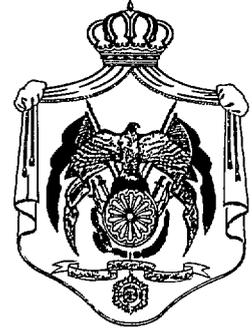


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*The Hashemite Kingdom of Jordan*



*Ministry of Water and Irrigation*

Report 3114-96-00-07

# Jordan Water Quality Improvement and Conservation Project

## The MWI Automation Plan

*WQIC Project*



The Technical Assistance Team Includes  
**Development Alternatives, Inc**  
Science Applications International Corp  
Harza Environmental Services, Inc  
Development Associates, Inc



United States Agency for International Development  
Contract No 278-0288-00-C-4026-00

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AUTOMATION PLAN  
Water Quality Improvement and Conservation Project

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**List of Acronyms**

ADP	Automated Data Processing
AR	Artificial Recharge
CIP	Commodity Import Program
CL	Central Laboratory
CMS	DAI Computer Management Specialist
COP	Concept of Operations Plan
DA	Development Associates, Inc
DAI	Development Alternatives, Inc
FIRMR	Federal Information Resources Management Regulations
GIS	Geographical Information Systems
GTZ	Deutsche Gessellschaft Fur Technische Zusammenarbert
HRD	Human Resources Development
IMS	Irrigation Management Services
IRM	Information Resources Management
JES	Jordan Environmental Society
JVA	Jordan Valley Authority
MIS	Management Information Systems
MN	Monitoring Network
MWI	Ministry of Water and Irrigation
NGO	Non-Governmental Organization
O&M	Operations and Maintenance
PD&I	Planning, Development and Information
PP/WM	Pollution Prevention/Waste Minimization
QA/QC	Quality Assessment/Quality Control
RFP	Request for Proposals
RSS	Royal Scientific Society
SAIC	Science Applications International Corporation
SG	Secretary General
SOW	Scope of Work
STTA	Short-Term Technical Assistance
TDY	Temporary Duty
TNA	Training Needs Assessment
UNDP	United Nations Development Program
USAID	United States Agency for International Development
WAJ	Water Authority of Jordan
WG	Working Group
WQIC	Water Quality Improvement and Conservation
WWW	The World Wide Web

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## **1. System planning and information surveys**

### **1.1 Purpose/Introduction**

This report is a complete revision of report WQIC 3114-95-00-07, Automation Plan for WQIC Project, June 1995. The purpose of this revision is to provide the Ministry of Water and Irrigation (MWI) and the United States Agency for International Development (USAID) with a comprehensive automation plan, procurement requirements, and implementation schedule to properly support the Water Quality Improvement and Conservation Project (WQIC) and the MWI including the integration of the United Nations Development Program (UNDP) and Deutsche Gesellschaft Fur Technische Zusammenarbeit (GTZ) project activities within the MWI. The current restructuring effort being carried out within MWI and the expansion of the central MWI has also dictated a modification of the original Automation Plan.

The main activities covered in this report relate to the assistance being provided by Development Alternative, Inc. (DAI) under a fourteen million dollar direct contract with USAID. DAI and its subcontractors provide assistance to 10 of the subcomponents being implemented at three locations. The WQIC components supported under the DAI contract<sup>1</sup> are:

- 1 Water Resources Monitoring and Management
  - a Policy and Strategic Planning
  - b Management Information System (Operations)
  - c Water Monitoring Network
  - d Laboratory Upgrade
  - e Artificial Recharge
- 2 Water Pollution Prevention and Cleanup
- 3 Irrigation Water Management
  - a Improving the Water Conveyance System
  - b Irrigation Water Management
- 4 Water Management Education
  - a Human Resources Development
  - b Public Awareness

To assist in the implementation, DAI has four U.S. based subcontractors: Harza Engineering Co., Harza Environmental Services, Science Applications International Corporation (SAIC), and Development Associates, Inc. In addition, DAI has 13 local subcontracts for varying lengths of time to assist with the project activities. WQIC Project is implemented by MWI with most of the activities implemented out of its headquarters. However, some activities are also implemented in the offices of the Jordan Valley Authority (JVA) located in Amman and the Jordan Valley, the Jordan Environmental Society (JES), and in the yet to be constructed MWI Training Center. To complicate management further, the ministry is made up of three different organizations and other donor projects that have direct input to the WQIC Project activities and the Ministry is undergoing a restructuring effort driven by World Bank conditionalities.

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<sup>1</sup> There are several other contractors assisting with other elements of the WQIC Project and the USAID supported Regional Date Banks Project that will benefit from this automation plan.

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Given the numbers of locations and consultant groups the Ministry will require information systems which

- allow a smooth flow of communication among project staff
- provide information to management staff on a timely basis
- facilitate reporting to both MWI, USAID and other donors
- enhance the ability of outside consultants and organizations to share information with MWI counterparts
- encourage the exchange of ideas throughout the project team
- complement the larger MWI Management Information System
- provide reliable and dependable access to the network
- provide the working groups a vehicle to enable them to work closely together thus ensuring the sustainability of the WQIC effort

This automation plan details the infrastructure (hardware, software, and Networking equipment) requirements for developing an information system which satisfies the above objectives and addresses the needs of MWI under its reorganization which is currently taking place. The plan is the result of work completed by the WQIC Project staff team. The short-term technical assistance was provided by an Information Systems Specialist and a Management Information Systems Specialist with Novell and Lotus Notes expertise.

It should be noted from the outset that the findings and recommendations presented in this plan are directed only at the MWI Management Information System to support the Working Groups implementing WQIC and the internal needs of the MWI. The Ministry wide Management Information System (MIS) being designed for the overall MWI is addressed in a separate analysis currently underway and should not be confused with the WQIC/MWI Project Management Information System defined in this document. The WQIC/MWI Project MIS covered in this document can be considered the first step towards the overall MIS that is being designed under the project and has been developed in consultation with the designer of the overall MIS to ensure compatibility and integration.

## **1.2 Background**

The planning and procurement for the initial computer network began directly after the WQIC startup in February 1994. There were a number of delays in the arrival of the computers and the network was not installed until November 1994. Thus, users have only been utilizing the network since December 1994. This network links most WQIC Project staff members, and some of the other staff associated with the GTZ and UNDP projects.

The network is currently used to exchange files and data among the WQIC, GTZ, and the UNDP projects. Printers, CD-ROMS, plotters, and other resources are shared. The project has two Pentium File Servers, one is being used as a Lotus Notes server and the other is a Novell 4.1 server that has Oracle 7.1 installed and used for file and printing services. The current staff primarily uses 35 IBM PC compatibles and four Macintoshes with an additional 5 Macintoshes in operation at the JES. The Macintosh's are used for desktop publishing purposes by staff responsible for the Public Awareness activities under the Water Management Education component. Project staff are currently using a wide range of software but the most frequently used programs are Ccmail, Microsoft Word, Excel, Powerpoint, and Project, and Lotus Notes.

At this time, an arrangement is being made to have an on-line Internet service in the Ministry to enable all project staff to communicate with other local and international agencies and universities which allows them to keep up to date on water-related research and study.

Improvements to the information systems and infrastructure must be continued to connect all the staff together. Currently, staff housed at JES are not connected to the network. Additionally, staff

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located at the upcoming Training Center will not be connected. Improved information systems are required in order to provide MWI and AID with the information needed on a daily basis to better manage projects and make informed decisions.

**1.3 Methodology**

This Automation Plan assesses both the current MWI computer hardware and software capabilities as well as provides an analysis of future needs. It also discusses local area network requirements to support the WQIC Project and the full MWI along with its financial and management needs. The plan is based on USAID guidelines for developing a five-year strategic Information Resources Management Plan (IRM), referred to in Handbook 18, Information Services, Part 5 Information Resources Management.

The requirements of this plan are based on the Federal Information Resources Management Regulations (FIRMR) which deal with the operation and procurement of equipment, systems services, and supplies as monitored by M/SER/IRM in conjunction with the Office of Management and Budget (OMB).

These regulations require that any complete cost estimate for Project advanced data processing (ADP) components should include life-cycle cost projected over a five-year period, whether funded in whole or in part by USAID. The following items should be included:

- 1 System planning and information surveys
- 2 Project computer hardware, software, and networks
- 3 Hardware redundancies
- 4 Commercial and custom-developed software
- 5 Spare parts, supplies, and expendables
- 6 Equipment maintenance
- 7 Uninterrupted power supply (UPS)
- 8 Site and computer room preparation
- 9 Hardware installation, checkout, and acceptance
- 10 Air conditioning and environmental controls
- 11 Application monitoring and client use
- 12 ADP operations and production processing
- 13 User training and orientation
- 14 Software and technical support
- 15 Ex-post facto audits and end-user evaluations

This plan also addresses the building of an infrastructure and systems which will remain after the original project procurers and trainers have left.

The Management Information System Specialist conducted user interviews to determine (1) the types of information staff requires in order to successfully contribute to the work plan, (2) the kind of information used in reporting to MWI, USAID and management staff, and (3) the constraints on obtaining critical information. The Information Systems Specialist and the Management Information Specialist also reviewed the use of the current Novell and Notes network.

From the interviews and the examination of systems use, a comprehensive set of recommendations was developed. The final automation plan along with the hardware and software needs are based on these recommendations.

**1.4 Targeted Audience**

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This document is intended for management level review and approval by the Jordanian Ministry of Water and Irrigation, USAID/Amman, the WQIC Project management, and USAID/W Information Resources Management. This report will be used as a guideline by the WQIC Project computer support staff and DAI in ordering and installing the remainder of the equipment needed to complete the network required for MWI operations.

### **1.5 Current Automation and General Needs**

The interviews revealed that MWI (mainly the WQIC Project) is already using automation to share, track and manage information on a limited basis. However, there are significant areas that need to be upgraded and expanded to be able to meet the long term needs of the MWI. This is especially true now that the ministry is undergoing restructuring which is resulting in the formation of a larger central organization which will absorb and expand the current MWI staff and include the centrally planning and monitoring functions.

### **1.6 General System Planning and Design Goals**

- The system should be inexpensive and easy to learn, so that the Ministry of Water and Irrigation can expand the system themselves beyond the scope of the pilot system.
- The hardware and software should adhere, as much as possible, to open standards (UNIX, MS-DOS, NOVELL networks, Relational Databases, DXF graphics interchange). These are the de facto standard file and system format in almost any government department and/or large corporations. Using standard systems will eventually facilitate file exchange among different outside agencies.
- In order to reduce down time in case of a system failure and increase the efficiency of system users, in-country vendor support should be available for any systems which might be procured.
- It is the goal of MWI to provide computers for all senior and mid level professional staff and the secretarial support staff. In addition one computer will be supplied for each two junior staff members.

## **2 Project computer hardware, software, and networks**

### **2.1 Current hardware, software, and networks**

The existing system, is composed of hardware and software procured over the past few years by the Ministry, GTZ, UNDP and USAID. USAID-financed equipment was procured during 1994 and 1995 under the technical assistance contract with DAI. The network, hardware, computers and software procured by DAI was for the start up of the WQIC project with the plan of having the network compatible with the overall MIS design for the entire Ministry. The existing systems and software are shown in Tables 1, 2 and 3.

Two main computer networks are being used by MWI staff and WQIC staff. These networks are

- WQIC Project network, a multi-platform system which connects some ministry personnel, and 4 GTZ project personnel and the WQIC project staff. The network consists of 4 MACINTOSH systems and 43 IBM or compatible systems which are all connected through intelligent hub and category 5 UTP cabling. They are connected to an ACER ALTOS 7000 file server through a NOVELL Netware network, and an IBM Pentium server running Windows NT Server and acting as the Lotus Notes Server.
- MWI network containing the water data-bank database which was developed by the UNDP project three years ago. It consists of one file server (IBM PS/2 model 80-386DX with 8

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MB Ram and 300 MB hard disk) and eight PC stations linked to the file server through a BUS topology running a Novell network. There are also two PCs in the Studies Department of the Water Authority (WAJ) which are linked to the system for data entry.

## **2.2 Planned Equipment Acquisition**

### **2.2.1 Hardware and upgrade needs**

Currently the project has two file servers which are becoming overloaded, one acting as the Novell server and one being used as a Windows NT Notes server. A new server will be procured<sup>2</sup> to act as an Oracle 7.1 server on which the ministry's large databases will be developed and to replace the functions of the two existing servers. The current Notes Server will be used as the Human Resources Development (HRD) server and it will cover all training needs for the future HRD building.

The capacity of the new server must be high enough to meet the needs of the MWI for the next five years. The increasing Notes database requirements, number of professionals in MWI, and Oracle RDBMS require heavy resources and fault tolerance such as RAM, Hard Disk, CPU, and built-in power supplies to increase network performance and reliability. The new server will have a minimum of 256 MB of RAM, which must be upgradable to a minimum of 2 GB. The effective disk storage of the server will need to be 8 GB with duplexing to handle additional data storage and redundancy requirements for the next five years. As the rest of the overall MWI MIS plan takes shape and additional users are added to the network, additional disk storage and RAM can be added as needed.

In order to further integrate the staff, the two main computer networks within MWI (WQIC and the GTZ/UNDP networks) must be linked to provide file sharing and data exchange capability among the staff using the two independent networks. Additional network accessories are required to complete this process.

Additional workstations are also required. Currently, many staff members do not have their own workstations and have to share with other users. For example, the irrigation counterpart and the ministry administrative staff do not have computers. This lack places large constraints on the ability to perform.

### **2.2.2 Additional Required Hardware**

Over the next three years there will be a requirement for a total of 162 computers and associated networks, printers and software for the MWI and its consultants. Currently there are 35 computers that will be absorbed into the new MWI and the balance of 80 will have to be procured along with the associated hardware and software as shown below. The total hardware requirements are summarized in Table 4 and the immediate requirements that are required to meet the needs of MWI during 1997 are set out in Table 5.

#### *2.2.2.1 FILE SERVERS - 1 required*

*Minimum Specifications for MWI server (on order as of November 1996)*

- Dual Pentium Pro 2x200 MHz, Total of 10 expansion slots EISA / PCI bus
- Tower Case W/ Min 7 Bays In Total, with 2 redundant power supplies
- 256 MB ECC Ram (Should Be Upgradable to 2 GB of Ram)

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<sup>2</sup> Currently on order

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- 4X4 GB Fast- Wide SCSI-2 Hot-Pluggable Hard Disks
- 2 x 32-Bit Fast- Wide SCSI 2 controllers
- 2 x 32-Bit 100 Mbps Redundant Ethernet Cards with an RJ45 connectors
- 3 5" FDD
- 15" SVGA LR Monitor
- built-in SVGA 2 MB VRAM
- 1 MB Cache memory
- 1 Internal SCSI CD-changer with min of 4 Disk changing capacity
- 4 GB SCSI-2 internal DAT Tape Backup Drive
- All other standard features, 104 keyboard, mouse, 2 fast serial ports w/16550 UART chip, 1 parallel port, flash BIOS, 1 external Fast - Wide SCSI 2 interface, all manuals in hard copy
- All power supplies are 50 HZ /220 volts
- Must come with Multi Processor support for Windows NT Advanced Server 3 5x and Novell Netware 4 1x

*2 2 2 2 Workstations*

**High End workstations - 50 required**

- One for instructor at MWI training room
- One for short term consultants and as a backup station
- Four for MWI computer staff
- HRD center (Training and Office computers)
- 30 for MWI Senior Staff and engineers

*Minimum Specifications*

- Intel Plug and Play PCI local bus Pentium 166MHz upgradable to next generation of processors
- desktop case w/ min 5 bays in total
- 32 MB RAM
- 2 GB enhanced IDE hard disk
- PCI 10/100 Mbps RJ45 Ethernet Card
- 3 5" FDD
- built-in SVGA local bus video with 2 MB VRAM
- 256 KB cache

**Low - End workstations - 30 required**

- For satellite Computer Training Center at the Jordan Valley for irrigation component
- For Junior and administrative MWI staff

*Minimum Specifications*

- Intel Plug and Play PCI local bus Pentium 120MHz upgradable to next generation of processors
- Desktop case w/ min 5 bays in total
- 16 MB RAM
- 1 2 GB enhanced IDE hard disk
- PCI 10/100 Mbps RJ45 Ethernet Card

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- 3 5" FDD
- built-in SVGA local bus video with 2 MB VRAM
- 256 KB cache

**Monitors**

- 14" SVGA color monitor qty = 50
- 15" SVGA color monitor qty = 9
- 17" SVGA color monitor qty = 18

**Notebook computers - 1 required for STTA**

*Minimum Specifications*

- Pentium 120, 12" TFT COLOR
- 850 MB HARD DISK
- 16 MB RAM
- Combo 14 4 Kbps FAXMODEM / Ethernet PC card
- 2 TYPE-II PCMCIA
- 3 5" FDD
- CD-ROM

*2 2 2 3 Peripherals*

**Laser Printers - 2 required**

- One printer for HRD building
- One for MWI

*Minimum Specifications*

- 20 Ppm
- 12 MB RAM
- 2 Paper Trays Each Capable Of 500 Sheets Of A4 Paper plus an extra manual feed tray with a capacity of minimum of 50 sheets
- built-in Ethernet Network **RJ45** Interface

**Laser Printer - 1 required**

- For satellite Computer Training Center at the Jordan Valley for irrigation component

*Minimum Specifications*

- 8 Ppm
- 2 Mb Ram
- built-in Ethernet Network **RJ45** Interface

**Color Ink Jet Printer - 1 required**

- One printer for HRD building

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*Minimum Specifications*

- 2 Ppm in color
- 6 Ppm in black

**Black Ink Jet Printer A3 - 1 required**

- One printer for HRD building

**24 Pin Wide Carriage Dot Matrix Printer - 1 required**

- For Satellite Computer Training Center at the Jordan Valley for Irrigation Component

**Digitizer (12x18) for Mapping and CAD Drafting - 1 required**

**28 8 Kbps External Modems - 3 required**

- To enable the different satellite training centers computers in different locations to communicate with main MWI file server

*2 2 2 4 Networking Accessories*

- Two 10/100 Mbps 24 Port Switchable Intelligent Hub ( RJ45 PORTS, BNC, AUI)
- Four 10 Mbps 24 Port Intelligent Hubs ( RJ45 PORTS, BNC, AUI) (or 4 x 24 Ports Hubs)
- AUI TO RJ45 TRANSCEIVERS QTY = 6  
These small devices are used to convert an old network adapter with only Thick Ethernet (AUI) connector to an RJ-45 connector which is used in the WQIC project Intelligent Hubs
- Cabling (Twisted Pair) - HRD center ( Training and Office computers), and for more MWI Staffing requirements ( Estimate ~100 JD /outlet)
- Windows NT Advanced Server (Current version) with 100 seat license
- Auto Data Switch - 8 -1 parallel (Allows all computers to use one printer QTY=1  
For satellite Computer Training Center at the Jordan Valley for irrigation component
- Overhead Projector QTY =1  
For satellite Computer Training Center at the Jordan Valley for irrigation component
- Network Patch Panels

**2 2 3 Software and Operating System**

There has been a lot of discussion about Network Operating Systems Today, two major NOS dominate the market Novell Netware and Windows NT Advanced Server In order to make the decision on which NOS the ministry should adopt as its primary and secondary NOS, the WQIC

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Project MIS team conducted a thorough technical research on the two NOS s. The findings on which the final decision were based are outlined below.

The latest Windows NT Advance Server (4.0) has many new features that will attract the newly trained ministry employees. One of these features, the "Administration Wizard", will enable the administrator to manage the whole network from one simplified window which will include creating user accounts, creating printers on the network or locally, creating groups, giving permissions on certain folders, etc. Another new feature is the inclusion of the new built-in Information Web Server that will help the ministry in the future to better communicate with its own staff and any external organizations which belong to the World Wide Web.

The ability to use longer file names will enable users to better understand and manage files and directories. Also, the addition of the in-box TCP/IP protocol that is the UNIX standard will help the overall MIS to better integrate IPX Novell standard protocol, and Microsoft own NetBUI protocol. For the above reasons the WQIC Project MIS staff recommends the following:

- 1- The new MWI server will run Windows NT Advance Server 4.0 together with Lotus Notes 4.0, plus any GIS system MWI agrees to have, and all file & print services for the WQIC, GTZ, UNDP Projects, and the MWI >160 computer stations.
- 2- The GTZ server will run Windows NT Advance Server 4.0 with ORACLE RDBMS 7.33 for NT and their databases.
- 3- The current Notes Server (IBM Pentium 60/ 80 MB RAM / 2 GB Hard Disk) will be transferred to the HRD unit and will run Novell Netware 4.1. The server will support all the computers in the training rooms and will "house" the HRD personnel development databases.

In addition to maximizing the use of Lotus Notes, the project has procured Autocad ver 13 for computer aided drafting, PC Anywhere and Netware Connect for remote communication, an upgrade to Microsoft products, Windows NT and Lotus Notes Server for Windows NT.

The analysis carried out for this automation plan revealed that additional software licenses are required to support the additional users who are now accessing the network and that many upgrades are needed. Table 5 provides a summary of the current software being used on the network and the numbers of additional licenses required to conform to international copy right laws. This software will be procured along with the hardware that will be added to the network.

### **3- Hardware Redundancies**

#### **3.1 Critical Servers**

Experience has shown that the three main sources of server failure are the server's hard drives, the hard drive controller, and the computer itself. Of the three types of failures, the hard drives and hard drive controller are the most common. To increase the fault tolerance of the MWI network and to increase operation time and network data integrity, the Minimum Specifications for the new server included Duplexing the Hard Drive Subsystem. This will avoid server problems with one of the three most common causes of failure. Having a Duplexed Hard Drive Subsystem in the file server means that when information is written to the server, it is actually mirrored so if one of the hard drives or one of the hard drive controllers fail, the server will automatically switch to the working one and the failed part could be replaced with minimum down time. The network users would not notice that any failure occurred.

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In order to minimize user down time an additional fault tolerance will be added which is a technology called Hot Swap of Hard Disk Drives, this means if one Hard Disk fails, it could be replaced while the system is running without shutting down the whole network. Another system fault tolerance measure is Redundant Power Supplies. This addition of Redundancy means that if one of the power supplies fails the next one will take over and the Server Management Software will notify the Systems Administrators of the problem so he or she can replace the failed power supply without powering down. The new server also includes a new technology that has been derived from the Main Frame principle which is the redundant MPS (Multi-Processor System) which will enable the load on the server to be equally distributed on more than one processor and in case of a CPU failure the other one will take over automatically.

## **4- Commercial and custom developed software**

### **4.1 Lotus Notes**

The project has recently installed Notes 4. To date, Notes has been used in a limited manner for internal mail and for limited database application on water monitoring and policy work. An example is the evaluation of water monitoring stations. This information is highly unstructured and is difficult to fit into a relational database. Currently under development is a Technical and Administrative Management Information System database (TAMIS) that will be used to manage all of the WQIC Project activities. This database will track project activities by component and house Action Memos, Scopes of Work, Terms of Reference, Microsoft Project schedules, and information about upcoming short term technical assistance, training, indicators, CIP contributions, subcontracts, level of effort, and weekly updates on activities. Maintaining this information in Notes will also provide a means of sharing information among WQIC staff members housed in the MWI. Through replication, it will further provide a link with JES and the DAI home office.

Lotus Notes discussion databases will be used to share ideas among Project staff members, both within and among working groups. These discussions could include new ideas for public awareness campaigns, dialogue on the benefits of various policy initiatives or discussion of training activities. This kind of database can also be used to house meeting minutes and the project newsletters.

A number of administrative functions should also be automated through Notes. Drivers' schedules, car management, inventory and procurement are all tasks that would be made more efficient through shared systems. An electronic library would house entries on both project generated and background documents. The abstracts would be full-text searchable, allowing for easy identification of critical documents.

A number of activities must be accomplished for this information sharing to be a success. Notes application development should be completed as much as possible by WQIC or MWI staff. The local Notes vendor, GCE, should be used only when programming obstacles cannot be overcome by internal resources. However, GCE expertise should be used as much as needed in order to teach project or MWI staff about Notes. Long term costs will be lower if this effort is made to institutionalize the Notes knowledge. Additionally, project staff will have to help each other learn to use the systems. This will involve training, fact sheets, user groups and discussion.

### **4.2 Internet**

In addition to maximizing the information shared among Project staff members, management staff stated that it was important to begin communicating with overseas-based engineers and water professionals and with universities. These relationships would provide critical dialogue on shared water problems and obstacles. This is the kind of information that can usually only be gathered at

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conferences or on study tours. Using the Internet this way could complement travel and make these relationships more sustainable.

A full-service Internet provider has recently been allowed to operate in Jordan. An account has been opened and one workstation outfitted with a modem will be used for Internet searching. To date it has not been possible to obtain a dedicated telephone line to make the Internet Station fully operational. Additional workstations could be outfitted once a dedicated telephone line is obtained and if and when user demand warrants it. However, due to the security issues related to computer hackers it has been decided that, in the near term, the Internet station would be kept isolated from the network while "on line" to prevent potential damage to the network or project data.

To maximize the return on investment of an Internet account, it will be critical for staff to be trained and for equipment use to be monitored for value and cost.

### **4.3 Recommendations for the Future**

#### **4.3.1 Communicating with USAID**

The location of the WQIC offices within the MWI building makes it easy to maintain electronic communications and file sharing among Project and MWI staff members. However, currently, there is no electronic mail or data exchange capacity between WQIC and USAID/Amman without going through the USA. If key USAID staff working with the project were to have Notes licenses and a modem (on a 486 PC with 8 megs of RAM), they could exchange Notes mail with project staff and directly access the WQIC Activities databases to get immediate updates on project activities. The cost of the licenses and modems would easily be justified by the benefits of direct access to this information and the enhanced communication flows.

With the security provided in Notes, electronic approval of documents is possible and could expedite the approval of action memoranda required under the project.

#### **4.3.2 Database Connectivity**

The larger Ministry-wide MIS component recommends the use of Oracle as the platform for the country-wide water information system. Research undertaken over the past months has confirmed that Oracle provides the required compatibility with existing systems currently being used throughout the country by WAJ and JVA.

There may be a time when there is a comparative advantage to having the highly structured Oracle program work with the unstructured Notes information. Should this interaction become necessary, the project will want to invest in DataLens software, which will allow the Oracle and Notes data to be exchanged.

#### **4.3.3 Communications with External Organizations**

Using the Internet station and connecting to the local Off-line and the On-line Internet providers, a link has just been established with a number of outside organizations such as the University of Jordan, the Chamber of Industries, JVA in Amman, in the valley and at the lab, JES, the Royal Geographic Center, and other key local institutions and subcontractors with which the Project staff works frequently. Although this is a dial up link through one station only, as the need increases the number of Internet stations could be increased to satisfy the ministry's needs.

## **5 System Maintenance and Spare Parts**

System maintenance and support is crucial to ensure that the work flow is not disrupted. Maintenance and support must be handled by computer professionals and documented properly. This can be done in two ways. One is to contract an outside vendor to provide support. Another is to institutionalize the knowledge and support the network internally.

Experience in Jordan has demonstrated that long term costs of an outside vendor are high and unacceptable. It was also found that outside vendors frequently do not know as much about the specific setup of the client's network as is required. Also, dependency on an outside company results in frequent calls to them for even the easiest maintenance as there is no internal learning from one service call to the next. Lastly, we have found that the response time to service requests is unacceptable as the vendors do not view time as an important factor.

The objective of the WQIC Project is to set up a system that will cut the increasing costs of service contracts and decrease the turn-around time for any piece of equipment to be fixed by the service company. Since today's computer technology is modular ("plug and play"), with no need for complex computer repair procedures, an in-house system service and support system can be developed. This will be achieved by having the computer experts of the WQIC Project conduct intensive and prolonged practical training courses for the computer staff of the MWI. Topics to be covered include computer system trouble-shooting, networking, upgrading, and replacing defective parts.

To minimize disruptions when there is a hardware failure, sufficient supplies of key spare parts must be kept on hand. At the beginning of each year, the MIS specialists will develop and have approved for procurement the projected spare parts requirements for the following year. Typically the spare parts required during the year include extra hard drives, ethernet cards, keyboards, mice, cabling.

It is estimated that the cost of spare parts over the next five years will be approximately \$5,000 for 1997 and \$10,000 per year for the next four years after the network is fully functional.

## **6 Uninterrupted Power Supplies (UPS)**

To minimize damage to the server and to ensure that vital data and time are not lost, UPS' will be provided for all servers and for the computers used to manage the networks. In Amman the power supply is stable enough that individual UPS for the PCs or having a separate UPS protected power supply for all the PCs is not justifiable. However, in the Jordan Valley it is recommended to have more protection.

### **6.1 Existing UPS**

- One APC 450 VA, that supports 3 Hubs
- One 2200 VA Smart UPS from APC, that supports the two servers, with power monitoring software installed

### **6.2 Planned Acquisitions**

- One 3 KVA UPS's for the WQIC project File Servers & Hubs
- Seven 250 VA UPS's For Satellite Computer Training Center at the Jordan Valley for Irrigation Component
- Transfer the 2200 VA Smart UPS to the HRD Training Center

## **7 Site and Computer Room Preparation**

### **7.1 Existing Site Preparation**

At the beginning of the project a basic room wiring was done, a level 5 UTP cabling was installed and a minimum of one RJ45 outlet was installed and in most of the offices there are 2 outlets while in other offices there are 3 or even 4 outlets. The initial cost for the wiring was 7,000 JD.

The current server room is located on the second floor of the WAJ building and consists of Aluminum and glass wall partitions so it enables the system administrator to monitor all server activities without having to enter the room. A cool/heat AC unit was installed so it keeps the servers' temperature at a constant level.

### **7.2 Planned Site Preparation**

The MWI server room will be moved to the new MWI building which is scheduled to be completed in 1998. The server room in the new building was designed by the WQICP CMS expert to accommodate the current and the future MWI computer network needs. The entire building has been designed to ensure the proper number of outlets, bandwidth and infrastructure to support the future Fiber Optic Backbone.

### **7.3 Computer Room Preparation**

The current temporary MWI training room has 6 computers, a Data Show, and an Overhead Projector. The computers are connected to the WQIC Project network by level 5 UTP cabling. The training room also has a cool/heat AC.

## **8 User Training and Orientation**

To help ensure the sustainability of the network and of all individual systems, a training program has been developed for the WQIC project and Ministry staff who interface with WQICP. A training room has been established and equipped with six computers. Since February 1995, instructors have been trained and two courses have been given each week on the various software applications used in the Ministry. Administrators for Novell and Lotus Notes have also been trained.

In addition to user training, which will continue throughout 1997 and 1998, special courses will be established for concentrated Novell training. This class will concentrate on introduction and advanced topics that are required in the daily activities involved in the administration of the Novell network. Six network administrators from MWI will be trained to ensure that there is sufficient redundancy to account for staff transfers, leave days, and holidays.

Although many users have attended introductory Lotus Notes classes, supplemental classes are required. To reduce costs, these classes will not be the normal certified Notes class. The WQIC project will nominate one or two individuals, who are especially proficient, to provide monthly workshops on Notes potential uses and problems. These nominees will also assist the administrators with database development.

The Human Resources Development component of the WQIC Project will develop all the computer training courses needed within the Ministry and continue to carry out courses as needed throughout the life of the project.

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## **9 Plan for Implementation**

This automation plan will be implemented in two phases to coincide with the restructuring and staffing of MWI. The first phase will begin late in 1996 and procure and install the equipment and software needed in 1997. The second phase will begin in late 1997 and will complete implementation of the automation plan. The second phase has yet to be funded, thus Phase I has been design as a stand alone system that can function without Phase II.

Upon approval of the Automation Plan, advertisements will be made and RFQs will be developed for all the required hardware and software in Jordan and the United States for Phase I. The RFQs will be evaluated by a committee composed of WQIC Project staff from MWI, WAJ, JVA and DAI. Approximately two months is allocated for the advertising and evaluation of bids.

It is expected that placing the orders and delivery of the equipment will take three to six months. During that time, the MWI computer staff will be trained on Novell 4.1 and Lotus Notes using the existing equipment.

Following installation of the equipment, the Project plans to have a network and MIS expert from the DAI home office come to Amman for four weeks to fine tune the network and to provide additional training for administrators and users.

To complete the network and to satisfy the automation needs of the Ministry, approximately \$404,000 will be spent to procure, install, and train staff in two phases (see Table 1). Phase I for \$143,000 to supply the needs for 1997 and the balance for 1998 and beyond. This network will be linked with the networks of JVA and WAJ to form the overall MIS for the full Ministry of Water and Irrigation.

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**10 Tables**

**10 1 Table 1**

**Estimated Costs of Phase I and Phase II**

<b>Hardware</b>	<b>Phase I Number</b>	<b>Phase I Cost</b>	<b>Phase II Number</b>	<b>Phase II Cost</b>
File Servers	1	35,000	0	0
Low-End Workstations	0	0	30	42000
High-End Workstations	17	34000	33	59400
14" Monitors	0	0	53	13250
15" Monitors	9	3600	0	0
17" Monitors	8	5600	10	7000
NoteBook Computers	0	0	1	3000
Laser Printers	2	4000	1	2000
Color-Inkjet Printers	0	0	1	500
Black Inkjet Printers	0	0	1	500
Digitizers	0	0	3	900
Network Accessories	lot	7,200	lot	10000
Network Patch Panels	4	2800	4	2800
		0		
Software	lot	13500	lot	50000
System Support (spare parts)	lot	8 000	lot	10000
Training			lot	5,000
<b>TOTAL COMMODITIES</b>		<b>113 700</b>		<b>206350</b>
5% Contingencies		5685		10317 5
<b>TOTAL</b>		<b>119,385</b>		<b>216,668</b>
Shipping, insurance fees 20%		23877		43333 5
<b>TOTAL BUDGET AMOUNT</b>		<b>143 262</b>		<b>260,001</b>

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**10 2 TABLE 2**

**Existing Hardware by Location**

<b>NO.</b>	<b>Room</b>	<b>Owner Description</b>	<b>Computer Type</b>
1	100-SG	SG-ASSISTANT	IBM 4/33DX /8/170
1	100-SG	SG-SECRETARY	IBM 4/33DX /8/170, 212
2	200-T	TRAINING	IBM 4/33DX /8/170
3	200-T	TRAINING	IBM 4/33DX /8/170
4	200-T	TRAINING	IBM 4/33DX /8/170
5	200-T	TRAINING	IBM 4/33DX /8/170
6	200-T	TRAINING	IBM 4/33DX /8/170
7	200-T	TRAINING	IBM 4/33DX /8/170
8	200-S	SECRETARY	IBM 4/33DX /8/170,212
9	200-S	PROJECT ASSISTANT	IBM PENTIUM 60/16/1 2GB
10	200-C	CAD DRAFTMAN	IBM PENTIUM 60/16/360
10	201	DISI PROJECT CORDINATOR	ZEOS PENTIUM 60/16/1 0GB
11	203	PP/WM	IBM 4/33DX /8/170,212
12	203	ARTIFICIAL RECHARGE	AVERX STEP NOTEBOOK
13	204	IMS	IBM 4/33DX /8/270
14	206	WQIC PROJ CO	IBM 4/33DX /8/170
15	207	SG-ASSISTANT	IBM 4/33DX /8/170
16	208	IMS	COMPUDYNE 486-DX2 66/16/212
17	209	PUBLIC AWARENESS	POWER MAC 7100-80MHZ/40/700
18	211	HRD	COMPUDYNE 486-DX2 66/16/850
19	211	HRD	COMPUDYNE 486-DX2 66/16/212
20	212	PUBLIC AWARENESS	MAC LC 475 /8/240
21	212	PUBLIC AWARENESS	QUADRA 650/16/260
22	213	GTZ	COMPUADD PENTIUM 16/1 2GB
24	215	FINANCIAL OFFICER	IBM PENTIUM 60/8/360
25	215	PROJECT ADMINISTRATOR	EKO PENTIUM 100/32/1 2 GB
26	216	COP	COMPUDYNE 486-DX2 66/16/1 2GB
27	217	HRD	IBM PSV 486/66/16/500
28	218	MN	COMPUDYNE 486-DX2 66/16/850
29	218	ARTIFICIAL RECHARGE	GATEWAY 2000 PENTIUM 60-
30	219	UNDP	IBM PS/2 70- 6/120
31	220	GTZ	GATEWAY 2000 486-16/540
32	221	GTZ	COMPUADD PENTIUM-8/420
33	221	GTZ	DELL 466 /16/1 2 GB
34	223	CMS	EKO PENTIUM 100/32/1 2 GB , 850
34	200-C	MWI PROGRAMMER	EKO PENTIUM 100/32/850 MB
35	223	MIS	EKO PENTIUM 100/32/1 2 GB
36	223	INTERNET STATION	POWER MAC 7100-80MHZ/40/700
38	223	WQICP-GTZ FILE SERVER	ACER ALTOS 7000/ 64/2X2 GB
39	223	WQICP FILE SERVER	IBM PENTIUM 60/80/2GB
40	223	STTA	IBM PS/NOTE NOTEBOOK
41	223	STTA	HP 4000DX COLOR NOTEBOOK
42	223	STTA	TI 4000DX COLOR NOTEBOOK
43	223	STTA	TI 4000DX MONO NOTEBOOK
44	226	MWI-FINANCIAL ANALYST	IBM 4/33DX /8/170
45	238	POLICY	IBM 4/DX66 /8/270
46	JES	PA	QUADRA 850 AV

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**10 3 TABLE 3**  
**Summary of Existing and Required Software**

<b>Name of Software</b>	<b>Current License</b>	<b>Additional Required Total</b>
• ADOBE ILLUSTRATOR FOR MAC	1	0
• ADOBE PHOTOSHOP 2 5 LIMITED	2	0
• AL NASHIR EL-SAHAFI	7	0
• ALDUS PAGEMAKER 5 0 FOR MAC	2	0
• ARCVIEW	1	2
• AUTOCAD VER 13 FOR WINDOWS	1	0
• CC-MAIL	1	100
• CENTRAL POINT ANTI VIRUS LAN VER	33	0
• CHEYENNE BACKUP SOFTWARE	100	0
• CLIP ART	1	0
• COPLOT, CODRAW, COSTAT	0	3
• COREL DRAW 5 0	1	0
• DBASE III FOR DOS	2	0
• DISK DOUBLER	2	0
• EASY OPEN TRANSLATOR	1	0
• EXPERT FONTS	1	0
• FILEMAKER PRO ARABIC	1	0
• GIS ATLAS	1	0
• HARVARD GRAPHICS FOR WINDOWS	1	0
• HIJACK PRO FOR WINDOWS		1
• LOTUS 1 2 3 FOR WINDOWS 4 0	1	0
• LOTUS FREELANCE GRAPHICS	2	0
• LOTUS NOTES 4 0 CLIENT	20	100
• LOTUS NOTES SERVER UPGRADE	1	0
• LOTUS NOTES VER 3 12	20	0
• MAC-LINK PLUS	2	0
• MICROSOFT OFFICE WITH ARABIC SUPPORT FOR WINDOWS 95	0	100
• MICROSOFT WORD 5 0 FOR MAC	1	0
• MS EXCEL 4 0 FOR MAC	2	0
• MS EXCEL 5 0	4	0
• MS OFFICE for WINDOWS 3 1	20	0
• MS OFFICE for WINDOWS 95	16	?
• MS PROJECT	14	0
• MS PROJECT W/ARABIC SUPPORT		6
• MS WINDOWS 95 (free comes preinstalled)	1	150 FREE
• MS WORD 2 0	1	0
• MS WORKS	1	0
• MY BROCHURES	1	0
• NETWARE CONNECT	8	0
• NORTON UTILITIES	14	0
• ORACLE UPGRADE FROM NOVELL TO NT	25	25

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• OS/2 FOR WINDOWS	1	0
• PC ANYWHERE FOR WINDOWS	1	0
• QUARK EXPRESS 3 3	2	0
• QUATTRO PRO 5 0	2	0
• STATGRAPHICS		1
• SURFER FOR WINDOWS	1	0
• VIRUS SCAN	1	0
• VISUAL BASIC		1
• WINDOWS 95 W/ARABIC SUPPORT (free comes preinstalled)		150FREE
• WINDOWS ATLAS	1	0
• WINDOWS NT ADVANCED SERVER 4 0	0	2
• WINDOWS NT ADVANCED SERVER 3 51	1	0
• WINTEXT	2	0
• WORD PERFECT 6 0 FOR WINDOWS	1	3
• Visio (charting program)	0	2
•		
•		

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## **10 4 Existing Peripherals**

### **Printers & Plotters**

- One 10 PPM IBM laser printer
- One 5 PPM IBM laser printer
- One 10 PPM Mannesman Tally laser printer
- One Hewlett Packard color inkjet printer
- One IBM color inkjet printer
- One Apple Macintosh Laser Writer Pro 10 PPM laser printer
- One Houston Instrument 8 pen B-size plotter
- One Dot Matrix FUJITSU DL 2400 PRINTER

### **Scanners**

- One Umax UC 1260 Flat Bed Full Page Color scanner
- One Microtek Flat Bed Full Page Color scanner

### **Tape Backup & Optical Drives**

- One Colorado Systems Jumbo Tracker 250 MB Tape Backup unit
- One Syquest 80 MB Optical Drive
- One 230 MB Optical Disk

### **Multimedia**

- Eight Internal Double Speed CD-ROM Drives
- One Sound Card, speakers, and a microphone

### **Fax Modems**

- Four external 14 4 Kbps Fax Modems

### **Digitizers**

- One Houston Instruments 12x12 Digitizer
- One E-Size Digitizer

### **Air-conditioning unit ( heating & cooling)**

- Two ceiling units

### **Overhead projector**

- Two units

### **Network Operating System**

- Novell Netware 4 1 100 user
- Windows NT 3 51 Advanced Server

### **Network Topology**

- A Star-Like topology connected by a three 24-Port 3COM Intelligent Hubs with Management Module installed
- Category 5 Unshielded Twisted Pair cabling (UTP)

### **Network Cards**

- One PCI Ethernet Card for File Server
- Twenty Seven 16 Bit Ethernet Cards in PC Stations

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Existing Uninterruptible Power Supply

- Two 2 KVA UPS's used for MWI-UNDP server and the WQIC project Hubs
- One 400 VA UPS used for WQIC server only

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10 5 TABLE 4

Summary of Existing and Required Hardware and Network Accessories

<u>ITEM</u>	<u>EXISTING</u>	<u>ADDITIONAL REQUIRED</u>
QUAD PENTIUM SERVER (ON ORDER)	0	1
GTZ SERVER	1	0
HRD SERVER	1	0
IBM & COMPATIBLES PENTIUM (high end)	0	50
IBM & COMPATIBLES PENTIUM (low end)	10	30
IBM & COMPATIBLES 486 -based *	23	0
IBM & COMPATIBLES 386 -based	1	0
IBM & COMPATIBLES NOTEBOOK COMPUTERS *	5	2
POWER MAC's 7100 *	3	0
MACINTOSH QUADRA*	2	0
MACINTOSH LC- based	2	0
LASER PRINTERS*	7	3
COLOR PRINTERS *	3	1
BLACK INKJET PRINTERS	1	1
COLOR PLOTTERS	1	0
DOT MATRIX PRINTERS	1	1
FAXMODEMS *	4	3
SCANNERS	2	0
TAPE BACKUP & OPTICAL DRIVES*	4	1
CD - ROMS	13	0
SOUND CARDS	1	0
DIGITIZERS	2	1
INTELLIGENT HUBS	3	6
UPS	4	8
TRANSCEIVERS	3	6
PRINT SERVERS	4	2
POCKET ETHERNET ADAPTER	3	1
AUTO DATA SWITCH	0	1
OVERHEAD PROJECTOR	2	1
E-SIZE PHOTOCOPIER	0	1
AIR-CONDITIONING UNIT ( HEATING & COOLING)	3	0
SPARE PARTS (SEE TABLE 5)	LOT	LOT

- \* One computer is located in the chamber and one in the Valley
- \* One fax modem is located in the chamber
- \* one laser printer in the chamber and one in the Valley
- \* One notebook computer is located in the chamber
- \* One color printer in the chamber
- \* One optical disk, one MAC LC, one QUADRA, one Laser Printer are in JES

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**10 6 TABLE 5**  
**Phase I of Procurement of the Automation Plan**

Item	Quantity	Unit Estimate \$	Total \$
1 Hi-End Computers	17	2000	34000
2 15" Monitors	9	400	3600
3 17" Monitors	8	700	5600
4 Hi-End Laser Printer	2	2000	4000
5 16 Port 10 Mbps Hubs	2	1500	3000
6 8 Port 10/100 Switch Hub	1	3000	3000
7 Cabling (Per Outlet)	12	100	1200
8 Software (lot) - see below			13500
9 Spare Parts (Lot) - see below			8000
10 Network Patch Panels	4	700	2800
11 Server <sup>3</sup>	1		35000
Sub - Total			113700
5% contingencies			5685
20 % S&H fee			23877
<b>Total</b>			<b>143,262</b>
<b>Spare Parts</b>			
	Quantity	Unit Estimate \$	Total \$
1 Hard Disks (1 2 GB)	10	199	1990
2 Motherboard (166 Mhz CPU)	2	500	1000
3 RAM (16 MB 60 ns SIMMS)	8	120	960
4 Keyboard	10	25	250
5 Network Cards (RJ45 & BNC Connectors)	10	50	500
6 MS Mouse	10	25	250
7 CD-ROMS (8x Speed)	3	100	300
8 Ethernet Pocket Adapter	3	100	300
9 External FAXMODEM (28 8 Kbps)	3	150	450
10 Consumables (Toner for laser Printers, Drums)	lot		2000
Total			8000
<b>Software</b>			
Lotus Notes 4 xx SMP	20		7200
Windows NT 4 xx	20		800
cc MAIL for Windows	20		1500
Word Perfect	5	100	500
Arcservefor NT	100		1000
Oracle for NT	5		1000
Norton Anti Virus	20		1500
Total			13500

<sup>3</sup> Currently on order