

**Technical Support for Procurement and Project Management  
and Private Sector Participation to the Ministry of Water and  
Irrigation, Water Authority of Jordan and the Jordan Valley  
Authority**

Support for Economic Growth and Institutional Reform:  
General Business, Trade & Investment IQC

**Ongoing O&M Assessment  
And O&M Training Needs Report**

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## TABLE OF CONTENTS

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Acronyms		
Executive Summary		1
SECTION I		2
	A. Background	2
	B. Summary of Previous Training Needs Report	2
SECTION II		3
	A. Training Needs Assessment Discussion	3
	B. Aqaba Site Visit	3
	C. Central Maintenance Facility Site Visit	6
	D. Central Meter Workshop	8
	E. Central Laboratory Site Visit	9
SECTION III		11
	A. Outsourcing Possibilities and Proposed Training Program Revisions	11
	B. Training Program Outline Costs	11
ANNEX A	PROPOSED TRAINING COURSES	13
ANNEX B	ESTIMATED TRAINING COURSE LEVEL OF EFFORT	16
ANNEX C	PREPARATION OF O&M TRAINIGN IN AQABA	22

## ACRONYMS

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ASEZ	Aqaba Special Economic Zone
AWC	Aqaba Water Company
MWI	Ministry of Water and Irrigation
SOP	Standard Operating Procedure
TAPS	Technical Assistance for Private Sector Participation
UFW	Unaccounted-for-Water
WAJ	Water Authority of Jordan

## EXECUTIVE SUMMARY

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The TAPS Consultants have updated the original Training Needs Assessment Report submitted in July 2003 to reflect direction from the Ministry of Water and Irrigation (MWI), as a result of further investigation into the needs of WAJ-Aqaba and the future needs of the new Aqaba Water Company (AWC).

Since the initial report in July, MWI and WAJ Officials have made clear that both additional key staff will need to be hired, and that existing WAJ-Aqaba Staff will be retained. Until the new wastewater treatment plant goes on-line in 2005, the number of key staff to be hired is relatively small, at a figure of fewer than five people.

Further, MWI Officials have expressed a willingness to consider outsourcing of a number of utility functions, including:

- The operation and maintenance of the new wastewater treatment facilities.
- Major maintenance of pumps, motors, engine-generator sets, and large vehicles.
- Meter repair and calibration.

These issues are critical to the form of the training program. If outsourcing of these functions is found to be cost-effective, training in these areas becomes less important. MWI has indicated that all existing employees in WAJ-Aqaba will be retained.

Despite these changes and the possibility of continuing to outsource certain utility functions such as heavy maintenance, meter calibration and repair, and certain laboratory tests, the original training program proposed in July 2003 has been found to be responsive to existing needs and has been retained.

*The program costs, noted in Annex C, have been estimated, assuming that all material will be first prepared in English, translated to Arabic and delivered in Arabic. All materials will be reproduced and provided to the utility for use in future staff training.*

## SECTION I

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### INTRODUCTION

#### A. Background

The Technical Assistance for Private Sector Participation (TAPS) Project is currently assisting the Ministry of Water and Irrigation (MWI) in transforming the existing Aqaba water/wastewater utility into a “corporatized” entity operating within the Aqaba Special Economic Zone (ASEZ).

The process requires that the present utility operated by the Water Authority of Jordan (WAJ), and known as WAJ-Aqaba, be transformed into a decentralized and financially self-sufficient utility. In order to raise performance levels, this transformation will require significant changes to current operating practices, as well as a significant commitment to the retraining of existing personnel in an effort to enhance qualifications, and the implementation of more advanced operation and maintenance techniques for existing and planned water and wastewater facilities.

#### B. Summary of Previous Training Needs Report

In July 2003, TAPS submitted a Training Needs Assessment Report for the WAJ-Aqaba utility. This needs assessment was based upon:

- A review of existing WAJ-Aqaba operating procedures.
- The results of written questionnaires for five levels of workers within WAJ Aqaba.
- Interviews with a representative cross-section of WAJ-Aqaba employees, from management to laborers, using the prepared questionnaires.
- An assessment of the results of the questionnaires.

The findings and recommendations of the July report included:

- Virtually no formal written procedures exist within WAJ-Aqaba.
- There is a need for more technical training across all worker classifications, as well as the need for more financial training.
- Higher salaries are necessary to attract and retain the quality of worker necessary to staff and operate an improved utility in the future.
- The new Aqaba Water Company (AWC) must embark upon a program of hiring new personnel in key management positions, and in key operational positions.
- AWC must offer significant retraining of existing WAJ-Aqaba Staff.

The July report prescribed a specific training program, specified who should receive such training, and included new, written procedures for critical operations and maintenance tasks.

## SECTION II

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### A. Training Needs Assessment Discussion

Since the July Training Needs Assessment, TAPS consultants have conducted additional interviews with MWI Officials and local WAJ-Aqaba Officials concerning the conclusions and recommendations of the Training Needs Assessment, and the personnel proposed for training.

The original report recognized that, in addition to key managerial and financial staff, AWC would require significant staff with more technical skills than currently exists in WAJ-Aqaba. These skills include wastewater treatment operators, mechanics, machinists, electricians, welders, and others. However, there is a shortage of such skills in Aqaba in both the public and private sector. Furthermore, it is WAJ-Aqaba's experience that current WAJ pay scales for such positions are not sufficient to attract skilled workers from Amman and other areas.

Since the initial report in July, MWI and WAJ Officials have made clear that both additional key staff will need to be hired, and that existing WAJ-Aqaba Staff will be retained. Until the new wastewater treatment plant goes on-line in 2005, the number of key staff to be hired is small, probably fewer than five people.

Additionally, MWI Officials have expressed a willingness to consider outsourcing of a number of utility functions, including:

- The operation and maintenance of the new wastewater treatment facilities.
- Major maintenance of pumps, motors, engine-generator sets, and large vehicles.
- Meter repair and calibration.

These issues are critical to the form of the training program. If outsourcing of these functions is found to be cost-effective, training in these areas becomes less important. The potential benefits of such outsourcing will be described later in this section.

### B. Aqaba Site Visit

As part of the Scope of Work, the TAPS Consultant made a site visit to Aqaba on September 16-17 to the following areas:

- The WAJ-Aqaba offices.
- The main wastewater pumping station in Aqaba.
- The Disi, Abu Dbaa, and Quwayra Wellfields.

The purpose of the visit was to meet with key WAJ-Aqaba Officials to discuss the training needs assessment, to determine the type of equipment used in Aqaba and its state of repair, and to determine how and where maintenance is performed on the equipment.

**Water System.** As has been noted in other previous reports including the Aqaba Prefeasibility Study, the water system consists of a series of wells in the Disi, Abu Dbaa,

and Quwayra areas. These wells discharge to storage reservoirs that feed the Aqaba water distribution system by gravity.

A typical Disi well is shown below in Figure 1. Figure 2 shows the main collection reservoir in Disi.

**Figure 1: Typical Well in Disi**



**Figure 2: Disi Collection Reservoir**



One unexpected finding on the Disi site visit was the presence of a complex of buildings adjacent to the Disi Collection Reservoir site. The complex includes a large metal building with concrete floors and an overhead crane, apparently a former water pumping station.

The building is largely unused at present, though it could be used as a maintenance and storage facility for the Disi area well equipment. The building complex is shown in Figure 3.

**Figure 3: Disi Building Complex**



One objective of the site visit was to obtain copies of available equipment manuals and drawings that might exist in Aqaba and Disi. Further, the installed equipment was to be examined to determine, if manuals did not exist, what equipment suppliers were used to possibly obtain manuals for future training.

The TAPS Consultant visited 12-15 wells and found that pumps, motors, electrical switchgear were from a large number of manufacturers and countries, making training from a single set of manuals impossible.

According to Mr. Imad Zreikat, WAJ-Aqaba's Assistant Secretary-General, all maintenance on the wells is performed by WAJ at their Central Maintenance Facility in Amman.

It was determined in a subsequent site visit to WAJ Amman's Central Maintenance Facility that the required manuals are kept at the facility where the maintenance is currently performed.

**Wastewater System.** While in Aqaba, the TAPS consultant also visited the Main Wastewater Pumping Station to view the installed pumps and to determine the manufacturers of those pumps and the pumps installed in the other four pumping stations operated by WAJ-Aqaba.

The Main Wastewater Pumping station is the largest of all pumping stations, and is the only wet-pit, dry-pit pumping station in Aqaba. All others are submersible stations.

The Main Pumping Station is part of the ongoing upgrade to the wastewater facilities. The electric motors, made in 1984 by Continental Electric and shown in Figure 4, will be retained. As part of the upgrade, the pumps (manufactured in 1984 by Clow Corporation) and shown in Figure 5) will be replaced by a manufacturer not yet selected.

**Figure 4: Existing Motors in the main pumping station**



**Figure 5: Existing Pumps in the main pumping station**



The pumps are conventional vertical, centrifugal pumps and are equipped with mechanical seals.

The Main Pumping Station is equipped with an 800 kW Cummins engine-generator set (Type SCO34C, Model 800.00 PKA), to operate the station's pumps in the event of a power outage. The station's engine-generator set is shown in Figure 6. It is understood that the engine-generator set will be retained in the current upgrade.

Pumping Station Number 2 is a submersible pumping station, equipped with Flygt Corporation pumps, Model 3201 and a Cummins engine-generator set. The three Al Hafayer pumping stations are equipped with Ebara submersible pumps.

WAJ-Aqaba currently repairs and maintains the wastewater pumps and other equipment, and has the operations and maintenance manuals for this equipment.

**Figure 6: Main Pumping Station Engine-Generator Set**



### **C. Central Maintenance Facility Site Visit**

As a result of the information learned in Aqaba, primarily that all major maintenance on wells operated by WAJ-Aqaba is performed at the Central Maintenance Facility in Amman, the TAPS consultants visited the facility to determine its capabilities and potential future outsourcing potential for maintenance. A photo of the workshop visit is included in Figure 7.

**Figure 7: Central Workshop Visit**

A highly developed maintenance facility, this site performs a full-range of maintenance including pump rebuilding, machining, electric motor rewinding, instrumentation repair, and complete vehicle maintenance.

The current procedure is for the facility to receive requests for maintenance from WAJ utilities from throughout the Kingdom, and performs the work on a cost center basis. In the case of a Disi well outage, for example, WAJ-Aqaba would request service from the Central Facility, a work order is issued, and a crew and equipment dispatched from Amman with a new or refurbished well pump from Central Storage. The crew would install the pump, and return to Amman with the defective pump that is then fixed and placed into Central Storage. The pumps to be exchanged have similar or identical characteristics (total dynamic head and capacity), but would not necessarily be from the same manufacturer. All work performed (labor, parts, and other expenses) are supposedly charged to the Aqaba budget, though this needs to be confirmed.

In addition to WAJ-operated facilities, the Central Maintenance Facility performs most major maintenance work for LEMA under a contract that specifies chargeback rates and performance criteria for the work. They have also agreed to provide a similar arrangement to the future operator of the Northern Governorates. These contracts could serve as a basis for similar work performed on behalf of AWC in the future.

The TAPS consultants were assured that the Central Maintenance Facility has all of the necessary maintenance manuals for the wide variety of pumps and other equipment

operated by WAJ-Aqaba. WAJ-Aqaba has no manuals for the wells, nor any expertise or equipment to remove and service the well pumps.

In response to a question by TAPS Consultants, the Maintenance Facility managers indicated that they have provided on-the-job training to maintenance personnel from the other governorates in the past, and would be willing to provide necessary training to AWC personnel in the future.

#### **D. Central Meter Workshop Site Visit**

The TAPS Consultants visited the Central Meter Repair and Calibration Workshop in Amman to determine how, or if, their activities should be outsourced by AWC in the future. The Central Meter Repair and Calibration Workshop received its ISO 9001 Certification in 2000.

The facilities receive residential and bulk water meters from all water utilities in the Kingdom, including LEMA with whom they have an outsourcing contract.

The residential meter facilities consist of:

- A disassembly area
- A meter body repair area
- A body painting area
- Three meter works assembly areas
- A meter calibration test stand
- Three meter pressure testing stands.

The facility has a separate repair and calibration area for bulk meters, including mechanical, ultrasonic, and electromagnetic meters.

When the workshop receives requests for assistance from a utility on bulk meters, it dispatches a 3-4-man team. Bulk water meters are usually repaired in-situ if possible.

Defective residential meters in Aqaba are removed by WAJ-Aqaba personnel and transported to the Amman facility. They then receive new or refurbished meters from Stores to take back and re-install.

The meter repair and calibration team are very specialized, and most workers interviewed had almost 20 years of experience. All were taught on-the-job by previous workers. No employees with this level of experience or expertise are believed to exist in Aqaba, and would have to be located and hired.

The cost of bulk meter refurbishment is approximately 25 JD per day for labor and 10 JD per day for a vehicle for approximately 2 days, making the overall trip cost a nominal 70 JD. These trips are required every 2-3 months, making the annual cost of bulk meter maintenance through the Central Workshop less than 500 JD.

WAJ policy is to replace or refurbish meters every 5 years, though 10 years is more typical. The Workshop manager reported that the cost of residential meter refurbishment is currently 11 JD per meter, though he believes that this number will rise in the future to

14-15 JD per meter, closer to its real cost. In the recent tenders, the bid cost for new residential meters was approximately 25 JD per meter.

Assuming an average number of 25,000 meters in Aqaba over the next 10 years and a 10-year replacement rate, the annual cost for meter repair and calibration using the Central Workshop would be less than 40,000 JD.

In subsequent discussion with Mr. Imad Zreikat, the Deputy Secretary-General of WAJ-Aqaba, TAPS consultants learned that WAJ-Aqaba also has a test stand for calibrating residential meters. He speculated that the test stand may also be adaptable for bulk meters. Mr. Zreikat indicated that they send over 1,000 residential meters to the Amman facility each year, and he would prefer to train the necessary personnel to perform meter calibration and repair in Aqaba.

This service will require further data and analysis to establish whether it is to AWC's advantage to continue to outsource the meter calibration and repair function on an "arms-length" contractual basis similar to LEMA or to provide the service locally in Aqaba.

### **E. Central Laboratory Site Visit**

The TAPS consultants visited the Central Laboratory to determine how, or if, their activities should be outsourced by AWC in the future. The Central Laboratory is working to receive ISO Certification 17025.

The Laboratory consists of seven separate sections:

1. Environmental Monitoring and Assessment Section
2. Drinking Water Monitoring Section
3. Water Chemistry Section
4. Wastewater Chemistry Section
5. Microbiology Section
6. Environmental Isotope Section
7. Information and Quality Assurance Section

The Laboratory is a new, multi-million JD facility with a staff of 100, and the capability of running 160 different tests. All tests required by Jordanian Standards for water, wastewater and reclaimed water are performed, including:

- pH, alkalinity and hardness
- Total suspended solids
- Total dissolved solids, conductivity and chlorides
- Oil and grease
- Biochemical Oxygen Demand (BOD) and Chemical Oxygen Demand (COD)

- Forms of nitrogen and phosphorus
- Heavy metals and PCBs
- Total Organic Carbon (TOC)
- Volatile organic compounds (VOCs) and Semi-volatile organic compounds (SVOCs)
- Microbiological tests including total coliform, fecal coliform, *Pseudomonas auriginosa*, *Giardia lamblia*, *Cryptosporidium*, nematodes, and algae
- Radioisotopes for dating and tracking water, and analyzing for uranium, radium and radon

When completed, the new laboratory at the wastewater treatment plant will have the capability to run daily process control tests, and normal environmental reporting tests including:

- Total suspended and volatile suspended solids
- Biochemical Oxygen Demand (BOD)
- Chemical Oxygen Demand (COD)
- Total Organic Carbon (TOC)
- Forms of nitrogen and phosphorus
- Microbiological tests including total coliform and fecal coliform

More elaborate testing for organic compounds, heavy metals, and certain microscopic organisms, required to be run periodically under the water and wastewater regulations, will, however, require outsourcing.

The Laboratory Personnel provided a printed price list for tests, but indicated that the Minister can discount these prices from 20 percent to 100 percent. LEMA also has many tests performed by the Central Laboratory.

## SECTION III

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### A. Outsourcing Possibilities and Proposed Training Program Revisions.

As a result of the TAPS Consultants' site visits, interviews and observations, several conclusions and recommendations can be made regarding outsourcing and resulting training requirements in the new company:

#### 1. Maintenance, Meter Repair/Calibration, & Laboratory Services

- The Central Maintenance Facility is clearly a well-equipped maintenance facility capable of providing for AWC's maintenance needs for the future.
- The Central Maintenance Facility has "arms-length" agreements with both LEMA and the Northern Governorates at below-market rates for major maintenance.
- Though detailed calculations have not yet been prepared, it is clear that the costs of acquiring specialized equipment and facilities: machine tools, lathes, welders, electrical test benches and a properly sized maintenance building, would not be cost-effective in the near-term and likely not at all.
- Trained, experienced technical personnel are not currently available in WAJ-Aqaba, and thus would need to be located and hired.
- Similar analyses for laboratory testing indicate that outsourcing these services to WAJ in Amman on a contract basis is most cost-effective for the foreseeable future. The contracts should contain provisions for ending the contract if current conditions change.
- As indicated, meter repair/calibration services will require further analysis and discussion to establish whether they should be provided by AWC or in Amman.

#### 2. Training Revisions

- As a result of the conclusions above, the training recommendations from the July 2003 Training Needs Assessment have been examined and still found to be suitable.
- The program has been reproduced in Annex A. References to maintenance in the program refers to those equipment items for which local maintenance is still appropriate.

### B. Training Program Outline and Costs

The proposed training program level of effort is outlined in Annex B. It has been assumed that all training would be developed in English, translated and delivered in Arabic to trainees in Aqaba.

As a knowledge-sharing as well as cost-saving measure, additional Arabic training materials, previously developed by Chemonics International for the USAID-funded Secondary Cities Project in Egypt, will be evaluated for their use in the training program, and serve as a continuing training resource for AWC in the future.

The training program would be held at the main office building in Aqaba, or in another suitable area. The proposed trainees to receive the training courses are as shown in Table 1 below.

**Table 1: Proposed Trainees for O&M Training Courses**

<i>Course Title</i>	<i>Trainee Group</i>
<i>Utility Management Workshop</i>	Management/Financial/Project Staff
<i>Water Pipeline Module</i>	Technical Supervisors/Technicians/Laborers (Safety Training)
<i>Wastewater Pipeline Module</i>	Technical Supervisors/Technicians/Laborers (Safety Training)
<i>Wastewater Pumping Station Module</i>	Technical Supervisors/Technicians/Laborers (Safety and Confined Space Training)
<i>Wastewater Treatment Module</i>	Management/ Technical Supervisors/Technicians

## ANNEX A

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### PROPOSED TRAINING COURSES

#### **Utility Management Workshop—8 Days**

- Introduction to Utility Finance
- Conducting Water Audits
- Cash Flow Management, Billing and Collection Techniques
- Contracting for Construction
- Prequalification of Prospective Tenderers
- Evaluation, Negotiation and Award of Construction Tenders
- Administration of Construction Contracts
- Project Startup and Warranty Period
- Water Audit Case Study
- Construction Case Study
- Value Engineering Techniques in Project Design and Construction
- Industrial Pretreatment
- Case Studies (2)
- Group Exercises (2)



**Water Pipeline Module—5 Days**

- Basic Math and Science For Operators
- Unaccounted-For Water and Leakage Detection
- Valve Operation and Maintenance
- Water Meters
- Traffic Control and Safety
- Case Studies (2)
- Group Exercises (2)

**Wastewater Pipeline Module—5 Days**

- Basic Math and Science for Operators
- Wastewater Hazards
- Infiltration and Inflow
- Valve Operation and Maintenance
- Traffic Control and Safety
- Jet Truck Operation and Maintenance
- Case Studies (2)
- Group Exercises (2)

**Wastewater Pumping Station Module—5 Days**

- Principles of Pumping and Hydraulics
- Well Pump Operation & Maintenance
- Submersible Pump Operation & Maintenance
- Dry Pit Pump Operation & Maintenance

- Storage Tank and Wet Well Maintenance
- Confined Space Entry
- Maintenance of Level Controls and Pump Station Appurtenances
- Maintenance of Valves

**Wastewater Treatment Module—5 Days**

- Basic Math and Science For Operators
- Wastewater Hazards
- Basic Wastewater Microbiology and Pond Operation

## ANNEX B

## ESTIMATED TRAINING COURSE LEVEL OF EFFORT—Utility Management Workshop—8 Days

Name of Course	English Preparation Time, Days	Arabic Translation Time, Days	Ex-Pat Delivery Time, Days	Local Delivery Time, Days	Total Course, Days
Introduction to Utility Finance	1.00	0.50	0.50	0.50	2.50
Conducting Water Audits	1.00	0.50	0.50	0.50	2.50
Cash Flow Management, Billing and Collection Techniques	1.00	0.50	0.50	0.50	2.50
Contracting for Construction	1.00	0.50	0.50	0.50	2.50
Prequalification of Prospective Tenderers	1.00	0.50	0.50	0.50	2.50
Evaluation, Negotiation and Award of Construction Tenders	1.00	0.50	0.50	0.50	2.50
Administration of Construction Contracts	1.00	0.50	0.50	0.50	2.50
Project Startup and Warranty Period	0.50	0.25	0.25	0.25	1.25
Water Audit Case Study	2.00	1.00	1.00	1.00	5.00
Construction Case Study	2.00	1.00	1.00	1.00	5.00
Value Engineering Techniques in Project Design and Construction	1.00	0.50	0.50	0.50	2.50
Industrial Pretreatment	1.00	0.50	0.50	0.50	2.50
Case Study 1	0.50	0.25	0.25	0.25	1.25
Case Study 2	0.50	0.25	0.25	0.25	1.25
Group Exercise 1	1.00	0.50	0.50	0.50	2.50
Group Exercise 2	0.50	0.25	0.25	0.25	1.25
<b>Total Man-Days</b>	<b>16.00</b>	<b>8.00</b>	<b>8.00</b>	<b>8.00</b>	<b>40.00</b>

## ANNEX B

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### ESTIMATED TRAINING COURSE LEVEL OF EFFORT—Water Pipeline Module—5 Days

Name of Course	English Preparation Time, Days	Arabic Translation Time, Days	Ex-Pat Delivery Time, Days	Local Delivery Time, Days	Total Course, Days
Basic Math and Science For Operators	2.00	1.00	1.00	1.00	5.00
Unaccounted-For Water and Leakage Detection	2.00	1.00	1.00	1.00	5.00
Valve Operation and Maintenance	1.00	0.50	0.50	0.50	2.50
Water Meters	1.00	0.50	0.50	0.50	2.50
Traffic Control and Safety	1.00	0.50	0.50	0.50	2.50
Case Study 1	0.50	0.25	0.25	0.25	1.25
Case Study 2	0.50	0.25	0.25	0.25	1.25
Group Exercise 1	1.00	0.50	0.50	0.50	2.50
Group Exercise 1	1.00	0.50	0.50	0.50	2.50
<b>Total Man-Days</b>	<b>10.00</b>	<b>5.00</b>	<b>5.00</b>	<b>5.00</b>	<b>25.00</b>

**ANNEX B****ESTIMATED TRAINING COURSE LEVEL OF EFFORT—Wastewater Pipeline Module—5 Days**

<b>Name of Course</b>	<b>English Preparation Time, Days</b>	<b>Arabic Translation Time, Days</b>	<b>Ex-Pat Delivery Time, Days</b>	<b>Local Delivery Time, Days</b>	<b>Total Course, Days</b>
Basic Math and Science For Operators	0.00	0.00	1.00	1.00	2.00
Wastewater Hazards	1.50	0.75	0.75	0.75	3.75
Infiltration and Inflow	0.50	0.25	0.25	0.25	1.25
Valve Operation and Maintenance	0.00	0.00	0.50	0.50	1.00
Traffic Control and Safety	0.00	0.00	0.50	0.50	1.00
Jet Truck Operation and Maintenance	1.00	0.50	0.50	0.50	2.50
Case Study 1	0.50	0.25	0.25	0.25	1.25
Case Study 2	0.50	0.25	0.25	0.25	1.25
Group Exercises 1	1.00	0.50	0.50	0.50	2.50
Group Exercises 2	1.00	0.50	0.50	0.50	2.50
<b>Total Man-Days</b>	<b>6.00</b>	<b>3.00</b>	<b>5.00</b>	<b>5.00</b>	<b>19.00</b>

**ANNEX B****ESTIMATED TRAINING COURSE LEVEL OF EFFORT—Wastewater Pumping Station Module—5 Days**

<b>Name of Course</b>	<b>English Preparation Time, Days</b>	<b>Arabic Translation Time, Days</b>	<b>Ex-Pat Delivery Time, Days</b>	<b>Local Delivery Time, Days</b>	<b>Total Course, Days</b>
Principles of Pumping and Hydraulics	2.00	1.00	1.00	1.00	5.00
Well Pump Operation & Maintenance	0.50	0.25	0.25	0.25	1.25
Submersible Pump Operation & Maintenance	2.00	1.00	1.00	1.00	5.00
Dry Pit Pump Operation & Maintenance	2.00	1.00	1.00	1.00	5.00
Storage Tank and Wet Well Maintenance	0.50	0.25	0.25	0.25	1.25
Confined Space Entry	1.50	0.75	0.75	0.75	3.75
Maintenance of Level Controls and Pump Station Appurtenances	0.50	0.25	0.25	0.25	1.25
Maintenance of Valves	1.00	0.50	0.50	0.50	2.50
<b>Total Man-Days</b>	<b>10.00</b>	<b>5.00</b>	<b>5.00</b>	<b>5.00</b>	<b>25.00</b>

## ANNEX B

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### ESTIMATED TRAINING COURSE LEVEL OF EFFORT—Wastewater Treatment Module—5 Days

Name of Course	English Preparation Time, Days	Arabic Translation Time, Days	Ex-Pat Delivery Time, Days	Local Delivery Time, Days	Total Course, Days
Basic Math and Science For Operators	0.00	0.00	2.00	2.00	4.00
Wastewater Hazards	0.00	0.00	0.75	0.75	1.50
Basic Wastewater Microbiology and Pond Operation	4.50	2.25	2.25	2.25	11.25
<b>Total Man-Days</b>	<b>4.50</b>	<b>2.25</b>	<b>5.00</b>	<b>5.00</b>	<b>16.75</b>

## ANNEX B

## TOTAL TRAINING COURSE LEVEL OF EFFORT

Name of Course	English Prep Time, Days	Arabic Translation Time, Days	Ex-Pat Delivery Time, Days	Local Delivery Time, Days	Total Course, Days
Utility Management Workshop	16.00	8.00	8.00	8.00	32.00
Water Pipeline Module	10.00	5.00	5.00	5.00	20.00
Wastewater Pipeline Module	6.00	3.00	5.00	5.00	14.00
Wastewater Pumping Station Module	10.00	5.00	5.00	5.00	20.00
Wastewater Treatment Module	4.50	2.25	5.00	5.00	11.75
<b>Total Level of Effort</b>	<b>46.50</b>	<b>23.25</b>	<b>28.00</b>	<b>28.00</b>	<b>97.75</b>



<b>ANNEX C TRAINING 1: Preparation of O&amp;M Training in Aqaba</b>									
<b>DIRECT LABOR</b>									
<b>I. Expatriate Advisors</b>	<b>Travel</b>	<b>Prep</b>	<b>Training</b>	<b>Total LOE</b>			<b>Fixed Daily Rate</b>	<b>Subtotal</b>	<b>Total</b>
Terry Driscoll - Industry Specialist	400%	4650%	2800%	7850%			116800%	9168800%	
<b>Subtotal: Expatriate Advisors LOE</b>	<b>400%</b>	<b>4650%</b>	<b>2800%</b>	<b>7850%</b>			<b>116800%</b>	<b>9168800%</b>	<b>9168800%</b>
<b>II. Local Professionals &amp; Local Personnel</b>	<b>Travel</b>	<b>Prep</b>	<b>Training</b>	<b>Total LOE</b>	<b>Daily Rate</b>	<b>Multiplier</b>	<b>Fixed Daily Rate</b>	<b>Subtotal</b>	<b>Total</b>
Ghassan Ayyoubi – Local Engr/ Translator		2325%	2800%	5125%	17100%	214%	36594%	1875443%	
<b>Subtotal: Local Personnel</b>		<b>2325%</b>	<b>2800%</b>	<b>5125%</b>				<b>1875443%</b>	<b>1875443%</b>
<b>Home Office Publications &amp; Management</b>	<b>Travel</b>	<b>Prep</b>	<b>Training</b>	<b>Total LOE</b>	<b>Daily Rate</b>	<b>Multiplier</b>	<b>Fixed Daily Rate</b>	<b>Subtotal</b>	<b>Total</b>
Project Manger		200%		200%	35100%	214%	75114%	150228%	
Project Administrator		100%		100%	17265%	214%	36947%	36947%	
Publications/Editing		100%		100%	21000%	214%	44940%	44940%	

Subtotal: Home Office Personnel		400%		400%				232115%
<b>Total: Direct Labor</b>	<b>400%</b>	<b>7375%</b>	<b>5600%</b>	<b>13375%</b>				<b>11276358%</b>
<b>OTHER DIRECT COSTS</b>								
<b>III. Travel, Transportation, Per Diem</b>			<b>Unit</b>		<b>Rate</b>		<b>Subtotal</b>	
A. International Travel			200%		280000%		560000%	
B. Airport Transfers			400%		5000%		20000%	
C. Local Transportation			7450%		500%		37250%	
D. Per Diem (Amman)			5525%		18500%		1022125%	
Subtotal: Travel, Transportation, PerDiem								1639375%
<b>IV. ODC- Operating Expenses</b>			<b>Unit</b>		<b>Rate</b>		<b>Subtotal</b>	
A. DBA Insurance			0%		1%		0%	
B. Medivac Insurance			200%		2200%		4400%	
C. Medical Exams			100%		10000%		10000%	
D. Inoculations								
E. Passport/Visa			200%		2500%		5000%	
Subtotal: ODC- Operating Expenses								19400%
<b>V. ODC- Training</b>	<b>5000%</b>	<b>Participants</b>						
			<b>Unit</b>		<b>Rate</b>		<b>Subtotal</b>	
A. Conference/Training Facilities--On-site			0%		150000%		0%	

B. Binders/ Inserts/ Graphics			6500%		1000%		65000%		
C. Reproduction (participants & 15 Reference)			6500%		2000%		130000%		
D. Awards/ Certificates			5000%		200%		10000%		
E. Ground Transportation			0%		5000%		0%		
F. Communications			13375%		1500%		200625%		
G. Supplies			5000%		800%		40000%		
H. Books (participants & 6 Reference)			5600%		10000%		560000%		
I. Interpretation									
J. Equipment - LDC/Screen/Projector			100%		50000%		50000%		
K. Shipping of Materials					4500%		0%		
L. Miscellaneous			6500%		500%		32500%		
<b>Subtotal: ODC- Training</b>									<b>1088125%</b>
<b>Total: Other Direct Costs</b>									<b>2746900%</b>
<b>GRAND TOTAL</b>									<b>14023258%</b>