental effects of the proposed Sludge Management Facilities and how the adverse impacts will be mitigated. The proposed project is but one element of the Alexandria Wastewater Program.

The overall program is needed to improve the health and well-being of the citizens of Alexandria by removing raw sewage from the streets and beaches of the City. The scope of the program was established by the Master Plan Study completed in 1978 and a Master Plan Updated completed in 1981.

SECTION 3

PROPOSED PROJECT AND ALTERNATIVES

The following subsections describe the proposed Sludge Management Facilities and three major alternatives:

- o Proposed Project
- o Mechanical dewatering of sludge
- o On-Site sludge drying beds
- o The no action alternative

3.1 PROPOSED PROJECT

3.1.1 Pump Station

Primary sludge containing both East and West Plant solids will be pumped from the West Plant to the solids processing site. The blended sludge pump station at the West Plant will inject primary effluent into the sludge force mains to maintain a pipeline velocity of at least 0.6 meter per second and dilute the primary sludge to an average of 2.25 percent solids. Primary sludge will be pumped to equalization tanks directly from the clarifiers using duplex plunger type pumps. The equalization tanks will allow a constant solids withdrawal concentration of approximately 5% to be achieved, and will dampen the diurnal variations in primary solids pumped from the clarifiers. The equalized sludge will be pumped into the force mains by piston diaphragm pumps. Identical piston diaphragm pumps will also inject effluent water to dilute the equalized sludge to about 2.25% solids. The use of these pumps will provide constant flow in the force mains regardless of variation in system pressure. The system is designed to convey sludge approximately 29 kilometers against a total dynamic head of up to 165 meters.

3.1.2 Force Mains

The force main consists of two 450 mm pipelines between the blended sludge pump station at the West Treatment Plant and the Sludge Processing Site (approximately 29 Km.). The force main will be provided with valved "cross-over" stations at about 2 Km intervals. The "cross-over" stations are designed to allow flow monitoring in the pipeline to detect leakage and to isolate only a 2 Km section of one line

if repairs are needed. One intermediate "pigging" station in addition to one at the pump station will be provided to facilitate cleaning the pipelines.

3.1.3 Sludge Processing Site

Facilities at the sludge processing site consist of sludge storage tanks, distribution system, sand drying beds, filtrate treatment and composting.

Storage tanks at the site are provided to allow overnight storage of sludge which is being continuously pumped from the West Treatment Plant. Sludge from the tanks and the force main will be distributed to the drying beds through open channels during a 12-hour period.

Sludge dewatering will be accomplished with sand drying beds consisting of a sand filter overlaying a gravel support bed with underdrain piping to collect the filtrate. The beds will be lined to retard seepage of filtrate into the ground water. Dried sludge will be removed and transported to the composting area by truck.

The filtrate drained from the drying beds and run-off from the composting area will be collected and treated to meet the required standards of 60 mg/l of BOD and 50 mg/l suspended solids before discharging into an irrigation drain. The treatment process will consist of plastic-media trickling filters followed by clarifiers and deep sand rapid infiltration beds or plastic-media trickling filters followed by clarifiers and low-rate mechanical aeration basins. The treated effluent will be pumped to an existing drain about 0.5 Km east of the site or used to irrigate on-site landscaping.

Windrow composting is proposed for sludge stabilization. Partially dried sludge from the drying beds will be mixed with previously composted sludge and formed in windrows for composting. The windrows will be mixed regularly to maintain voids in the pile and to expose all of the compost to the elevated temperatures inside of the windrow. The composting period will be 25 to 30 days. The composted material will then be stored for an additional 30 to 90 days before distribution to farms for use as a soil amendment.

3.2 MECHANICAL DEWATERING ALTERNATIVE

Mechanical dewatering at the treatment plants sites with the partially dried sludge trucked to a remote site for composting, storage and distribution to the farmers was considered. Also, mechanical dewatering at the remote site was considered followed by composting, storage and agricultural reuse. Although the mechanical dewatering alternative has a lower Phase 1 capital cost than the proposed alternative, the higher Phase 2 cost and the higher operating and maintenance costs more than offset the savings when considered on a present worth basis. This alternative would have the adverse impact of heavy truck traffic on congested streets to transport the sludge to a composting site. In either alternative the mechanical dewatering system is technically complicated and would require highly skilled operators and mechanics to maintain the equipment and an assured source of hard currency to supply parts.

3.3. ON-SITE SLUDGE DRYING BEDS

The existing treatment plant sites do not have sufficient land area available for drying beds. The alternative considered to provide the required land area was to fill in Lake Maryout next to the West Treatment Plant Site. A fill of about 280 hectares in the Lake would have a significant negative impact on fisheries in the Lake. Adverse subsoil conditions and soft lake deposits would require special construction techniques in order to avoid excessive settlement. The excessive construction costs and adverse impact of filling in a large area of the Lake eliminated this alternative from further consideration.

3.4 NO ACTION ALTERNATIVE

Failure to provide a Sludge Management Facility will require that the primary sludge from the treatment plants be discharged to Lake Maryout with the treatment plant effluent thus contributing to the further degradation of the Lake and in effect, rendering the treatment plants useless.

SECTION 4

AFFECTED ENVIRONMENT

4.1 PUMP STATION

The pump station will be constructed on the site of an existing wastewater treatment plant in an area next to an existing sedimentation tank.

4.2 FORCE MAINS

Of the 29 Kilometer route for the force main, 25 Kilometers is along city streets and railroad right-of-way, about 2 Kilometers is on embankment constructed along the shoreline of Lake Maryout and about 2 Kilometers is along farm roads in agricultural areas.

4.3 SLUDGE PROCESSING SITE

The site for the sludge processing facility is about 400 hectares of largely undeveloped land bounded on three sides by the Beheig Canal and on the other side by a military firing range. The site is presently occupied by about 18 families and there are about 100 hectares presentaly under cultivation, all without title to the land.

SECTION 5

ENVIRONMENTAL CONSEQUENCES

5.1 CONSTRUCTION IMPACT AND MITIGATION

5.1.1 Employment

Construction of the Sludge Management Facilities will provide employment for Egyptian Professional, Technical and Non-technical people. During the approximate 40-month construction period, the Contractors will employ local Engineers, Technicians and non-technical laborers. This will represent about LE 15 Million in labor costs and LE 50 Million in direct benefit to the Community as the labor costs are returned to the economy for other goods and services.

5.1.2 Displaced Housing

Approximately 18 families now living on the site will have to be relocated. While it is believed that these families are living illegally (squatters) on the site of the sludge processing facility, they will be given early warning and assistance in moving to other housing.

5.1.3 Displaced Agriculture

Approximately 250 feddans now being farmed on the Sludge Processing Site may be taken out of agricultural production. The loss of this land for farming will be more than compensated for by the benefits derived from the more than 100 tons per day of composted sludge which will be available to farmers in the region for use as a soil amendment.

5.1.4 Noise

The project will be constructed with heavy equipment that will generate noise in the immediate vicinity of construction. Pile-driving may also be required at the West Treatment Plant for construction of the sludge pumping facilities. Construction will be confined for the most part to daylight hours to mitigate the impact on nearby residents.

5.1.5 Dust

Dust from construction areas will be generated, particularly at the sludge processing site. At areas close to residential dwellings, such as the West

Treatment Plant, stockpiled soil will need to be wetted to minimize dust. Trucks carrying earth, sand, and similar material will need to be covered.

5.1.6 Traffic

Increased truck and vehicle traffic will be generated at all construction areas. Heavy equipment will be located at the major construction areas so they do not need to travel between remote areas. Improved access roads will be needed to the West Plant and the processing site. Where practical, buses should be used to transport construction workers to and from the construction areas.

5.1.7 Wildlife and Vegetation

Observation of the areas of construction have not indicated the presence of wildlife, except for aquatic life in Lake Maryout. A portion of the force main will be constructed in fill along the bank of the Lake, which will displace some vegetation but will not have a significant affect on the aquatic life. Since the net effect of the project will be to reduce organic pollutants discharged to the Lake, there will be a net positive impact on aquatic life when the project is completed.

5.1.8 Energy Consumption

Construction of the sludge management facilities will require moderate energy consumption. Site construction will require substantial earthwork. This earthwork along with the 29 Kilometer pipeline construction will rely heavily upon construction equipment. Associated fuel consumption will be considerable.

Fuel consumption will be minimized by careful civil design. Site facilities will follow existing topography to the greatest extent possible. Likewise the depth of pipeline facilities will be held to a minimum thus reducing excavation and backfill.

5.2 OPERATIONAL IMPACT AND MITIGATION

5.2.1 Employment

It is anticipated that total employment to operate the pump station, force main and sludge processing site will be about 300 people for Phase I and 600 people during the future Phase II. This will represent an

average annual payroll between LE 1.0 Million and LE 2.0 Million which will be multiplied three to four times as it is released in the economy.

5.2.2 Ground Water

The sludge pump station will not impact ground water since all process flows will be contained in concrete tanks or pipes. The sludge force mains could impact ground water if a leak develops and is not promptly repaired. Operation will include routine measurement of sludge flow at each crossover station along the pipeline length. A reduction in flow downstream of the previous measurement will indicate a leak, which will be located and repaired within the 2 Kilometers of adjacent upstream pipeline section. Near-surface waters along most of the force main route contain high concentrations of dissolved salts and are not useable for domestic water supply.

Although most of the site appears to be underlain by unweathered rock, the sludge beds at the processing site will have the potential to pollute ground water. All of the beds will be lined to retard seepage into the groundwater. Lining will be installed beneath the underdrain piping which will convey all filtrate water to the treatment system. The other site facilities, including sludge storage tanks, pump stations and filtrate treatment plant, will contain process streams in tanks and pipelines. The compost area will be hard-surfaced and runoff water will be collected for treatment before release from the area.

5.2.3 Surface Water

The sludge pump station will not impact surface water since all process flows will be contained in concrete tanks or pipes. The sludge force mains could impact surface water if a leak develops and is not promptly repaired. Operation will include routine measurement of sludge flow at each crossover station along the pipeline length to detect leaks.

The sludge beds at the site will be operated such that applied sludge depth will be less than half of the total bed depth. Site runoff will be drained to ponds at each corner of the beds where it will be pumped (with bed filtrate water) to the treatment system. The other site facilities, including sludge storage tanks, pump stations and filtrate treatment plant, will contain process streams in tanks and pipelines. The compost area will be hard-surfaced and runoff water will be collected for treatment.

5.2.4 Vectors

Potential disease carrying vectors consist primarily of insects and the operators who may come in contact with sludge.

Insect vectors will be negligible at the West Plant pumping system and nonexistent along the force main route. The surface area of the sludge equalization tanks at the West Plant will be negligible compared to nearby Lake Maryout, therefore any insect breeding potential will be negligible.

At the sludge processing site, insect breeding can occur on the surface of the sludge beds. The sludge in normal application depths will not sufficiently dry in the time needed for insects to hatch. The traditional mitigation measure in Egypt has been to apply successive applications of sludge at about 4-day intervals and cover the final application with a very thin layer of sand. This would be costly, and it would also make the dewatered sludge unsuitable for composting because of the significantly lower water content. The proposed practice at the AGOSD site is to use the traditional practice of successive applications at 4 day intervals followed by the last application in a shallow (less than 5 cm) layer of sludge within 4-5 days after the previously applied sludge layer. This procedure will drown the insect larvae, and the final thin sludge layer will dry rapidly by evaporation and prevent further breeding.

To mitigate potential vectors from workers who have handled sludge, all such workers will be furnished with rubber gloves and provided with convenient washing facilities.

5.2.5 Visual

The project will have visual impact at a number of locations. The Blended Sludge Pump Station will be located on the site of the West Treatment Plant. This structure will be a typical industrial type building and will not be unusual with respect to the other plant structures.

Several valve crossover stations will be located along the pipeline route. These small fenced-in structures are located in the railroad rights of way and thus will be typical of surrounding facilities.

The sludge processing facilities will be constructed on a site of basically open land. The facilities will

consist of open drying beds, compost piles, storage and treatment tanks, an Administration Building, Vehicle Maintenance Building and Apartment Housing. The facilities will be visible from off site but will not impose displeasing appearances. The tanks and beds will be constructed in regular confined patterns and will not be marred by random and sloppy operations. Tanks and structures will be typical of an industrial facility. The perimeter of the site will be planted with a buffer of trees. While the buffer will not hide the site it will improve the overall appearance of the area. At the present time the area is practically devoid of trees and quite unsightly due to lack of maintenance of the land surface.

5.2.6 Odors

The sludge pump station and processing site will have the potential for odors.

The sludge equalization tanks at the West Plant will be open to the atmosphere in order to prevent the possibility of laborers entering a hazardous area and to avoid the costs of a tank cover and odor removal equipment. The proposed mixing equipment will minimize the agitation and violent disturbance of the liquid surface, to minimize the release of odorous gases. The odors produced from the equalization tanks will be a point source and be readily dispersed with negligible consequences down-wind. These odors will be negligible when compared to the diffuse-source of odors associated with the adjacent Lake Maryout.

The sludge storage tanks and sand beds at the site will produce odors, but the site is in an agricultural area and not as densely populated as the area near the West Plant. The large area of the site will also serve to reduce odors beyond its limits. Odors from other sludge drying sites in Egypt are not objectionable on adjoining properties. Management practices at those sites are similar to those proposed for Alexandria in that un-stabilized sludge is applied to the beds.

5.2.7 Traffic

Minimal traffic impacts will occur from operation of the sludge pumping and force main system. Very few additional staff will be required above the level needed for operation of the West Treatment Plant. No chemicals are needed for system operation, so delivery truck traffic will not be necessary.

108

Traffic associated with the processing site operation will be twofold: composted sludge vehicles and personnel vehicles. Removal of the composted sludge from the site to farm lands will generate considerable traffic and will vary depending on whether the compost is picked up at the site by individual farmers or delivered by AGOSD in larger trucks. Pick up and deliveries can be scheduled to minimize impact on other traffic in the area. To mitigate the increase in vehicle traffic to transport workers to and from the site, it is recommended that several buses be used for this purpose.

5.2.8 Energy Consumption

The selected sludge management system has a moderate level of energy consumption. Power demand associated with sludge transport has been minimized by pumping sludge at the highest solids concentration feasible within the maximum pressure limitations allowed for the pipeline system. The pumping system used to transport dilute sludge to the sludge processing site requires 140 kilowatts for Phase I average conditions. While this demand is substantial, it is offset by the very low power demand associated with dewatering and stabilizing the sludge.

Dewatering is accomplished by natural drainage and solar drying. The only energy demand is that associated with mixing the stored sludge and collecting and pumping the filtrate. The mixing energy consumption is estimated at 30 Kw, and the average demand associated with filtrate collection and pumping is 40 KW for Phase I average conditions. Energy associated with filtrate treatment is not quantified here as that demand would be common to all sludge management schemes.

Energy associated with sludge stabilization, or composting, is again very low. The input heat associated with composting is supplied as a product of the natural biological reduction. Some supplemental energy is associated with compost hauling and turning machinery. This demand is estimated to be about 1,300 liters of fuel per day.

The selected sludge management scheme does not require the use of any chemicals, therefore there are no secondary energy demands associated with chemical production and distribution. The final compost product is used as a soil amendment thus offsetting secondary energy consumption associated with chemical fertilizer production and distribution required in lieu of compost.

Excess energy consumption has been mitigated for this project by applying the following principles:

1. Transport sludge at the maximum feasible solids concentration.
2. Rely upon solar radiation and natural drainage for dewatering.
3. Achieve stabilization at temperatures elevated by natural biological decomposition.
4. Do not rely on supplemental chemicals for stabilization or dewatering.

5.2.9 Mediterranean Sea

The sludge management facilities, per se, will have no positive nor negative impact on the Mediterranean Sea. However, other parts of the project which eliminate raw sewage discharges to the sea have the positive impact of removing much of the solids which have previously gone to the Sea.

5.2.10 Lake Maryout

The solids management program also has minimal impact on Lake Maryout. However, the overall project, by eliminating raw sewage discharges into Lake Maryout, has the positive impact of removing much of the solids currently being discharged into the Lake.

5.2.11 Heavy Metals

Excessive application of heavy metals to agricultural soil may cause certain metals to be translocated into the vegetative matter of the crop. Excessive accumulations of certain metals may also become toxic to various crops. Because metals are commonly found in municipal wastewater sludge, a large body of information has been developed by the scientific community on how to safely use sludge on agricultural land.

The cumulative effect of heavy metals can be mitigated by two approaches: (1) reducing or eliminating the undesirable component or (2) controlling the rate and cumulative amount of sludge to be applied. Both approaches are proposed for the AGOSD project.

AGOSD has established regulations to require pre-treatment of industrial wastes before discharge into their sewer system. In addition, GOFI has initiated a program to design and construct pre-treatment facili-

ties for critical industries in Egypt including Alexandria.

AGOSD, as part of the operating procedure for the sludge management facility, will routinely measure the concentrations of zinc, cadmium, copper, lead, aluminum, chromium and boron in the sludge. This information will allow the determination of the application rates for composted sludge to keep the heavy metal concentrations within safe limits. Records will be maintained and monitored so that amounts allocated to individual farms can be controlled. The Operation and Maintenance Manual which will be prepared for the project will define the testing, recording and monitoring procedures in detail. Instruction and training will be provided for AGOSD's operating staff during startup of facilities.

5.2.12 Pathogens

The presence of pathogenic organisms in sewage sludge can restrict its use on crops for human consumption unless properly controlled. The composting process (aerobic thermophilic decomposition of organic constituents) generates elevated temperatures within the compost windrows and to some extent in the curing and storage piles. The high temperatures generated (55° to 80°C) not only facilitate the composting process but also inactivate the human pathogens in the sludge. The composting operation is planned to expose the pathogens to elevated temperatures for more than 10 days, which has been shown to render a sludge pathogenically safe for soil application. Further, the sludge will be stored on site from 30 to 180 days prior to release. Stock piling has been shown to further reduce the level of active pathogens. AGOSD as part of the operation of the sludge processing facility will monitor the composted sludge for pathogens to insure acceptable standards before application to agricultural land.

In spite of the weaknesses previously noted in the amendment to the EIS, the Environmental Considerations section of the Project Paper Amendment adequately identifies major environmental issues and includes an appropriate plan of action. Accordingly, environmental clearance for the Project Paper Amendment is hereby issued.

cc: Dr. Stephen F. Lintner, AID/W ANE/PD/ENV

ID#ALENCL:DR/PS:JStames:28JUN87

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ANNEX M
STATE 161618

ACTION AID 3 INFO DCM ECON /5

VZCZCCRD208
RR RUEHEG
DE RUEHC #1618 1480413
ZNR UUUUU ZZH
R 280413Z MAY 87
FM SECSTATE WASHDC
TO AMEMBASSY CAIRO 1212
BT
UNCLAS STATE 161618

LOC: 005 283
28 MAY 87 0624
CN: 32480
CHRG: AID
DIST: AID

REF TO	DK	PPP
DATE TAKEN		DATE 6/4
NOTE 31 MAY 87 INITIALS		<i>[Signature]</i>

AIDAC

E.D. 12356: N/A
TAGS: N/A

SUBJECT: AUTHORITY FOR REVIEW AND APPROVAL OF ENVIRONMENTAL ASSESSMENT OF ALEXANDRIA WASTEWATER SYSTEM EXPANSION, AMENDMENT 2

REF: CAIRO 12002

1. STEPHEN F. LINTNER, ENVIRONMENTAL COORDINATOR FOR ANE/PD/ENV, HEREBY DELEGATES AUTHORITY FOR REVIEW AND APPROVAL OF ENVIRONMENTAL ASSESSMENT FOR AMENDMENT 2 OF ALEXANDRIA WASTEWATER SYSTEM EXPANSION PROJECT TO JOHN STARNES, MISSION ENVIRONMENTAL OFFICER. SHULTZ
BT
#1618

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UNCLASSIFIED

STATE 161618

memorandum

DATE: 28 June 1987

REPLY TO
ATTN OF: DR/PS, John C. Starnes, Mission Environmental OfficerSUBJECT: ALEXANDRIA WASTEWATER SYSTEM EXPANSION (262-0100)
Amendment 2

TO: DR/UAD, Charles A. Scheibal

Dr. Stephen F. Lintner, Bureau Environmental Coordinator, has delegated authority (State 161618) for environmental clearance of the subject project to the Mission Environmental Officer. With the concurrence of the Bureau Environmental Coordinator and in conjunction with the preparation of Amendment 2 to the Project Paper, a decision was made to prepare an amendment to the original Environmental Impact Statement (EIS) which would cover the additional issues raised by the requirement for sludge management facilities. It was agreed that the amendment to the EIS would use the format of an environmental assessment.

I have reviewed the amendment to the EIS prepared by WWCG and dated March 1987. The policy of the ANE Bureau is that environmental assessments be "stand alone" documents that any interested person could read to get a quick overview of the project and understand management decisions regarding the alternative selected. Such a document may repeat and summarize discussions that are found in other documents related to the project. Technical alternatives are presented and discussed with regard to their environmental impacts. Project costs and benefits are also presented. The document presented is extremely weak with regard to addressing the major alternatives for sludge management in Alexandria.

There is no discussion regarding those alternatives previously identified in the technical analysis. These alternatives are:

- NO ACTION,
- SEA DISPOSAL,
- INCINERATION,
- LANDFILL,
- COMPOSTING.

"No action" is obviously not a viable alternative for sludge management given the fact that the treatment plants are being rehabilitated and expanded under an existing AID-financed contract. Sludge will be produced by these plants and there will be a requirement to dispose of this sludge.

124

The EIS prepared for this project recommended that the proposed treatment level of the wastewater plant be upgraded from preliminary treatment to primary treatment; one of the primary reasons for this recommendation was concern regarding the possibility of sludge bank development in the vicinity of the outfall. Obviously, the use of a sea disposal option for disposal of sludge would negate the benefits derived from upgrading proposed treatment levels from preliminary to primary.

A review of the technical analysis indicates that both landfilling and composting are viable alternatives for sludge management in Alexandria. Landfilling is the simplest of the two to construct and manage. Composting introduces a number of concerns that must be given careful consideration in the management of the facilities. Though landfilling is slightly less costly and composting has greater management requirements, composting has been presented as the preferred alternative. The primary consideration appears to be the desire to demonstrate that a valuable resource has been reclaimed from the wastewater treatment process; it is the intent of AGOSD to offer the composted sludge free of cost to area farmers for use as a soil amendment.

The recovery of a valuable resource is certainly not an unworthy consideration in the selection of an appropriate sludge management system; however, it is important that the project design adequately address the issues raised. Significant issues identified which relate to the proposed sludge management facilities include:

- Displacement of Families,
- Loss of Agricultural Land,
- Pollution of Groundwater and Surface Waters by Sludge Bed Filtrate,
- Excessive Heavy Metals in Composted Sludge,
- Pathogens in Composted Sludge,
- Relocation of Cemetery,
- Encroachment into Lake Maryout to Accommodate Sludge Pipeline.

It is important to note that AID has previously endorsed a wastewater master plan for Alexandria which includes the provision of primary level treatment facilities with discharge of the treated effluent to the Mediterranean Sea via a long outfall. As a result of continued controversy over the issue of land disposal versus sea disposal of the wastewater effluent, the GOE has delayed construction of the proposed outfall system. This has resulted in the interim disposal of wastewater into Lake Maryout; until such time as a final decision is reached regarding the disposal alternatives, discharge of primary effluent into the lake can be expected to have an adverse environmental impact on the lake.

SECTION 6

LIST OF PREPARERS

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APPENDIX

AGENCY CONTRACTS

Contracts have been made and discussions held relative to their areas of special interest with the following Agencies or companies.

<u>Agency/Company</u>	<u>Date</u>
Fish and Wildlife	April 1987
Antiquities	April 1987
Military	March 1986
Ministry of Reconstruction and New Communities	March 1986
Alexandria Planning Commission	1983-Ongoing
Alexandria Governor	Ongoing
Ministry of Health	March 1987
Maryout Company	May 1986
Ministry of Irrigation	Ongoing
Sumed Company	Ongoing
Department of Fisheries	1986 - Ongoing

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