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Jordan Schools Construction & Rehabilitation Program

Environmental Assessment Report Aqaba Schools

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TABLE OF CONTENTS

List of Tables ..... **iii**

List of Figures ..... **v**

Acronyms and Abbreviations ..... **vi**

Executive Summary ..... **vii**

1. Introduction **1**
1.1 Objective and Scope of Work 1
1.2 Environmental Assessment Requirements 2
1.2.1 Scoping Process 2
1.2.2 EA Methodology 3
1.3 Content of the Report 3

2. Project Description **5**
2.1 Purpose of the Project 5
2.2 8th Area Secondary Boys School 6
2.2.1 Project Components 6
2.2.2 Project Location 7
2.3 10th Area Secondary Girls School 9
2.3.1 Project Components 9
2.3.2 Project Location 10
2.4 Al Karameh Secondary GIrls School 12
2.4.1 Project Components 12
2.4.2 Project Location 13

3. Environmental Laws & Regulations **14**
3.1 Regulation for Protection of the Environment in ASEZ (No. 21 for 2001) 14
3.2 Environment Protection Law (No. 52 for 2006) 14
3.2.1 Environmental Impact Assessment Bylaw for 2005 15
3.2.2 Air Protection Bylaw for 2005 (No. 28 for 2005) 15
3.2.3 Solid Waste Management Bylaw (No. 27 for 2005) 15
3.2.4 Soil Protection Bylaw (No. 25 for 2005) 16
3.3 Public Health Law (No. 54 for 2002) 16
3.4 Law for Protection of Cultural Heritage & Sites (No. 5 for 2005) 16
3.5 Water Authority Law (No. 19 for 1988) 16
3.6 Education Law (No. 93 for 1994) 16
3.7 Instructions and Codes 17
3.7.1 Instructions for Noise Prevention for 2007 17
3.7.2 Jordanian Building Codes 17

4. Environmental Setting **20**
4.1 Biophysical Environment 20
4.1.1 Location and Climate 20

4.1.2 Geomorphology and Geology....22
4.1.3 Land Use....23
4.1.4 Archaeological Findings....23
4.1.5 Biodiversity System....24
4.1.6 Prevalent or Adaptive Vegetation....26
4.2 Socioeconomic Context....27
4.2.1 Population and Major Economic Activities....27
4.2.2 Quality of Life and Cultural Issues....29
4.2.3 Prevalent Architectural Images....30
4.2.4 Health and Other Community Services....31
4.2.5 Educational Services....33
4.2.6 Transportation....35
4.2.7 Water and Electricity Supply....37

5. Environmental Impacts....39
5.1 Assessment of Overall Impacts....39
5.2 Expected Environmental Impacts....39
5.2.1 Construction Impacts....39
5.2.2 Socio-economic Issues....41
5.2.3 Public Health and Safety Issues....43

6. Environmental Management Plan....48

Appendix A: List of Preparers....56

Appendix B: Bibliography of References Used....57

Appendix C: List of Attendees to Scoping Session....59

Appendix D: Correspondence....61

Appendix E: Regulation for Protection of the Environment in ASEZ (No. 21 for 2001)....62

LIST OF TABLES

Table 1.1: Significant Issues Identified in the Scoping Session 2
Table 3.1: Maximum Allowable Noise Levels.....17
Table 3.2: Permissible Levels of Worker Exposure to Noise 19
Table 4.1: Amount of Annual Rainfall in Aqaba City (2000 – 2005).....21
Table 4.2: Climatic Information for Selected Months in Aqaba City (2005).....21
Table 4.3: Types of Mammals in the governorate of Aqaba 24
Table 4.4: Distribution of Cultural Agencies in Aqaba Governorate, 2005.....30
Table 4.5: Notifiable Disease in Aqaba Health Directorate and in Jordan, 2006 31
Table 4.6: MOH Centers and Clinics in Aqaba, 2005 32
Table 4.7: Employees of the MOH by profession in Aqaba Directorate.....32
Table 4.8: Number and Type of Cooperatives in the Governorate of Aqaba, 2005 ...33
Table 4.9: Number and Type of Charitable Societies in the Governorate of Aqaba, 2005 33
Table 4.10: Number of Students by Sex and Supervising Authority in Aqaba Directorate, 2006/2007.....34
Table 4.11: Summary of the Number of Students at MOE Schools in Two Different Educational Levels by Sex, Aqaba Directorate, 2006/2007 34
Table 4.12: Number of Administrators, Technicians and Teachers at MOE Schools by Sex in Aqaba Directorate, 2006/2007 34
Table 4.13: Number of MOE Schools by Sex and Stage, Aqaba Directorate, 2006/2007 35
Table 4.14: Number of MOE School Buildings by Ownership and Attendance System, Aqaba Directorate, 2006/2007 35
Table 4.15: Number of MOE Schools and Students by Administrative Divisions and Sex, Aqaba Directorate, 2006/2007 35
Table 4.16: Length of Road Networks by Type of Road, 2005 36
Table 4.17: Number of Licenced Vehicles by Type of Vehicle and Ownership in the Governorate of Aqaba, 2005.....36
Table 4.18: Number of Road Accidents, Type of Accident and Number of Casualities in the Governorate of Aqaba, 2005 36
Table 4.19: Water Supply for Domestic and Municipal Purposes in Aqaba Governorate, 2001 – 2005 37

Table 4.20: Average Quantity of Domestic Wastewater Flowing from Aqaba to the WWTP, 1994 - 2005.....37
Table 4.21: Rural Electrification for the Areas of Aqaba, Ma'an, and Shobak, 2005 .38
Table 6.1: Proposed Mitigation Measures during Design 48
Table 6.2: Proposed Measures during Construction.....52
Table 6.3: Proposed Mitigation Measures during Operation.....54

LIST OF FIGURES

Figure 2.1: Location of the Proposed Schools in Aqaba City.....5
Figure 2.2: Plan of Proposed 8th Area Secondary Boys School.....7
Figure 2.3: Close-up of Proposed 8th Area School Site 8
Figure 2.4: Land Area of Proposed 8th Area Secondary Boys School 8
Figure 2.5: 8th Area School Location on a Main Road in a Residential Area 9
Figure 2.6: Plan of Proposed 10th Area Secondary Girls School 10
Figure 2.7: Close-up of Proposed 10th Area School Site 11
Figure 2.8: Land Plot of Proposed 10th Area Secondary School for Females.....11
Figure 2.9: School Location in a Residential Area 12
Figure 2.10: Plan of Proposed Al Karameh Secondary Girls School 13
Figure 2.11: Completed Housing Facilities in Al Karameh Area 13
Figure 4.1: Site Location of the 8th Area Secondary Male School.....20
Figure 4.2: Site Location of the 10th Area Secondary Male School.....21
Figure 4.3: Biogeographical Map 22
Figure 4.4: Population Aged Less than 14 and Unemployment Rates in Aqaba and Jordan, 2006 28
Figure 4.5: Type of Economic Activity in Aqaba Governorate.....29

ACRONYMS AND ABBREVIATIONS

ASEZ	Aqaba Special Economic Zone
ASEZA	Aqaba Special Economic Zone Authority
CMC	Construction Management Consultant
EA Environmen	tal Assessment
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
IUCN	International Union for the Conservation of Nature
MOE	Ministry of Education
MOEnv	Ministry of Environment
MOH	Ministry of Health
USAID	United States Agency for International Development
WAJ	Water Authority of Jordan

EXECUTIVE SUMMARY

ES.1 Introduction

The Ministry of Education (MOE) of Jordan with the cooperation of the United States Agency for International Development (USAID) is currently implementing the Jordan Schools Construction and Rehabilitation Program. For the Aqaba region, this program includes the immediate construction of 3 new schools and renovation of 13 others. CDM International is the Project Manager and Engicon is providing consulting services for the environmental assessment (EA) for this project.

This report deals with the construction of the three new schools:

- The 8th Area Secondary School for Males, which will have 22 classrooms, serve 792 (or 1,044) students, and recruit around 60 staff members.
- The 10th Area Secondary School for Girls, which will have 28 classrooms, serve 1,008 (or 1,188) students, and recruit around 60 staff members.
- Al Karameh Secondary School for Girls, which will have 28 classrooms, serve 1,008 (or 1,188) students, and recruit around 60 staff members.

The EA was prepared to fulfill the requirements of the applicable USAID regulations, the Aqaba Special Economic Zone Authority (ASEZA) environmental regulation, and the Jordanian EIA Bylaw. The process of preparing this EA involved holding a Scoping Session during which the issues to be analyzed in the EA were identified and discussed. Following this, a Scoping Statement was prepared, which described the significant environmental issues that would be analyzed further in the EA. The issues are summarized below:

Construction Issues	Socioeconomic Issues	Public Health & Safety Issues
Occupational health & safety	Interaction between students/ classes	Communicable disease prevention
Workers sanitation	Student psyche inside the classroom	Sanitary facilities
Traffic	Monitoring of student behavior	Indoor and outdoor safety issues
Noise	Employment and economic development	Injury from car accidents
Dust pollution	Land Use	Protection from intruders
Waste generation	Traffic during operation	Safety in workshops
Employment opportunities	Travel time to and from school	Provisions for physically challenged students
		Earthquake protection
		Chalk dust

ES.2 Project Description

The project under study consists of the construction of the 3 schools with a fast-track schedule to be located in the city of Aqaba. The aim for building the 3 facilities is to solve the overcrowding problem in surrounding schools.

The 8th Area Secondary Boys School will be designated as Secondary Boys, for grades 4th to 12th. The area of the land where the school will be built is 15,396 m^2. The built up area will be 3,045 m^2 while the gross built up area will be 4,567 m^2 such that each student is allocated 5.77 m^2.

The 10th Area Secondary Girls School will be designated as Secondary Female, for grades 1 to 12. The area of the land where the school will be built is 8,350 m^2. The built up area will be 3,906 m^2 while the gross built up area will be 5,859 m^2 such that each student is allocated 5.81 m^2.

Al Karameh Secondary Girls School will be designated as Secondary Female, for grades 1 to 12. The area of the land where the school will be built is 9,000 m^2. The built up area will be 3,516 m^2 while the gross built up area will be 5,274 m^2such that each student is allocated 5.23 m^2.

ES.3 Environmental Laws & Regulations

The following are the environmental laws and regulations relevant to the construction of the proposed schools:

- Aqaba Special Economic Zone Environment Protection Regulation (No. 21 for 2001): It states that all projects in this zone are subject to an Environmental Impact Assessment and provides instructions for solid waste disposal, including waste resulting from construction activities.
- Air Protection Bylaw (No. 28 for 2005): It sets the condition that all closed and semi-closed public spaces in Jordan should have sufficient ventilation in accordance with the Jordanian Building Code.
- Solid Waste Management Bylaw (No. 27 for 2005): It states that any party performing an activity that will result in solid waste should abide by specified instructions.
- Soil Protection Bylaw (No. 25 for 2005): It states that the Ministries of Environment and Agriculture should study the sites of development projects and their impact on land and natural resources.

- The Public Health Law (No. 54 for 2002): It states that any person infected with a contagious disease should be isolated in order to prevent a disease outbreak. It also gives mandate to the Ministry of Health to monitor sewerage networks and internal installations and to ensure that public health is not jeopardized.
- Law for Protection of Cultural Heritage & Sites (No. 5 for 2005): Destruction or damage of any heritage site is strictly forbidden.
- Water Authority Law (No. 19 for 1988): It gives mandate to the Water Authority of Jordan to connect the public to the water and sewer networks, and maintain, operate, and manage these networks.
- Education Law (No. 93 for 1994): It specifies that the Ministry of Education is responsible for providing school buildings suitable for educational purposes and to distribute them throughout the country in accordance with Jordan's educational policy. The Ministry is also responsible for supervising all educational institutions in the country to ensure that they are abiding by the legislation.
- Instructions for Noise Prevention for 2003: These instructions specify the maximum allowable level of noise for the different types of areas, both during the daytime and at night.
- Jordanian Building Codes: Many of the building codes for Jordan address environmental, health, and safety issues and are relevant to the school building. They are as follows:
  - Jordanian Code No. 3: Loads and Forces (Section 4: Earthquake Actions)
  - Jordanian Code No. 15: Fire Protection
  - Jordanian Code No. 16: Natural Ventilation
  - Jordanian Code No. 17: Natural Lighting
  - Jordanian Code No. 18: Water Supply for Buildings
  - Jordanian Code No. 19: Wastewater for Buildings
  - Jordanian Code No. 20: Beautification of the City
  - Jordanian Code No. 21: Solid Waste
  - Jordanian Code No. 22: Public Safety during Construction
  - Jordanian Code No. 23: Electrical Installation
  - Jordanian Code No. 27: Fire Alarm Systems

- Jordanian Code No. 32: Building Requirements for the Physically Challenged

ES.4 Environmental Setting

The project location is in the city of Aqaba, which is situated on the Red Sea in the southern tip of Jordan. The 3 schools will be constructed in the middle of residential areas, surrounded by main and secondary roads.

Biophysical Environment

Aqaba city is characterized by very hot and dusty weather in summer and a temperate winter. The area is quite dry such that the wind direction is northerly to north-westerly.

Aqaba is considered part of the Sudanian penetration region with mostly alluvial with granite and saline soil.

At the junction where the Gulf of Aqaba meets the Red Sea spreading center, the tectonic plate boundary continues as a transform fault zone with a movement that is considered active until today, but it is periodic rather than continuous.

The neighboring areas to the proposed school sites are mainly residential or housing units that are still under construction. Services already exist within the proposed land plot and are easily accessible by main and secondary roads, except for al Karameh site, where the entire residential area is still under construction. The land parcels for the three schools are flat with no vegetation and covered with sand and rocky cobbles.

Archeological sites in Aqaba city date back to 4000 BC, due to its strategic location at the junction for trading between Asia, Africa, and Europe. Regarding the project sites, the Department of Antiquities has conducted field visits to the proposed site areas and concluded that there are no known sites of archeological value (according to letter no. 13.14.5823 dated 20 June 2007).

The Gulf of Aqaba extends for about 180 km from the Jordanian shore in the north to the sills of the Strait of Tiran in the south. It is the only marine fish resource of Jordan. The Gulf of Aqaba hosts about 110 species of soft corals, 120 species of hard corals, and over 1000 species of fish. A few of the countless marine creatures living in the waters of Aqaba are corals, coral fish, reptiles, and mammals.

Vegetation in Aqaba is characterized by having a tropical tree element, in addition to shrubs and annual herbs. In the Sudanian region, vegetation is usually attributed to the shallow water table.

The most common animal species in Aqaba and the surrounding areas are the Cairo Spiny Mouse, the Golden Spiny Mouse, the Wagner Gerbil, the Baluchistan Gerbil, the Egyptian Gerbil, the Bushy-tailed Jird, the Said Jird, and the Fat Sand Rat. Most of these animals are classified as endangered.

Socioeconomic Context

Aqaba is Jordan's only outlet to the sea and is considered a transport hub to the Gulf Countries. Moreover, Aqaba is considered as one of Jordan's primary industrial centers. In addition, plans are currently underway to increase the city's tourist facilities, especially around the area south of the city center.

Aqaba is a thriving coastal city with one of the lowest poverty rates in the Kingdom. The residents have access to all the basic infrastructure needs including water, sanitation, and electricity.

By the end of 2007, the population of Aqaba is expected to be around 88,771, the vast majority of which is urban. The population growth rate in Aqaba Governorate is the highest in the country.

In the governorate, the population is young with those aged less than 14 years consisting of 42.1% of the total population. The unemployment rate is estimated at 13.8, with a major difference between males and females.

The main economic sector in Aqaba is the “Transportation, Storage and Communication” sector, followed by “Public Administration and Defense” and “Wholesale and Retail Trade”. The percentage of those working in the “Hotels & Restaurants” and “Fishing” is generally less than expected for a coastal city.

As for architectural images, ASEZA is striving to present Aqaba as a city reflecting traditional Islamic foundations, a state-of-the-art business center, and respect for the unique environment of the waters and mountains of the area.

In terms of health, the most common notifiable diseases in Aqaba are diarrhea, mumps, animal bites, brucellosis, amebic dysentery, and measles. Other health issues of concern include Leishmaniasis, head lice, and animal bites.

Regarding health services, the Ministry of Health operates 10 health centers and 9 village centers in the Aqaba Health Directorate. In addition, there are a total of 347 health workers, 37 of which are general practitioners while only 2 are specialists.

For the scholastic year 2006/2007, the Governorate of Aqaba registered 32,672 students, of which 17,101 were females and 15,571 were males. The Governorate houses 109 schools with 18 schools for girls, 30 schools for boys and 61 co-ed.

In the kindergarten level, the number of students is balanced between males and females. However, more females are registered at the primary level. The number of female employees at MOE schools is double that of the number of male employees.

Out of the 59 MOE schools in Aqaba, only 13 are rented. In addition, there are only two-shift systems, applied in the owned schools and not the rented ones.

Aqaba is distinguished with the variety of transportation means it has access to. In addition to the road network, railways, and waterways are two major facilities used for transporting either persons or goods and materials. The number of accidents that usually occur in the governorate is somehow significant. However, only 5.2% of these are car/pedestrian collisions.

The utilization of water per capita in the Aqaba is much higher than in other governorates of Jordan. This is attributed to the fact that Aqaba has the highest temperature rates in the country and has a long summer season. Water is supplied continuously to Aqaba city from the Disi Aquifer in the south.

Regarding electricity, data show that 99% of the population of rural areas in Aqaba is connected to the electricity network.

ES.5 Environmental Impacts

Construction of a school in a residential area is generally not associated with any major environmental concerns. As the project does not require any rehabilitation works, the main issues relate to nuisances resulting from construction activities, which are temporary and can be significantly mitigated through proper planning and best management practices. During operation, the most prominent concerns are those relating to indoor safety issues, which can be addressed through a good design and effective supervision by the school staff.

Therefore, the succe ss of the project will hi ghly depend on adherence to the environmental management plan and public h ealth law th at strives to address most of the issues discussed.

Construction issues related to the project were identified as follows:

- Occupational Safety and Health: Worker exposure to dust, high noise levels, and other potential hazards associated with the use of heavy construction machinery.
- Workers' Sanitation: Importance of provision of sanitary facilities.
- Traffic: Congestion due to movement of vehicles in and out of the site.
- Noise: Resulting from operating con struction equipment and disturbing r esidents in the neigh borhood. Can be mitigated by adhering to the Noise Instruct ions and will only be temporary.
- Dust Pollution: Impact on surround ing areas or even beyon d with the worst case expected during summer.
- Waste Gen eration: Imp act on surrounding areas if not disposed of properly and regularly.
- Employment Opportunities: Considered positive but expect ed to be minimal as male foreign workers are usually assigned for construction works.

Identified socio-economic issues include

- Interaction between Students: Not preferred t o mix students of differ ent ages during recesses and within the school building in general.
- Student Psyche: Major factors inclu de color of walls, lightin g, temperature, and dust.
- Monitoring Student Behavior: The location of the supervising staff's offices should overlook the students' main activity areas and hallways.
- Employment and Econ omic Devel opment: Around 60 jobs create d during operation of each school, many of which will benefit women.
- Land Use: Changes ar e attributed to reduct ion of value as a re sult of noise generated by school operation and increase in value to do improved services and access to the land.

- Traffic: Traffic congestion generated during picking up and dropping off hours, requiring proper entrances and exits as well as parking spaces.
- Travel Time: Reduction in travel time to the school leading to decreased effort and money expended for transportation.

Identified public health and safety issues include:

- Communicable Disease Prevention: Most common diseases include measles, hepatitis A, the flu, lice, and chicken pox. Important measures include good housekeeping practices and availability of a medical examination room.
- Sanitary Facilities: Odors emitted from the facilities as well as general sanitary concerns. It is preferred that:
  - School toilets are to be located on the southern side of the school at a distance from the classrooms.
  - Ventilation is provided.
  - Oriental toilets are provided.
  - There are no openings in the ground or on the walls.
- Indoor and Outdoor Safety Issues: The risk of accidents and injuries requires that various preventive measures are taken. These include: Stair railings, no sharp corners, safety precautions for the gas containers, protection on windows, anti-slip tiles, fire escapes and fire alarm and fire fighting systems, shaded areas in the courtyard, and flood mitigation measures.
- Injury from Car Accidents: No exits should be designed on the main road. Also, safety signs, speed bumps, and zebra crossings are needed.
- Protection from Intruders: A high fence around the school, a guardhouse near the entrance, and surveillance cameras are essential.
- Safety in Workshops and Laboratories: Handling sharp tools, heavy material, and electric wires requires careful supervision. Among other measures, first aid kits and an alarm system are needed. Chemicals should be stored and disposed of in a safe manner.
- Provisions for Students with Special Needs: Students with special needs should be made to feel welcome in every part of the school that their fellow students have access to. Ramps, special desks, and other provisions for the optically

challenged and hearing impaired need to be available at the school, in addition to special sanitary facilities for the physically challenged.

- Earthquake Protection Measures.
- Dust chalk: Although it is non-toxic, inhalation of dust chalk by students with respiratory problems should be avoided by locating them away from the blackboard.

ES.6 Environmental Management Plan

In order to ensure that the schools are designed, constructed, and operated in a safe and environmentally sound manner, an environmental management plan (EMP) was developed, designating responsibilities for the various entities involved in the project implementation. The EMP adheres to Jordanian codes and regulations and tackles the following issues:

- Health and safety
- Workers' sanitation
- Traffic disruption
- Noise
- Dust and air pollution
- Water demand
- Soil and water pollution
- Water stagnation
- Waste generation
- Employment opportunities during construction
- Archaeological Resources
- Interaction between students/classes
- Student psyche inside the classroom
- Monitoring of student behavior
- Employment and Economic development
- Traffic during operation
- Communicable disease prevention

- Sanitary facilities
- Indoor and outdoor safety issues
- Injury from car accidents
- Protection from intruders
- Safety in workshops for males and females
- Provisions for physically challenged students
- Earthquake protection
- Flood protection
- Utilization of water for landscaping

1. INTRODUCTION

The Ministry of Education (MOE) of Jordan with the cooperation of the United States Agency for International Development (USAID) is currently implementing the Jordan Schools Construction and Rehabilitation Program. For the Aqaba region, this program includes the immediate construction of 3 new schools and renovation of 13 others. CDM International is the Project Manager and Engicon is providing consulting services on environmental issues for this project.

This report deals with the construction of the three new schools:

- The 8th Area Secondary School for Males: The School will have 22 classrooms from Grade 4 – Grade 12 and is expected to serve 792 students with the traditional curriculum and 1,044 if a rotation curriculum is applied.
- The 10th Area Secondary School for Females: The school will have 28 classrooms from Grade 1 – Grade 12 (with 2 classrooms for kindergarten) and is expected to serve 1,008 students with the traditional curriculum and 1,188 if a rotation curriculum is applied.
- Al Karameh Secondary School for Females: The school will have 28 classrooms from Grade 1 – Grade 12 (with 2 classrooms for kindergarten) and is expected to serve 1,008 students with the traditional curriculum and 1,188 if a rotation curriculum is applied.

Around 60 staff members, educational, and administrative, will be recruited when each school starts operating.

In accordance with national laws, including Aqaba Special Economic Zone Authority's (ASEZA) Environmental Regulation and the Jordanian Bylaw for Environmental Impact Assessment (EIA), and USAID environmental regulations Title 22 CFR Part 216, an Environmental Assessment (EA) for the proposed project was prepared. It is important to note that in accordance with ASEZA regulations, environmental clearance for the Aqaba schools will be issued by ASEZA.

1.1 OBJECTIVE AND SCOPE OF WORK

In accordance with section 216.6(a) of the CFR, "the purpose of the EA is to provide the Agency and host country decision-makers with a full discussion of significant environmental effects of a proposed action. It includes alternatives which would avoid or minimize adverse effects or enhance the quality of the environment so that the

expected benefits of development objectives can be weighed against any adverse impacts upon the human environment or any irreversible or irretrievable commitment of resources."

1.2 ENVIRONMENTAL ASSESSMENT REQUIREMENTS

The EA was prepared to fulfill the applicable USAID regulations, the requirements of the ASEZA environmental regulation, and the Jordanian EIA Bylaw. The process of preparing this EA involved holding a Scoping Session during which the issues to be analyzed in the EA were identified and discussed by the public and private sectors, NGOs, and stakeholders (Table 1.1).

Table 1.1: Significant Issues Identified in the Scoping Session

Construction Issues	Socioeconomic Issues	Public Health & Safety Issues
Occupational health & safety	Interaction between students/ classes	Communicable disease prevention
Workers sanitation	Student psyche inside the classroom	Sanitary facilities
Traffic	Monitoring of student behavior	Indoor and outdoor safety issues
Noise	Employment and economic development	Injury from car accidents
Dust pollution	Land Use	Protection from intruders
Waste generation	Traffic during operation	Safety in workshops
Employment opportunities	Travel time to and from school	Provisions for physically challenged students
		Earthquake protection

Following this, a Scoping Statement was prepared, which described the significant environmental issues that would be analyzed further in the EA.

1.2.1 Scoping Process

The scoping process forms the basis for developing the EA and helps to delineate the significant and non-significant environmental issues associated with the proposed project. It includes developing a Pre-Scoping Brief, which describes the project and presents a preliminary identification of the environmental issues. On February 28, 2007, a Scoping Session was held to review the findings of the Pre-Scoping Brief and to identify and discuss environmental issues, associated with the project. Participants in the Scoping Session included representatives of government, public and private institutions who have expertise or interest in the project's environmental issues. The results of the scoping process were incorporated into a Scoping Statement, which presented a description of the project's significant environmental issues, as well as the methodology for evaluating them in the EA. The Scoping

Statement was approved by the USAID ANE Environmental Bureau Officer on 29 June 2007.

1.2.2 EA Methodology

Information for the EA was gathered through site visits, consultations with government and non-governmental agencies, interviews with consultants, visits to agency archives, and online research. Original fieldwork and/or sampling were not included in this study.

1.3 CONTENT OF THE REPORT

The EA's proposed content was presented in the Scoping Statement and followed the guidelines set forth in USAID Handbook 3, Appendix 2D, Part 216.6(c), the ASEZA regulations and Jordan's EIA Bylaw. The content was further developed in this report as follows:

Executive Summary : This section summarizes the report's conclusions and recommendations.

1. **Introduction:** This section outlines the EA's objectives, scope of work, and EA requirements.
2. **Project Description:** This section describes the project, its location, and its main components.
3. **Environmental Laws & Regulations:** This section includes the applicable institutional and regulatory framework in Jordan, including related standards, laws and regulations, in addition to US regulations for foreign country assistance.
4. **Environmental Setting:** This section provides a brief description of the environment in the project area, which will be affected by the proposed project. It is divided into 2 subsections: the Biophysical Environment and the Socioeconomic Context.
5. **Environmental Impacts:** This section includes the environmental impacts of the proposed action. Most of this section concentrates on the significance of short-term and long-term effects of the proposed project, as well as direct and indirect effects.
6. **Environmental Management Plan:** This section outlines the steps needed in order to ensure design, construction, and operation of the project in accordance

with the recommendations of the EA. It will also delineate responsibilities for each measure.

The report also includes the following appendices:

- List of Prep arers: The names and qualificatio ns of the p eople respo nsible for preparing the EA.
- Bibliography of references used.
- List of meetings held and names of attendees.
- Relevant technical data not included in the main report.

2. PROJECT DESCRIPTION

The project under study consists of the construction of 3 schools with a fast-track schedule to be located in the city of Aqaba. The schools will be distributed as shown in Figure 1.1 below and described in the sections that follow. The location "66 8 Area" refers to the 8th Region School, the location "65 10 Area" refers to the 10th Region School while Al Karameh refers to Al Karameh Comprehensive School.

Figure 2.1: Location of the Proposed Schools in Aqaba City

2.1 PURPOSE OF THE PROJECT

The aim for building the 8th Area Secondary Boys School is to solve the overcrowding problem in surrounding schools, such as Faisal 1st Basic Boys School, Abdullah Bin Qays School, and Al-Hussein Bin Ali Secondary School. The average number of students per class in these schools currently reaches 44. Moreover, the proposed location for building this new school is due to the lack of public schools in the 8th and the 3rd Residential Areas, where the nearest school, which is Faisal II Basic Boys School, is 2 km away from students' homes.

The purpose for selecting the 10th Area for constructing the school is to solve the overcrowding problem in the surrounding schools, including the 8th Area Secondary

Girls School, Khadeejah Bent Khwailed Secondary School, and Sawari Comprehensive School. The average number of students per class in these schools reaches 45. The current challenge faced by the area's residents is that the nearest school to the students' homes is 2 km away, which is the 8th Area Secondary Girls School.

Al Karameh Area is an ongoing housing project aimed at resettling around 6,160 inhabitants who will be transferred from the North Shallala area. The North Shallala is a quarter in Aqaba characterized by a high poverty rate. It is expected that around one third of the population transferred (1,920) will be children who would require at least 2 schools in that area. One school is currently being built temporarily for girls while a second awaits commencement. This will be the proposed Al Karameh School under discussion.

2.2 8 TH AREA SECONDARY BOYS SCHOOL

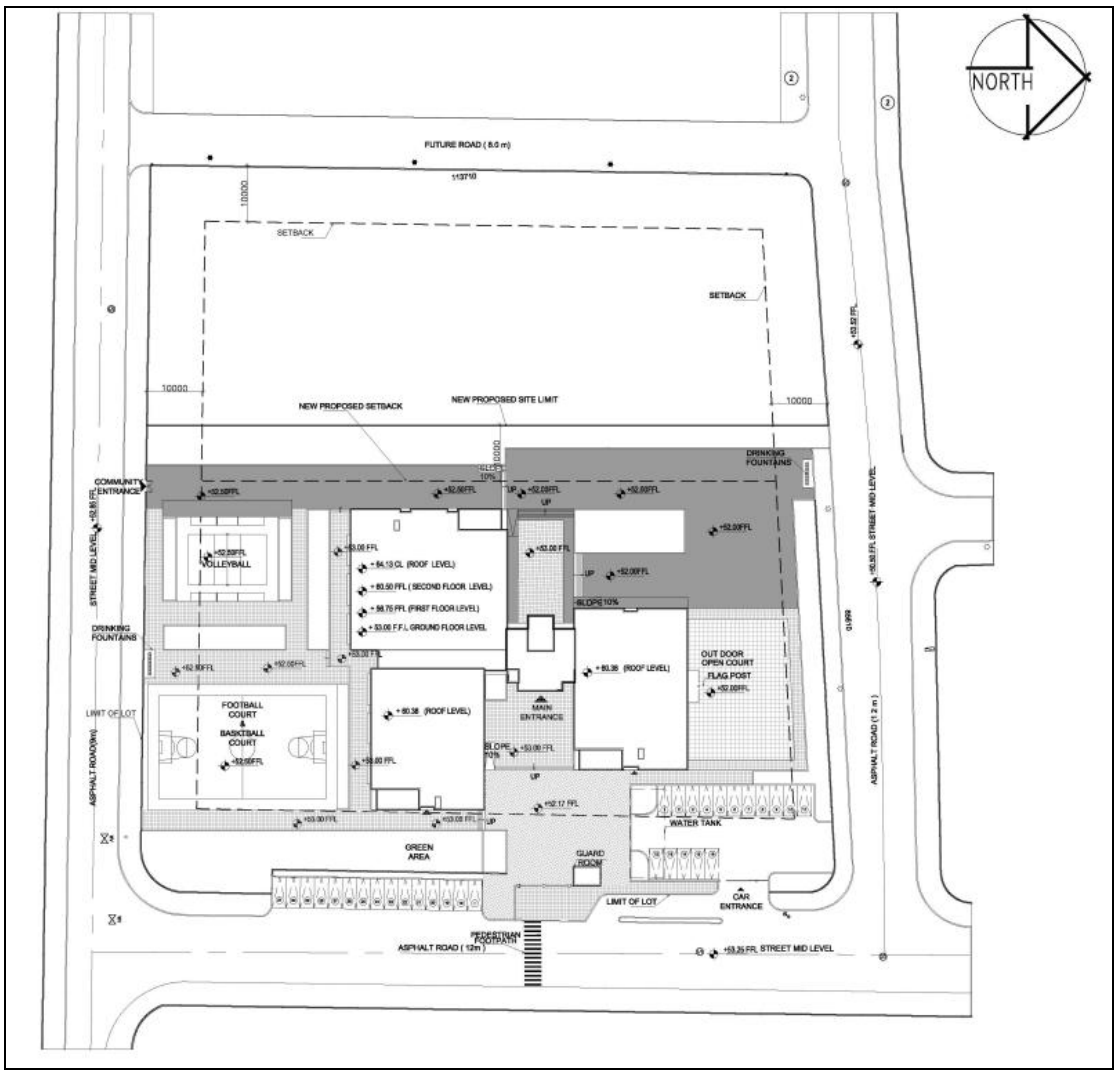
2.2.1 Project Components

The school will be designated as Secondary Boys, for grades 4 th to 12th, with a proposed number of 22 classes. The area of the land where the school will be built is 15,396 m^2. As for the built up area, it will be 3,045 square meters distributed as follows:

- Administrative spaces (such as lobby, reception, offices, storage rooms, staff kitchenette, and restrooms): 400 sq. m
- Education Spaces (such as classrooms, lockers, office, resource area, laboratories, and workshop): 2000 sq. m
- Education support spaces (such as gymnasium/hall, public restrooms, multipurpose hall, physical education office and storage, storage for tables and chairs, canteen, and library): 440 sq. m
- Services spaces (such as student restrooms, mechanical/electrical room, and janitor's closet): 125 sq. m

The gross built up area (total built up area including structure and circulation) is 4,567 such that the area per student is 5.77 sq. m/student. As for the outdoor services, they occupy a total area of 2,147 square meters. This includes the guard room, security station, water reservoir, open courts, play field area, green area, and car parking lots. Figure 2.2 on the following page shows the proposed plan of the proposed school.

Figure 2.2: Plan of Proposed 8th Area Secondary Boys School



2.2.2 Project Location

The 8th Area Secondary Boys School will be situated on a main road 500 m away from a police station. The location is in a quiet residential area where many of the houses are currently under construction. The land parcel is flat with no vegetation and is covered with sand and rocky cobbles (Figures 2.3, 2.4, and 2.5).

Figure 2.3: Close-up of Proposed 8th Area School Site

Figure 2.4: Land Area of Proposed 8th Area Secondary Boys School

Figure 2.5: 8th Area School Location on a Main Road in a Residential Area

2.3 10 TH AREA SECONDARY GIRLS SCHOOL

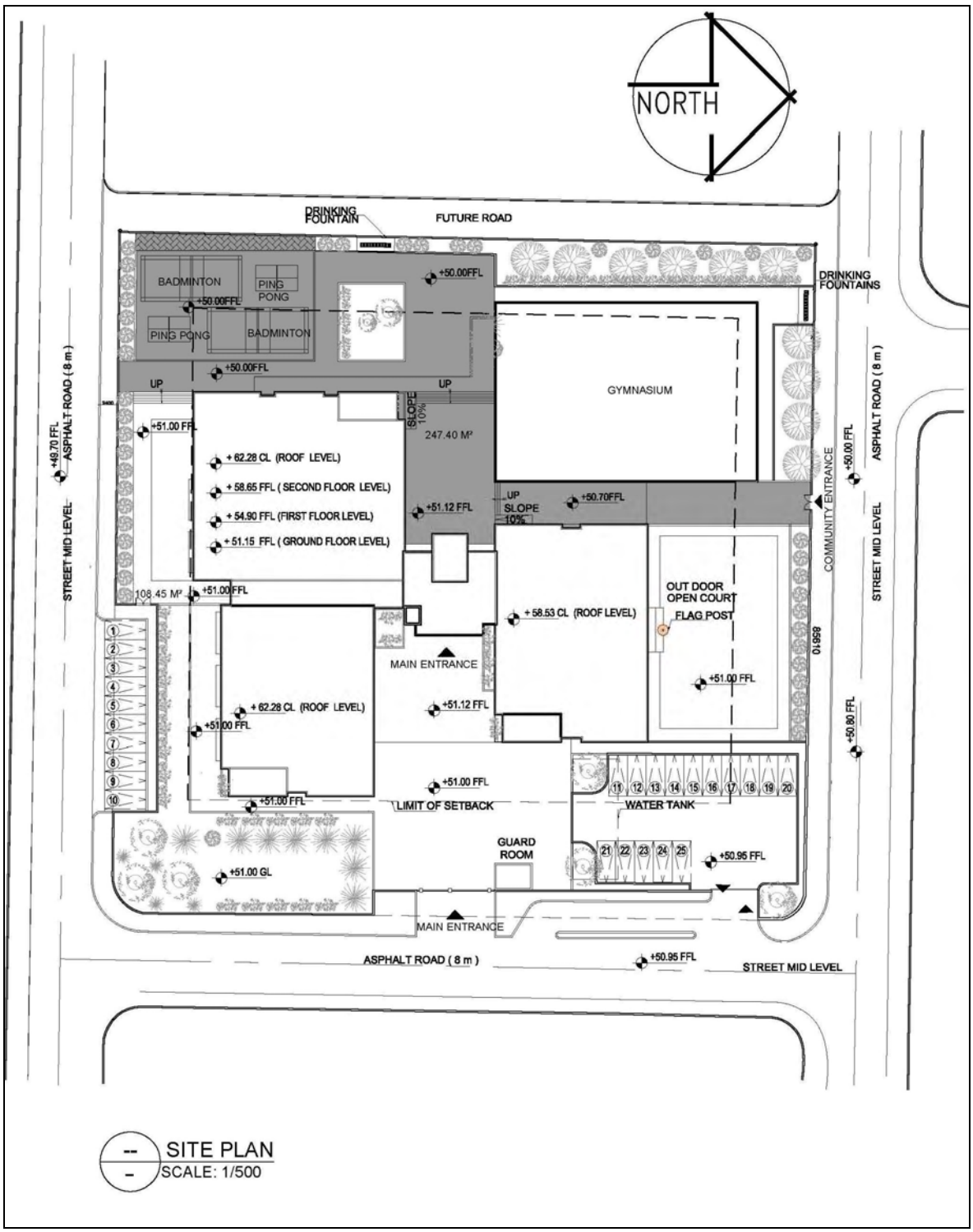
2.3.1 Project Components

The school will be designated as Secondary Girls, for grades 1 to 12, with a proposed number of 28 classes, 2 of which are for kindergarten. The area of the land where the school will be built is 8,350 m^2. As for the built up area, it will be 3,906 m^2 distributed as follows:

- Administrative spaces (such as lobby, reception, offices, storage rooms, staff kitchenette, and restrooms): 400 sq. m
- Education Spaces (such as classrooms, lockers, office, resource area, laboratories, and workshop): 2,536 sq. m
- Education support spaces (such as gymnasium/hall, public restrooms, multipurpose hall, physical education office and storage, storage for tables and chairs, canteen, and library): 830 sq. m
- Services spaces (such as student restrooms, mechanical/electrical room, and janitor's closet): 140 sq. m

The gross built up area (total built up area including structure and circulation) is 5,859 such that the area per student is 5.81 sq. m/student. As for the outdoor services, they occupy a total area of 2,673 square meters. This includes the guard room, security station, water reservoir, open courts, play field area, green area, and car parking lots. Figure 2.6 on the following page shows the proposed plan of the proposed school.

Figure 2.6: Plan of Proposed 10th Area Secondary Girls School



2.3.2 Project Location

The proposed land plot for the new school is located in a residential area and is surrounded by secondary roads but no main roads. The plot is flat with no vegetation and covered with sand and rocky cobbles (Figures 2.7, 2.8, and 2.9).

Figure 2.7: Close-up of Proposed 10th Area School Site

Figure 2.8: Land Plot of Proposed 10th Area Secondary School for Females

Figure 2.9: School Location in a Residential Area

2.4 AL KARAMEH SECONDARY GIRLS SCHOOL

2.4.1 Project Components

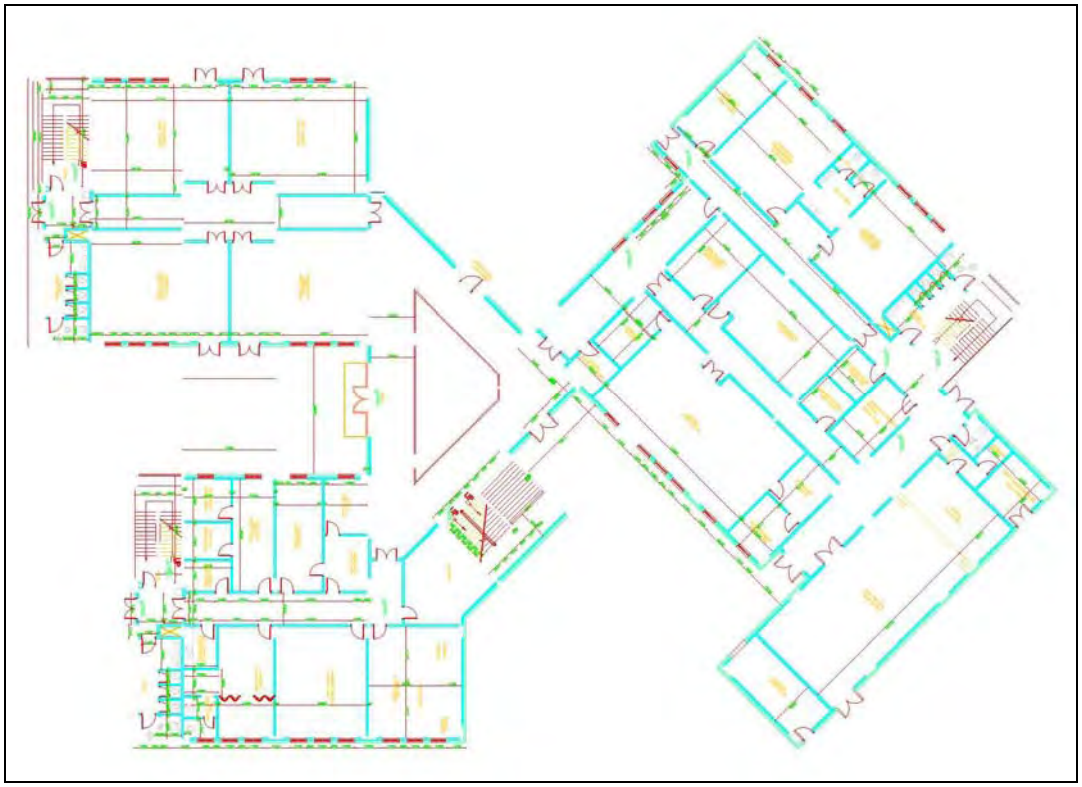
The school will be designated for Secondary Girls, for grades 1 to 12, with a proposed number of 28 classes, 2 of which are for kindergarten. The area of the land where the school will be built is 9,000 m^2. As for the built up area, it will be 3,516 m^2 distributed as follows:

- Administrative spaces (such as lobby, reception, offices, storage rooms, staff kitchenette, and restrooms): 400 sq. m
- Education Spaces (such as classrooms, lockers, office, resource area, laboratories, and workshop): 2,536 sq. m
- Education support spaces (such as gymnasium/hall, public restrooms, multipurpose hall, physical education office and storage, storage for tables and chairs, canteen, and library): 440 sq. m
- Services spaces (such as student restrooms, mechanical/electrical room, and janitor's closet): 140 sq. m

The gross built up area (total built up area including structure and circulation) is 5,274 such that the area per student is 5 .231 sq. m/student. As for the outdoor services, they occupy a total area of 2,529 square meters. This includes the guard room, security station, water reservoir, open courts, play field area, green area, and car

parking lots. Figure 2.10 on the following pag e shows the proposed plan of the proposed school.

Figure 2.10: Plan of Proposed Al Karameh Secondary Girls School



2.4.2 Project Location

The school will be bui lt on a 9-d unum site l ocated at the heart of Al Kara meh residential area (Figure 2.11). The terrain in the area is flat with no vegetation cover.

Figure 2.11: Completed Housing Facilities in Al Karameh Area

3. ENVIRONMENTAL LAWS & REGULATIONS

This section aims to identify and describe the applicable institutional and regulatory framework in Jordan, including related standards, laws and regulations, in addition to USAID regulations for foreign country assistance.

3.1 REGULATION FOR PROTECTION OF THE ENVIRONMENT IN ASEZ (NO. 21 FOR 2001)

Issued in 2001, the Aqaba Special Economic Zone (ASEZ) Environment Protection Regulation (full text in Appendix E) aims to ensure that all projects in this zone are subject to an Environmental Impact Assessment (Article 9). The assessment and its process should be approved by ASEZA. According to Article 8, the objective of the EIA is to "identify, examine and define the impacts of a Project on the Environment, its effects on, and how it is affected by the economic and social aspects". The process should also propose means to reduce the adverse impacts and shall be undertaken during the planning, design, execution, and operation phases of a project.

In Article 39 of the regulation, throwing, treating, or incinerating solid waste is prohibited except in designated places away from residential areas and water channels. As for Article 46, it states that persons engaging in construction activities resulting in wastes or soils are responsible for their storage, safe transport, and unloading in specified locations.

Another important requirement in the regulation is that "all closed and semi-closed places should fulfill sufficient ventilations means in proportionate with the size, capacity and type of activity of such place" (Article 51).

3.2 ENVIRONMENT PROTECTION LAW (NO. 52 FOR 2006)

In 2006, the Jordanian Law for Protection of the Environment was decreed. Article 5 of this law states that the Ministry of Environment (MOEnv) 'shall in cooperation and coordination with the authorities concerned with environment affairs at the local, Arab and international level, assume the preservation of the environment elements and components from contamination'. Based on this law, the following bylaws and instructions were issued.

3.2.1 Environmental Impact Assessment Bylaw for 2005

The EIA Bylaw was issued to ensure that the anticipated impacts any development project may have on the social, economic, and natural environment in Jordan are identified. Its aim is to limit these impacts in order to achieve sustainable development in the country. The bylaw applies to all industrial, agricultural, commercial, construction, residential, and tourism projects but is replaced by the ASEZ Environment Regulation for projects located in Aqaba.

3.2.2 Air Protection Bylaw for 2005 (No. 28 for 2005)

The aim of the Air Protection Bylaw is to protect public health and the environment from pollution resulting from human activities by controlling air pollutants emitted from stationary and mobile sources. Article 11 of the Air Protection Bylaw sets the condition that all closed and semi-closed public spaces should have sufficient ventilation in accordance with the Jordanian Building Code. The ventilation provided should also be in line with the type of activity to be performed in that space.

3.2.3 Solid Waste Management Bylaw (No. 27 for 2005)

The Solid Waste Management Bylaw aims to establish a solid waste management system that would protect the environment and public health. It also strives to benefit from material found in or resulting from this waste in an environmentally safe manner. Article 5 specifies that any party performing an activity that will result in solid waste should abide by the following:

- Provide qualified staff to manage the waste and measures to protect the safety of the workers.
- Provide the necessary vehicles, containers, and equipment to manage the waste.
- Monitor the solid waste collection and determine their path and transport to the designated dumping sites.
- Place containers in appropriate locations, maintaining them, and replacing those that can no longer be utilized.
- Take proper precautions to prevent mixing of hazardous and domestic solid waste.
- Prohibit the burning and open dumping of waste.

3.2.4 Soil Protection Bylaw (No. 25 for 2005)

The applicability of this bylaw is in Article 3-E, which states that the MOEnv, in coordination with the Ministry of Agriculture, is responsible for studying the sites of development projects and their impact on land and natural resources. Environmental considerations should be taken into account when developing these projects.

3.3 PUBLIC HEALTH LAW (NO. 54 FOR 2002)

The Ministry of Health is the entity responsible for applying the Public Health Law in Jordan. In its Article 21, the law states that any person infected with a contagious disease should be isolated in order to prevent a disease outbreak. Regarding wastewater, Article 53 gives mandate to the Ministry of Health to monitor sewerage networks and internal installations and to ensure that public health is not jeopardized.

3.4 LAW FOR PROTECTION OF CULTURAL HERITAGE & SITES (NO. 5 FOR 2005)

Issued by the Ministry of Tourism & Antiquities, the Law for Protection of Cultural Heritage & Sites aims to conserve, protect, and maintain Jordanian heritage sites. According to Article 11 of the law, destruction or damage of any heritage site is strictly forbidden.

3.5 WATER AUTHORITY LAW (NO. 19 FOR 1988)

The Water Authority Law and its amendments established the Water Authority of Jordan (WAJ) as an autonomous agency responsible for all water and wastewater issues in the country. WAJ's mandate includes connecting the public to the water and sewer networks, as well as maintaining, operating, and managing these networks.

3.6 EDUCATION LAW (NO. 93 FOR 1994)

The Education Law and its amendments specify that the Ministry of Education is responsible for providing school buildings suitable for educational purposes and to distribute them throughout the country in accordance with Jordan's educational policy. The Ministry is also responsible for supervising all educational institutions in the country to ensure that they are abiding by the legislation.

3.7 INSTRUCTIONS AND CODES

In addition to laws and bylaws, there are several instructions and codes that set the limits and specifications for various elements such as noise, occupational safety, and provisions for the physically challenged. The sections that follow describe those that are applicable to the project.

3.7.1 Instructions for Noise Prevention for 2007

These instructions address ambient noise and were issued by the Ministry of Environment in 2007. Article 6 of the instructions specifies the maximum allowable level of noise for the different types of areas, both during the daytime and at night.

According to the Instruction for Controlling and Preventing Noise, Conducting construction works that use noisy equipment like mixers and shakers and any other similar equipment between 8 pm and 6 am except for the cases approved by the Ministry is prohibited.

Article 6 states that "it shall not be allowed in any case to exceed the maximum limit for the equivalent sound level" in accordance with Table 3.1.

Table 3.1: Maximum Allowable Noise Levels

Area	Maximum limit for equivalent sound level (decibel A)	
	Day Night	
Residential areas in cities	60	50
Residential areas in suburbs	55	45
Residential areas in villages	50	40
Residential areas that have some workshops or simple vocations or business and commercial and administrative areas and downtown	65 55	
Industrial areas (heavy industrial)	75	65
Tuition, worshipping and treatment places and hospitals	45 35	

3.7.2 Jordanian Building Codes

In 1993, the Government of Jordan issued the Building Code Law (No. 7 for 1993), which led to the creation of the Jordan Building Code Commission. The Commission, lead by the Ministry of Public Works & Housing, was designated the responsibility of preparing building codes for the country.

Since then, the Commission has published 32 building codes regarding the design and construction of buildings in Jordan. For any building design to obtain clearance in Jordan, it has to be approved by the Jordanian Engineers' Association, Civil Defence Directorate, and the Earthquake Commission. These agencies ensure that the design abides by these codes, many of which address environmental, health, and safety issues and are relevant to the school building. They are as follows:

- Jordanian Code No. 3: Loads and Forces (Section 4: Earthquake Actions)
- Jordanian Code No. 15: Fire Protection
- Jordanian Code No. 16: Natural Ventilation
- Jordanian Code No. 17: Natural Lighting
- Jordanian Code No. 18: Water Supply for Buildings
- Jordanian Code No. 19: Wastewater for Buildings
- Jordanian Code No. 20: Beautification of the City
- Jordanian Code No. 21: Solid Waste
- Jordanian Code No. 22: Public Safety during Construction
- Jordanian Code No. 23: Electrical Installation
- Jordanian Code No. 27: Fire Alarm Systems
- Jordanian Code No. 32: Building Requirements for the Physically Challenged

The sections that follow describe two of these codes.

3.7.2.1 Jordanian Code No. 22: Public Safety during Construction

The Code of Public Safety during Construction describes the required measures to be taken in order to safeguard the work environment during construction works. This includes sanitation, toilet facilities, drinking water, medical services, protection from fires, lighting, ventilation, noise, gases, electrical wiring, openings and edges, transporting workers, solid waste collection and disposal, and insects and harmful animals. For example, noise levels and exposure periods permitted for workers are set forth under this code (Table 3.2).

Table 3.2: Permissible Levels of Worker Exposure to Noise

Sound Level (dB)	Exposure Period (Hour/day)
90 8	
92 6	
95 4	
97 3	
100 2	
102 1.5	
105 1	
110 0.5	
115 0.25	

3.7.2.2 Jordanian Code No. 32: Construction Requirements for the Physically Challenged

The code sets forth the requirements for any building in order to accommoda te persons with physical disabilities. The code provides design parameters for various elements including the following:

- Dimensions for spaces with different purposes.
- Slopes.
- Non-slip floors.
- Positions of doors, direction of opening, and handles.
- Dimensions of food areas.
- Materials to be used for carpeting, tiles, and walls.
- Window dimensions and locations.
- Toilet facilities.
- Water coolers.
- Requirements for stairs.
- Main entrances on same level as sidewalks.

4. ENVIRONMENT AL SETTING

This section provides a description of the environment in the project area, which will be affected by construction and operation of the proposed school. The amount of data and analyses included in this section is in keeping with the relative significance of the impact. The purpose of this section is to provide a general overview of the biophysical and socio-economic conditions of the project area, namely Aqaba city. Background information will be summarized or referenced.

4.1 BIOPHYSICAL ENVIRONMENT

4.1.1 Location and Climate

The Governorate of Aqaba is the location of the 8th Area Secondary Male School, which will be situated on a main road 500 m away from a police station. The location is in a quiet residential area where many of the houses are currently under construction.

Figure 4.1: Site Location of the 8th Area Secondary Male School

The 10th Area Secondary Female School is also located in a quiet residential area in the center of the city of Aqaba (Figure 4.2). As for location of Al Karameh School, it is in a proposed residential area currently under construction at the northeastern part of the city of Aqaba.

Figure 4.2: Site Location of the 10th Area Secondary Male School

Aqaba city is charact erized by very hot a nd dusty weather in summer, with temperatures reaching up to 46°C and a temperate winter with low temperatures reaching ar ound 5°C. The mean annual temperature is estimated at around 25 °C. Between 20 01 and 200 5, the amou nt of rainfall in Aqaba ranged between 7.8 and 21.9 mm (Table 4.1).

Table 4.1: Amount of Annual Rainfall in Aqaba City (2000 – 2005)

Year A	mount (mm)
2000/2001 26.5	
2001/2002 9.2	
2002/2003 11	
2003/2004 Not	Available
2004/2005 6	

Source: DOS Statistical Year Book, 2005

The wind direction in the area is northerly to no rth-westerly[1]. In summary, Table 4.2 shows climatic information for Aqaba city for the year 2005.

Table 4.2: Climatic Information for Selected Months in Aqaba City (2005)

Parameter	January	April	July	October
Mean Maximum Temperature (°C)	21.3 31.7	40.3 31.9		
Mean Minimum Temperature (°C)	9.5	18.7 26.3	20.0	

[1] Jordan Meteorological Department Website (www.jmd.gov.jo)

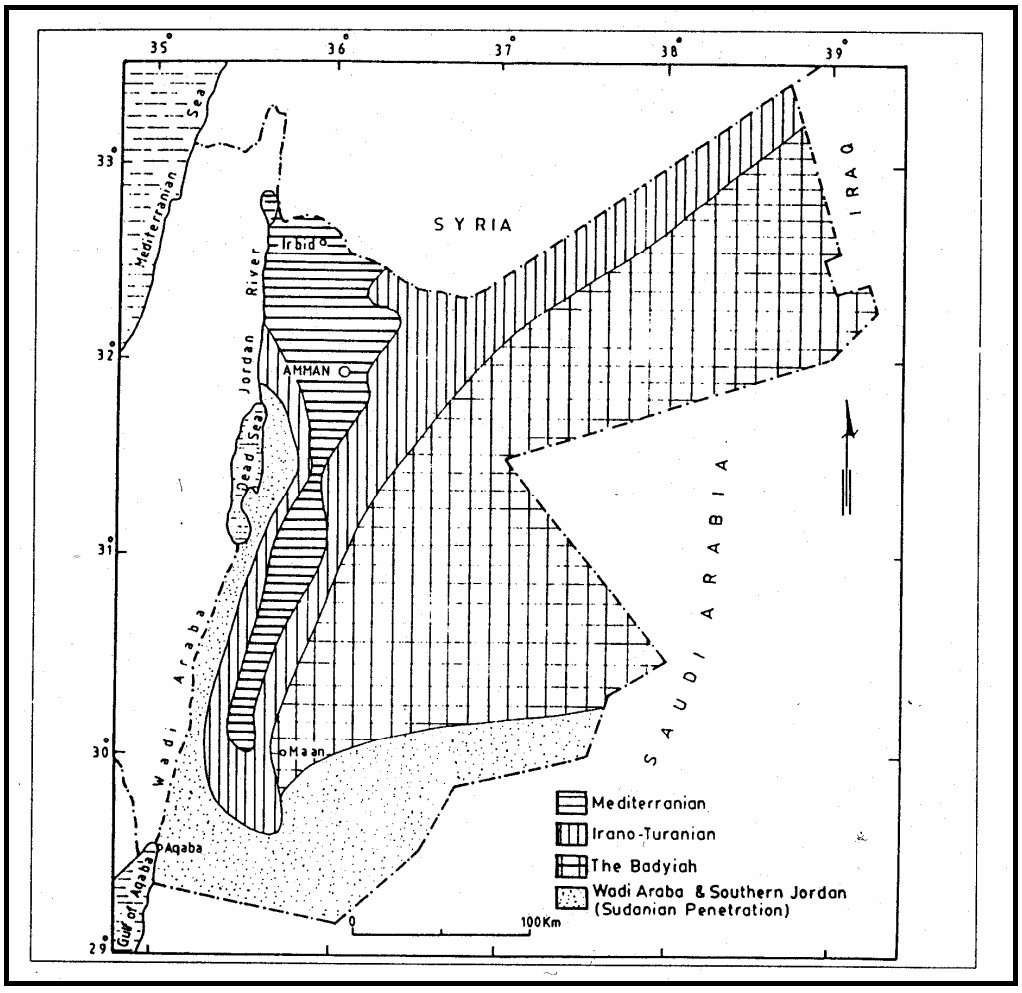
Parameter	January	April	July	October
Total Monthly Rainfall (mm)	0.4 0.0	0.0 0.0		
Mean Relative Humidity (%)	52.4	33.9	37.0	45.7
Prevailing Wind Direction (degree)	354	345	330	351
Mean Wind Speed (Knots)	3.0	9.7	10.1	9.4

Source: Jordan Meteorological Department Website (www.jmd.gov.jo)

4.1.2 Geomor phology and Geology

Of the main four biogeo graphic regions in Jordan, Aqaba is considere d part of th e Sudanian p enetration r egion (Figur e 4.3). The types of soil in Aqab a are mostly alluvial with granite an d saline so il, mostly sandy or sa ndy hammada. Granite fragments and some saline soils re sult from co rrosive effects. Sand originates from the archaic igneous rocks of the mountain ranges that are adjacent to Aqaba town (granites, porphory, dolomites, etc.) then it accumulates in dunes or as sandy plains[2].

Figure 4.3: Biogeographical Map



[2] General Corporation for Environment Protection, *Jordan Country Study on Biological Diversity* and *Plant Biodiversity and Taxonomy*, 2000, United Nations Environment Programme

At the junction where th e Gulf of Aqaba meets the Red Sea spreadin g center, the tectonic plate boundary continues as a transform fault zone. This transform fault zone is known as the Gulf of Aqaba – Dead Sea rift, and it extends from the Red Sea rift to the Zagros-Taurus Mountains in Turkey. The continental mass splits into the Arabian and African plates as a result of the Gulf of Aqaba – Dea d Sea rift which extends along with that of the Red Sea. This strike-slip faulting has caused an extensive uplift that was experienced in areas adjacent to the rift. This movement of the strike-slip faulting is believed to be active until today, but it is periodic rather than continuous[3].

Regarding the propose d land parcels, they ar e all con sidered flat an d covered with sand and rocky cobbles.

4.1.3 Land Use

For the 8th and 10th Secondary Schools, the neighboring areas to the proposed sites are mainly residential or housing units that a re still und er construct ion. Services already exist within the proposed land plots an d are easily accessible by main and secondary roads.

As for the Karameh Sch ool site, the entire area is currently under constr uction with a plan to make it a resid ential area. It is theref ore expected that the school will b e situated, same as the other two schools, b etween residential hou ses and b e accessible by main and secondary roads.

4.1.4 Archaeological Findings

Archeological site s in Aqaba date the city ba ck to 4000 BC, due to its strategic location at junction for trading between Asia, Africa, and Europe.

The world's oldest known church is probably located in Aqaba, dating back to the late third centur y. The chur ch had been unearthed by several archeologists and is now back-filled with earth for protection. The church is located ea st of Istiklal Street in the center of the city[4].

In the 12th century, the Crusaders had occupied an area of Aqaba where they built a fortress called Helim. T he fort rema ins well-preserved until this day. It was rebuilt in the 14th century under the Mamluks and has been changed several times since then. The Hashemite Coat of Arms is found above th e main doorway. It was placed during

[3] General Corporation for Environmental Protection, *Jordan Country Study on Biological Diversity,* 1998.
[4] Ministry of Tourism & Antiquities Website (www.mota.gov.jo)

the Great Arab Revolt of the First World War, when the Turks were driven out of Aqaba[5].

Regarding the project sites, the Department of Antiquities has conducted a field visit to the area and concluded that there are no known sites of archeological value (Appendix D).

4.1.5 Biodiversity System

The Gulf of Aqaba extends for about 180 km from the Jordanian shore in the north to the sills of the Strait of Tiran in the south. The Gulf of Aqaba is characterized by its great depth in proportion to its width. It has an average depth of about 800 m, which reaches to more than 1 800 m in its deepest regions, while its width averages about 20 km, reaching a maximum width of 26 km[6].

It is the only marine fish resource of Jordan and is unique because of its clear waters, low algae productivity, and colourful biological diversity inhabiting the coral reefs. The Gulf of Aqaba hosts about 110 species of soft corals, 120 species of hard corals and over 1000 species of fish. A few of the countless marine creatures living in the waters of Aqaba are corals, coral fish, reptiles, and mammals.

The distribution of mammals in the city of Aqaba and the nearby areas is shown in Table 4.3 below in their scientific name.

Table 4.3: Types of Mammals in the governorate of Aqaba

Type of Mammal	Common Name	Location	Status*
Paraechinus aethiopicus	Desert Hedgehog Ethiopian Hedgehog	Wadi Araba, Wadi Rum	Endangered, None
Rhinolophus clivosus	Arabian Horseshoe Bat	Wadi Rum	None
Eptesicus bottae	Botta's Serotine Bat	Wadi Rum	None
Otonycteris hemprichi	Hemprich's Long-eared Bat	Wadi Rum	None
Pipistrellus bodenheimeri	Bodenheimer's Pipistrelle	Wadi rum	None
Tadarida teniotis	European Free-tailed Bat	Wadi Rum	Endangered
Canis aureus	Golden Jackal, Asiatic Jackal	Wadi Rum	Endangered
Canis lupus	Wolf	Wadi Rum	Endangered

[5] King Hussein Website (www.kinghussein.gov.jo)
[6] General Corporation for Environmental Protection, *Jordan Country Study on Biological Diversity,* 1998.

Type of Mammal	Common Name	Location	Status*
Vulpes cana	Blanford's Fox	Wadi Rum	None
Vulpes vulpes	Red Fox	Wadi Araba	Endangered
Felis margarita	Sand Cat	Wadi Rum	Endangered
Procavia capensis	Common Rock Hyrax	Wadi Rum	None
Capra ibex nubiana	Wild Goat, Nubian Ibex	Wadi Araba, Wadi Rum	Endangered
Lepus Capensis	Cape Hare, Arabian Hare	Wadi Araba, Wadi Rum	Endangered, None
Hystrix indica	Indian Crested Porcupine	Wadi Araba	Endangered
Allactaga euphratica	Five-toad Jerboa	Wadi Araba	None
Eliomys melanurus	Southwest Asian Garden Dormouse	Wadi Rum	None
Acomys cahirinus	Cairo Spiny Mouse	Aqaba, Wadi Rum	Endangered
Acomys russatus	Golden Spiny Mouse	Aqaba, Wadi Rum	Endangered
Gerbillus dasyurus	Wagner's Gerbil	Aqaba	None
Gerbillus cheesmani	Cheesman's Gerbil	Wadi Rum	None
Gerbillus nanus	Baluchistan Gerbil	Aqaba, Wadi Araba, Wadi Rum	Endangered
Gerbillus henleyi	Pygmy Gerbil	Wadi Rum	Endangered
Gerbillus gerbillus	Egyptian Gerbil	Aqaba, Wadi Araba, Wadi Rum	Endangered
Sekeetamys calurus	Bushy-tailed Jird	Aqaba	Endangered
Meriones libycus	Libyan Jird	Wadi Araba	Endangered
Meriones crassus	Sundevall's Jird, Sand Jird, Silk jird	Aqaba Non	e
Psammomys obesus	Fat Sand Rat	Aqaba, Wadi Rum	Endangered

Source: Zuheir S. Amr, "Mammals of Jordan", 2000, United Nations Environment Programme and *The 2006 IUCN Red List of Endangered Species Website (www.iucnredlist.org)

Regarding the mammals that exist specifically in Aqaba, a brief description of each is presented hereunder.

The Cairo Spiny Mous e is a noctu rnal mammal associate d with rocky terrains an d steppe-desert habitats a nd is endan gered. It is considered a social animal with large colonies an d can be fo und along t he Jordan Rift Valley f rom the Dead Sea until Aqaba.

The Golden Spiny Mouse is a rocky terrain inhabita nt and is classified a s endangered. It is most common a mong rocky a reas along Wadi Araba and in some mesic habit ats. It cou ld be either n octurnal or active in th e morning hours and lat e afternoon.

The Wagner Gerbil is found in a wide range of habitats that include basalt deserts, silt dunes and cultivated areas. It is a very common species in the Jordanian desert.

The Baluchistan Gerbil is similar to the Wagner Gerbil with some differences in appearances. This species is also a desert inhabitant that prefers hammada and habitats with loose soil texture and is classified as endangered.

The Egyptian Gerbil is a medium-sized gerbil. This kind of species inhabits sand dunes and is classified by the International Union for the Conservation of Nature (IUCN) as endangered[7]. It prefers salt flats and sandy areas.

The Bushy-tailed Jird prefers to live in arid regions around mountain slopes. It is a good climber and is nocturnal. It is classified as endangered.

The Sand Jird is one of the most common jirds inhabiting the dry and arid habitats of Jordan. Sand areas and hammada are the areas mostly preferred by this kind of species.

The Fat Sand Rat is a large rodent. An important characteristic of the Fat Sand Rat is that it is considered an important reservoir for human Leishmaniasis, which is an endemic disease in the region (refer to section 4.2.5) and is associated with areas inhabaited by this animal, including Aqaba city. Moreover, this species was found to share burrows with the Grey hamster and is considered endangered.

Regarding domesticated animals, it was recorded in 2005 that Aqaba has 10,230 sheep, 27,140 goats and only 10 cows[8].

4.1.6 Prevalent or Adaptive Vegetation

Vegetation in Aqaba is characterized by having tropical tree element such as *Ziziphus spina-christi*, in addition to shrubs and annual herbs. Some of the main floral species in Aqaba are: *Acacia species, Balanites aegyptiaca, Calotropis procera, Maerua crassifolia, Salvadora persica, Ziziphus spina-christae, Haloxylon persicum, and Ochradenus baccatus*[9].

In the Sudanian region, vegetation is usually attributed to the shallow water table since it has a low altitude.

[7] The 2006 IUCN Red List of Endangered Species Website (www.iucnredlist.org)
[8] DOS, Statistical Yearbook 2005
[9] General Corporation for Environment Protection (2000), *Plant Biodiversity and Taxonomy*, United Nations Environment Programme

The sites of the proposed project have no vegetation cover. Only scattered bushes were observed in the 8th and 10th Area sites.

4.2 SOCIOECONOMIC CONTEXT

Aqaba is Jordan's only outlet to the sea and is considered a transport hub to the Gulf Countries. Aqaba's sea and airport both comprise focal points for development and are also two major regional and international logistic centers. Moreover, Aqaba is considered as one of Jordan's primary industrial centers, especially with the several heavy industries that are planned for the south of the city, the desert that is located northeast of the city, the light manufacturing, and the processing plants for the northeast section near the airport.

In addition to the 1,100 hotel rooms that Aqaba offers, plans are underway to increase the city's tourist facilities. Major development plans for tourism in Aqaba are being prepared, in particular for the area that is south of the center of the city. Plans to enhance the tourism and products in nearby Petra and Wadi Rum are also of great concern to Jordan. The sections that follow describe the socio-economic characteristics of Aqaba city and governorate (when data on the city is not available).

4.2.1 Population and Major Economic Activities

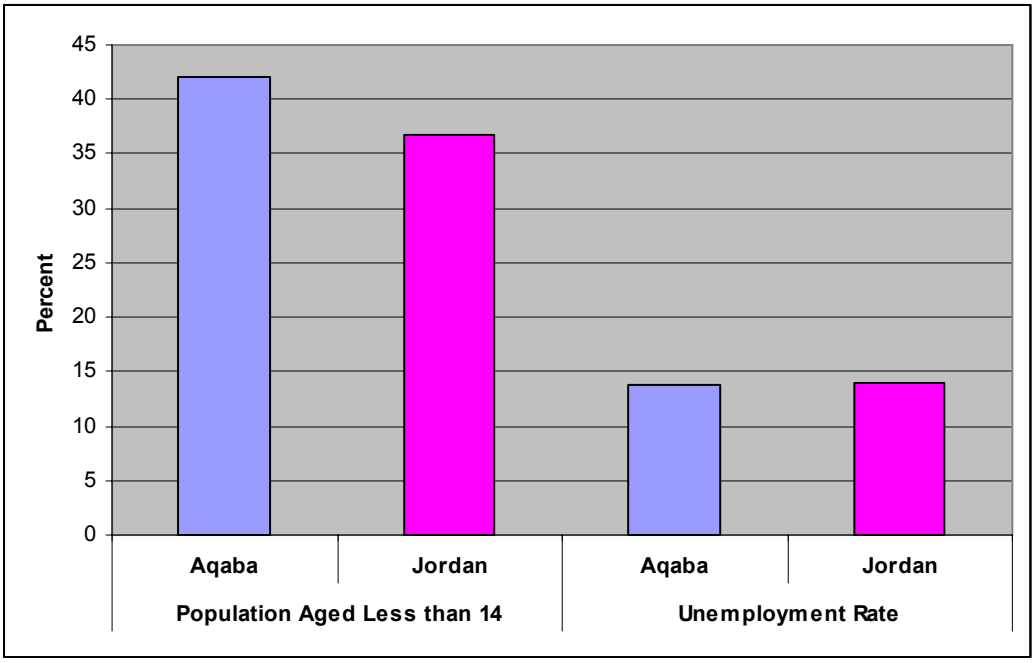
In 2004, the city of Aqaba had a population of approximately 80,790 inhabitants, 45,294 of which were male and 35,496 female comprising around 14,749 families[10]. The urban population was 80,059 while the rural population was only 731. By the end of 2007, the population of Aqaba is expected to increase to around 88,771, of which 49,768 would be male and 39,002 female making up about 16,206 families. These estimates were based on a mean annual growth rate of 3.19% for Aqaba Governorate, the highest in the country.

Regarding Aqaba governorate, its population constitutes about 2.1% of the total population of the Kingdom of Jordan. The population is young with those aged less than 14 years consisting of 42.1% of the total population. In Jordan, this rate is less at 36.8%. As for the unemployment rate, it is estimated at 13.8. This is slightly lower than the overall unemployment rate in the country, which is approximately 14 (Figure 4.4). There is a major difference in unemployment rates between males and females

[10] DOS, Population and Housing Census of 2004

in Aqaba, such that the male unemployment rate is 12.8 while the female unemployment rate is 22.3[11].

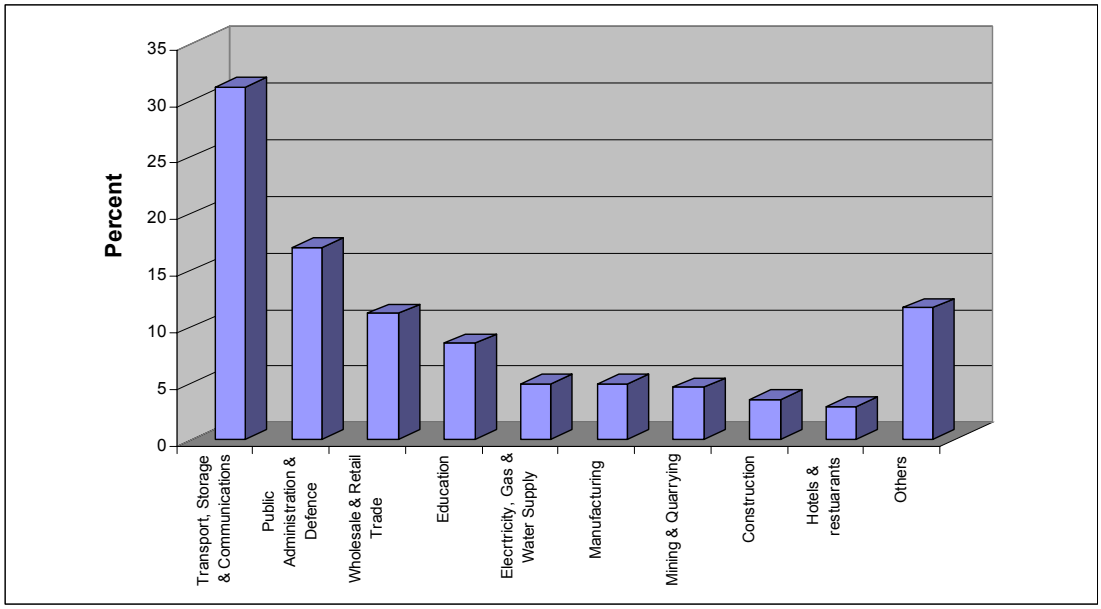
Figure 4.4: Population Aged Less than 14 and Unemployment Rates in Aqaba and Jordan, 2006



The main economic sector in Aqaba is the "Transportation, Storage and Communication" sector, with a participation of 31.1% from the working population, followed by "Public Administration and Defence" at 16.9% and "Wholesale and Retail Trade" at 11.1% (Figure 4.5). The business of Hotels and Restaurants make up only 2.9% of Aqaba's working population, while the Fishing Industry is virtually non-existent. For a coastal city, these findings are considered quite surprising.

[11] DOS, Employment and Unemployment Survey of 2006

Figure 4.5: Type of Economic Activity in Aqaba Governorate



Source: Department of Statistics (DOS), Employment and Unemployment Survey of 2006

4.2.2 Quality of Life and Cultural Issues

Aqaba is a thriving coastal city with one of the lowest poverty rates in the Kingdom (7.7 according to the World Bank's Poverty Assessment of 2004). The residents have access to all the basic infrastructure needs including water, sanitation, and electricity (Refer to section 4.2.7).

Despite its location on the coast, Aqaba's population does not exhibit typical characteristics of a coastal population. The people of Aqaba are extremely friendly and welcoming; however, they are considered relatively conservative. For example, local women do enjoy considerable freedom compared with many other countries in the region. They are entitled to a full education and have the right to vote and often play significant roles in their communities. However, arranged marriages and dowries are still quite common.

Recently, the city of Aqaba has experienced a development and construction boom. It is now quite common for residents of other governorates, especially Amman, as well as foreigners to relocate to the city for luring job opportunities. If this trend persists, it may lead to a significant change in the traditional lifestyle and make up of the population of Aqaba.

As indicators of cultural activities, the following Table 4.4 shows the number of cultural agencies registered in the governorate of Aqaba.

Table 4.4: Distribution of Cultural Agencies in Aqaba Governorate, 2005

Type of Agency	Number
Printing Press	5
Bookshops 14	
Publishing Agencies	0
Advertisement Agencies	8
Cinemas 2	

Source: DOS Statistical Yearbook, 2005

The numbers show th at the sect or is st ill limited with only 2 cine mas and no publishing agencies. The governorate has 14 bookshops and 5 printing presses.

4.2.3 Prevalent Architectural Images

In 2001, ASEZA issued design guidelines with the purpose of providing building regulations that will "co ordinate an d control th e planning and design of all new o r modified residential, commercial, tourism, and industrial developme nt within the ASEZ, in or der to enhance the identity, charact er, quality, and attraction of Aqaba…" The guidelines also pr ovided a Master Plan f or the zone that would introduce an image of th e city reflecting traditio nal Islamic f oundations, state-of-the-art business center, and respect for t he unique e nvironment of the waters and mountains of th e area[12].

According t o these guidelines, the old town of Aqaba sho uld look like a traditiona l village and use the following motifs:

- The scale and shape of new buildings to be low and simple like existing buildings.
- Use of natural materials and colo rs that reflect the natural materials of the adjacent mountains and desert.

As for the facades and structure:

- Existing facades are to be covered with hand-troweled stucco and / or stone.
- Stucco walls are to be painted varying shade s of earthtone colors, with changes in color where building forms change.
- Maximum building height is two stories. Roofs must be flat.
- Use of simple details.

[12] ASEZA (2001), ASEZA Design Guidelines 2001

4.2.4 Health and Other Community Services

The most common notifiable diseases in Aqaba are diarrhea, such that, in 2006, around 3,529 cases were reported. Other illnesses include mumps, animal bites, brucellosis, amebic dysentery, and measles (Table 4.5).

Table 4.5: Notifiable Disease in Aqaba Health Directorate and in Jordan, 2006

Disease	Number of Cases in Aqaba	Total Number of Cases in Jordan	% of Cases in Aqaba to Total
Diarrhea 3,529		133,200	2.6
Pulmonary Tuberculosis	1	174	0.6
Brucellosis 8		217	3.7
Typhoid / Paratyphoid	0	21	0
Hepatitis A	0	482	0
Meningococcal Meningitis	0	17	0
Non-Meningococcal Meningitis	0	580	0
Measles 5		29	17.2
Animal Bite	12	2,529	0.5
Mumps 26		636	4.1
Amebic Dysentery	6	466	1.3

Source: Ministry of Health Website (www.moh.gov.jo)

Noting that the population of Aqaba is 2.1% that of Jordan, the percentage of diarrhea cases compared with the total cases in the country is not significantly disproportionate. This is not true of measles, however, with a percentage of 17.2 % compared to the national cases.

Concerning other common diseases in Aqaba, 181 cases of Leishmaniasis have been reported in Jordan in 2006 [13]. Leishmaniasis is an endemic skin disease that is transmitted by the bite of a sand fly. It is widely distributed in arid and semi-arid regions and has been reported by some of the scoping session participants to be of concern.

Head lice are another health problem that students are exposed to at school. Lice are wingless insects having mouthparts that are adapted for sucking body fluids. Deposited eggs of lice usually glue to hair shafts, hatch within 7 to 10 days, and start to feed immediately on blood. Although lice are not considered dangerous and do not spread disease, they are highly contagious and can become a major nuisance for the infected child.

[13] Source: Ministry of Health Website (www.moh.gov.jo) – Note: Data at Directorate or Governorate level were not available.

The only four poisonous scorpion species in Jordan are *Leiurus quinquestriatus, Androctonus crassicauda, Androctonus bicolor* and *Buthotus judaicus,* the first two of which are the most toxic. All scorpions are venomous, and their venom glands produce a variety of toxins. Mammalian cells are affected by the venom composition, reflecting a wide range of symptoms such as palpitation, abdominal pain, dizziness, imbalance in the white blood cells, pinch in breathing, and heart inflammation.

Scorpions form a real threat to children inside a school building. It must be noted that scorpions are nocturnal; they often slip into bedding or cracks, and under logs or stones. Moreover, fissures and cracks around the doors of the proposed school building itself could provide easy access for scorpions. It is important to state that scorpion stings are generally attributable to carelessness or negligence. For example, if the toilets were located several meters away from the school building and are not being monitored, this may provide a habitat for the scorpion.

Regarding health services, the Ministry of Health (MOH) operates 10 health centers and 9 village centers in the Aqaba Health Directorate (Table 4.6). There is only one tuberculosis center, which is justifiable considering the low rate of incidence in the area.

Table 4.6: MOH Centers and Clinics in Aqaba, 2005

Type of Facility	Number
Health Centers	10
Village Centers	9
Maternal & Child Health Centers	8
Dental Clinics	10
Tuberculosis bacilli Centers	1

Source: DOS Statistical Yearbook, 2005

There are a total of 347 health workers in Aqaba. Of these, 37 are general practitioners while only 2 are specialists. It is also worth mentioning that there are no MOH veterinaries working in Aqaba (Table 4.7).

Table 4.7: Employees of the MOH by profession in Aqaba Directorate

Profession of Employees	Number
Specialist 2	
General 37	
Resident 0	
Veterinary 0	
Dentist 18	

Profession of Employees	Number
Pharmacist 8	
Nurse 21	
Midwife 15	
Others 246	
Total 347	

Source: DOS Statistical Yearbook, 2005

Concerning community services, Aqaba contains several cooperatives for different fields, in addition to charitable societies that address a variety of needs. Tables 4.8 and 4.9 show the distribution of both cooperatives and charities in Aqaba Governorate.

Table 4.8: Number and Type of Cooperatives in the Governorate of Aqaba, 2005

Type of Cooperative	Number
Agriculture 10	
Housing 9	
Multi-purpose 18	
Mutual Benefit	0
Women 2	
Others 8	
Total 47	

Source: DOS Statistical Yearbook, 2005

Table 4.9: Number and Type of Charitable Societies in the Governorate of Aqaba, 2005

Type of Charitable Society	Number
Specialized 3	
Multi-purpose 21	
Total 24	
Women Associations (included above)	4

Source: DOS Statistical Yearbook, 2005

4.2.5 Educational Services

For the scholastic year 2006/2007, the Governorate of Aqaba registered 32,672 students, of which 17,101 were females and 15,571 were males. The Governorate houses 109 schools with 18 schools for girls, 30 schools for boys and 61 co-ed[14]. Co-ed is defined as a school for girls and boys between the 1st and 3rd grades and girls only between the 4th and 12th grades.

[14] Ministry of Education, Aqaba Education Directorate, General Education Situation for 2006/2007

The Ministry of Education recorded the following data concerning the governorate of Aqaba as it is for the scholastic year 2006/2007. Tables 4.10 through 4.14 below summarize the current academic situation in Aqaba.

Table 4.10: Number of Students by Sex and Supervising Authority in Aqaba Directorate, 2006/2007

Supervising Authority	Number of Students			Number of Schools			
	Male	Female	Total	Male	Female	Mixed	Total
Ministry of Education	9,846	12,619	22,465	17	17	25	59
Private	2,987	4325	7,312	2	0	37	39
Total	12,833	16,944	29,777	19	17	62	98

The two supervising authorities considered in Table 4.10 above are the Ministry of Education and the Private Education and Kindergarten. In both cases, there are more female students than males. In Aqaba directorate, a total of 29,777 students are distributed in 98 schools.

Table 4.11: Summary of the Number of Students at MOE Schools in Two Different Educational Levels by Sex, Aqaba Directorate, 2006/2007

Sex	Stage	
	Kindergarten	Primary
Male	101	8,475
Female	105	10,814
Total	206	19,289

According to Table 4.11, the number of students in the kindergarten level is balanced between males and females. However, a difference of 2,339 students appears at the primary level in favor of females.

Table 4.12: Number of Administrators, Technicians and Teachers at MOE Schools by Sex in Aqaba Directorate, 2006/2007

Positions	Sex		Total
	Male	Female	
Administrators	54	104	158
Technicians	14	48	62
Teachers	420	829	1,249
Total	488	981	1,469

Table 4.12 shows that the number of female employees at MOE schools is double that of the number of male employees. This is a typical trend in all of Jordan whether in private or public schools as the education sector is generally dominated by women.

Table 4.13: Number of MOE Schools by Sex and Stage, Aqaba Directorate, 2006/2007

Sex	Stage		
	Primary Se	condary	Total
Male 9		8	17
Female 8		10	18
Co-ed 19		5	24
Total	36 23 59		

The only imbalance tha t is clear in Table 4.13 above is that the number of mixe d schools for the second ary stage is much smal ler than the schools for the primary level. This is due to the fact that above that level, co-ed schools be come for girls only.

Table 4.14: Number of MOE School Buildings by Ownership and Attendance System, Aqaba Directorate, 2006/2007

Sex	Owned Re		nted		Total
	One Shift	Two Shifts	One Shift	Two Shifts	
Male	19	0 2 0			21
Female	25 2 11			0 38	
Total	44 2 13			0 59	

Out of the 59 MOE sch ools, only 1 3 are rented . In addition , there are only two-shift systems, applied in the owned schools and not the rented ones (Table 4.14).

Table 4.15: Number of MOE Schools and Students by Administrative Divisions and Sex, Aqaba Directorate, 2006/2007

Administrative Unit	Schools Stude				nts		
	Male Female		Mixed	Total	Male	Female	Total
Aqaba District	12 6 12			30	8,595	9,126	17,721
Wadi Araba	2	2	5	9	411	775	1,186
Quwera 3		9	8	20	839	2,719	3,558
Total	17	17	25	59	9,845	12,620	22,465

It is evident in Table 4. 15 that having 22,465 students distr ibuted over a total of 59 schools would lead to crowding as it becomes quite serious in some cases.

4.2.6 Transportation

Aqaba is distinguishe d with the variety of transportation means it h as access to. I n addition to the road network, railways, airport, and waterwa ys are two major facilities used for transporting either persons or goods and materials.

Details of the roads network in Aqaba governorate are shown in Table 4.16 below.

Table 4.16: Length of Road Networks by Type of Road, 2005

Type of Road	Length (Km)
Rural 89	
Secondary 92	
Highways 342	
Total 523	

Source: DOS Statistical Yearbook, 2005

The number of vehicles distributed in the governorate of Aqaba is sho wn in Table 4.17 below. There are currently 6,348 ve hicles curr ently registered in the governorate, 4,653 of which are private while 1,695 ar e public. Others includ e motorcycles, agricultural vehicles, construction vehicles and special use vehicles.

Table 4.17: Number of Licenced Vehicles by Type of Vehicle and Ownership in the Governorate of Aqaba, 2005

Type Saloons	Buses	Vans and Trucks	Tankers Tra ilers		Other	Total
Private 2,536	42	1,331 8		46	690	4,653
Public 638	4	140	54	859	0	1,695
Total 3,174	46	1,471	62	905	690	6,348

Source: DOS Statistical Yearbook, 2005. Note: Public vehicles mean commercial vehicles.

The number of accident s that usually occur in the governorate of Aqaba is somehow significant, such that 1, 876 acciden ts were registered in 20 05. Howeve r, of these, only 98 (5.2%) were car/pedestrian collisions. The rate of fatalities in these accidents is 7.6%, as 44 deaths occurred out of 577 casualties, ar ound 0.55% of the total population in the governorate. Table 4.18 belo w summariz es the type of vehicular accidents and the number of causalities in Aqaba.

Table 4.18: Number of Road Accidents, Type of Accident and Number of Casualities in the Governorate of Aqaba, 2005

Type of Accident	Number
Turnover 105	
Car collision	1,673
Collision with pedestrians	98
Total	1,876
Casualities Nu	**mber**
Injured 533	
Dead 44	
Total	577

Source: DOS Statistical Yearbook, 2005

As for the railway network, Aqaba Railway Corporation is responsible for monitoring the networks' functioning. The railway's main purpose is to transport phosphate and other goods to Aqaba harbor for export.

4.2.7 Water and Electricity Supply

The quantity of water that had been supplied for household and municipal purposes, in the governorate of Aqaba has been relatively constant for the past 5 years (Table 2.19).

Table 4.19: Water Supply for Domestic and Municipal Purposes in Aqaba Governorate, 2001 – 2005

Year	Water Supply (million m^3)
2001 15	
2002 14.7	
2003 15	
2004 15	
2005 15	

Source: DOS Statistical Yearbook 2005

The utilization of water per capita in the governorate of Aqaba was 3 93.3 Liters/day in 2005. This rate is much higher than other governorates in Jordan, all of which consume less than 200 Liters/day. This is attributed to the fact that Aqaba has the highest temperature rates in the country and has a long summer season. In addition, the population of Aqaba receives water on a continuous basis from the Disi aquifer, which is considered a reliable drinking water source for the area. As for wastewater, the amount that flows to the treatment plants in Aqaba is shown in Table 4.20.

Table 4.20: Average Quantity of Domestic Wastewater Flowing from Aqaba to the WWTP, 1994 - 2005

Year	Average Quantity (m^3)
1994 5,488	
1995 6,014	
1996 6,666	
1997 7,341	
1998 8,219	
1999 8,774	
2000 8,804	
2001 9,310	
2002 9,329.3	
2003 10,33	2.1

Year	Average Quantity (m^3)
2004 10,33	2.1
2005 7,041	

Source: Water Authority of Jordan, Annual Report for 2005

Regarding electricity, the available data recorded includes not only the governorate of Aqaba but also Ma'an and Shobak. Therefore, Table 4.21 below includes the electrification details for all of the previously mentioned areas together. The data show that 99% of the population of these areas is connected to the electricity network.

Table 4.21: Rural Electrification for the Areas of Aqaba, Ma'an, and Shobak, 2005

Total Number of Villages		Number of Electrified Villages and Population		% Villages and Population Electrified	
Villages	Population	Villages	Population	Villages	Population
92	105,000	92	104,000	100	99

Source: National Electric Power Company, Annual Report for 2005

5. ENVIRONMENTAL IMPACTS

This section includes the reasonable anticipated environmental impacts associated with construction and operation of the proposed school. Most of the section concentrates on the significant short-term and long-term identified possible effects as a result of the scoping session, as well as direct and indirect effects. Other considerations will include possible conflicts between the proposed project and any other land-use plans policies, energy requirements, conservation measures, and socio-economic impacts.

5.1 ASSESSMENT OF OVERALL IMPACTS

Construction of a school in a residential area is generally not associated with any major environmental concerns. As the 3 schools will not require any rehabilitation works, the main issues relate to nuisances resulting from construction activities, which are temporary and can be significantly mitigated through proper planning and best management practices. During operation, the most prominent concerns are those relating to indoor safety issues, which can be addressed through a good design and effective supervision by the school staff.

Therefore, the success of the project will highly depend on adherence to the environmental management plan that strives to address most of the issues discussed.

5.2 EXPECTED ENVIRONMENTAL IMPACTS

5.2.1 Construction Impacts

The environmental impacts during the construction phase of a project are usually negative with conditions that can be mitigated. Fortunately, most of these impacts are temporary and can be mitigated by taking the necessary precautions.

5.2.1.1 Occupational Safety and Health

Safety and health risks are expected during the construction period. This is particularly true in relation to the construction workers who will be present at the site. Workers will be exposed to dust, high noise levels, sun exposure (sun stroke) and dehydration during summer months, and other potential hazards associated with the use of heavy construction machinery.

5.2.1.2 Workers' Sanitation

Workers' sanitation on site poses a serious impact on the neighborhood. Provision of sanitary facilities onsite will be made available as it is considered critical to avoid these health hazards on the surrounding residents. Hiring foreign workers without assuring their health clearance may also expose the local community beyond the project's neighborhood to infectious diseases. The construction contractor and construction management consultant (CMC) will ensure compliance that site workers have the necessary health certificates.

5.2.1.3 Traffic

The negative impact resulting from construction activities is mainly due to movement of vehicles in and out of the site. Therefore, normal traffic movement may be slightly disrupted.

5.2.1.4 Noise

Noise pollution is a negative impact that will surely result from operating construction equipment such as cranes, trucks, drilling, etc. The major negative impact that could result is the noise generated during night hours or midday. This impact will disturb residents in the neighborhood. However, this impact can be mitigated by adhering to the Noise Instructions and will only be temporary.

5.2.1.5 Dust Pollution

Excavation and construction-related activities will generate dust that will have a negative impact on surrounding areas or even beyond. Moreover trucks transporting construction material will cause dust pollution to streets they would be passing through unless they are properly covered, and while transporting construction residues to dumping sites, which is when flying dust is expected to take place. However, the worst case of dust pollution would be during summer, when *khamasin* wind occurs.

5.2.1.6 Waste Generation

Waste generated from construction activities will have a negative impact on surrounding areas if not disposed of properly and regularly. In addition, the process of transporting all construction debris may also disturb neighboring areas and constitute a nuisance to residents around the site and is not aesthetically accepted.

5.2.1.7 Employment Opportunities

A positive impact would arise regarding employment opportunities for the local community upon proceeding with the project. However, this is true during operation more than during construction, since foreign workers are usually assigned for construction works. Moreover, families of workers would predominately benefit from work generated during construction.

5.2.2 Socio-economic Issues

Building a school can produce many socioeconomic benefits for the residents of the area where it will be located. These could range from job creation to decreasing the daily transport time to another school situated further away. The planned schools are also unlike any traditional schools in the area, for their facilities will be open to community use for different purposes such as the gym, library, computer labs, and multipurpose halls.

5.2.2.1 Interaction between Students

Due to the wide age range in the 3 schools, it is not preferred to mix students of different ages during recesses and within the school buildings in general. Students of different ages interacting together may result in chaos and increase the chance of conflict, making it difficult for teachers and supervisors to control them.

5.2.2.2 Student Psyche

An important impact to be considered is the student's psyche inside the classroom. Major factors affecting this impact are the color of walls, lighting, temperature, and dust.

Regarding the color inside the classrooms, research has suggested the following:

- Children are generally in tune with natural colors and those with human skin tones. On the other hand, primary colors can sometimes be harsh and should be used sparingly.
- The view that red leads to aggression and green calms has been found to be a myth. In fact, it has been shown that colors have a place for all students when used with care.
- The use of neutral colors such as gray, beige, white, or off white are not recommended as they do not stimulate the student.

- The use of more saturated accent colors in some areas may help in providing a varied, stimulus-rich learning environment[15].

Lighting is also an issue of concern, bearing in mind that Aqaba is a very hot city in summer, which will limit the utilization of the sunlight during the season, since windows would need shutters. One recommendation could be to use a large percentage of ceiling and wall surfaces with a higher Light Reflectance Value. Another could be to plant deciduous trees outside the classroom window. The tree would block the harsh summer sun and allow the winter sun.

Moreover, dust is an issue that must be mitigated especially when *Khamasin* wind occurs. This can also be done by planting trees outside the classroom windows.

5.2.2.3 Monitoring Student Behavior

Students need continuous monitoring and special supervisory measures. Ensuring these measures will limit the problems that may result from students fighting or arguing with each other. Therefore, the location of the supervising staff's offices will have a large impact on this matter. If the offices overlook the students' main activity areas and hallways, this could serve to reduce the chance of trouble significantly.

5.2.2.4 Employment and Economic Development

A major positive impact of implementing the school in the 8th, 10th, and Karameh areas is the creation of job opportunities for the local community. Around 60 employees from different fields would be required to work at each school, such as the director, teachers, secretaries, administrators, accountants, janitors, guards, etc. However, as males receive the majority of work opportunities during construction, it is foreseen that females would probably benefit more from operation jobs especially for the post of teachers.

5.2.2.5 Land Use

The impact of the school buildings on land use in the surrounding areas could be both positive and negative. The negative impact is attributed to the high level of noise generally associated with a school facility. This may reduce the value of the surrounding land. However, the schools may also improve services and access to the area thereby reviving it, offsetting the drop in land value.

[15] Fielding, R. Learning, Lighting and Color: Lighting Design for Schools and Universities in the 21st Century published in the International Association of Lighting Designers (www.pldplus.com)

5.2.2.6 Traffic

Traffic resulting during operation is considered to be a potential negative impact that needs to be addressed. During picking up and dropping off hours, traffic congestion may become a burden on the residents that are close to the school. Therefore, providing proper entrances and exits to the school as well as parking spaces is an important component of the school design.

5.2.2.7 Travel Time

Reduction in travel time to the school is considered a significant positive impact of the new school, on condition that the enrolled students are residents of the nearby areas. Not only will travel time be minimized as a result, but also effort and money especially for children who will be able to walk to the school and not require transportation thus reducing a family's bill in car fuel cost.

5.2.2.8 Noise

Throughout the scholastic year, noise resulting from the school may be a disturbance to the residents in the surrounding areas. This will be mainly felt during the arrival and departure times and the recesses between classes. Mitigating this impact could prove to be highly difficult as students are interacting with each other outdoors. Fortunately, the noise will only be heard during short periods throughout the day and after schools empty in the afternoon, there will be no noise from the facility.

5.2.3 Public Health and Safety Issues

An essential requirement for building any school is to provide a safe and healthy environment for the students, teachers, and all workers at the school. The following sections address pubic health and safety issues associated with the proposed new school.

5.2.3.1 Communicable Disease Prevention

Communicable disease can be easily spread among students as they spend much of their time in contact with each other. The most common diseases at schools are measles, hepatitis A, the flu, lice, and chicken pox. There are several ways to reduce the risk of epidemics at the school. The most important is the general cleanliness of the building, most importantly the sanitary facilities. Another is the availability of a

medical examination room, where a student suspected with a disease can be quarantined until a physician can examine him.

5.2.3.2 Sanitary Facilities

The characteristics and location of sanitary facilities has a significant impact on the hygiene and ultimately the health of students. For example, odors emitted from the facilities can be an intolerable nuisance on the students. It is therefore preferable that the school toilets be located on the southern side of the school (as the wind is northerly) and be at a distance from the classrooms. Ventilation is a necessity in all toilets.

Another issue is that oriental toilets were proposed by the attendees of the scoping session who preferred their use instead of regular ones due to the difficulty in cleaning and maintaining the latter. The sanitary facilities should be positioned in an area where they can be constantly monitored. In addition, the structure of the facility should not have any openings in the ground or on the walls in order to avoid any venomous animals such as scorpions or snakes to hide there. The tiles should be non-slip while the type of paint easily maintained and cleaned. Corners where dirt can accumulate should be avoided.

5.2.3.3 Indoor and Outdoor Safety Issues

Whenever a large number of children assemble in one place, the risk of accidents and injuries increases. One important cause on a school premise is the stairs. Another is sunstroke, due to Aqaba's extremely hot climate. In addition, tripping and falling are also quite common.

Therefore, the following measures are essential to ensure a safe environment for the students:

- Stairs should have a railing and be accessible to handicapped and special needs students. It is preferable to have two sets of stairs at each end of the hallway.
- There should be several entrances/exits for the school.
- Material coating for the walls and desks should be harmless, with no sharp edges.
- Ensure that there are no sharp corners that students may be exposed to.

- There should be safety precautions for the gas containers stored and used in the school.
- The location, height, and type of electricity sockets should take into account safety of the students and employees at the school.
- Protection on windows needs to be installed.
- Avoid placing coolers along the hallway.
- Use anti-slip tiles on the floor.
- Drainage system for each storey to ensure dry floors, as well as tilting of the floors to ensure proper drainage.
- Install fire escapes, emergency exits, as well as fire alarm and fire fighting systems. Emergency exits signs should be distributed appropriately throughout the building.
- Kindergartens should be located on the ground floor.
- Provide shaded areas in the courtyard.
- Flood mitigation measures should be taken into consideration when designing the school.

5.2.3.4 Injury from Car Accidents

As the 8th Area School is going be located on a main street, the risk of car accidents is a major concern for the students, especially for those who walk home. Therefore, within the design, there should be no exits on the main road near the school. The same should apply to the Karameh School if it were located on a main road. The 10th School will be located on secondary roads only. However, the issue of traffic safety is as important for this school as the others.

Traffic awareness is vital in all 3 cases. A parking lot for cars and buses should be designated on the premises. This will allow students to reach their transportation vehicle without venturing out into the street. In addition, it is recommended that school safety signs be placed out side each school. Minimum speed bumps and zebra crossings should also be added. If possible, a pedestrian bridge may also be helpful.

5.2.3.5 Protection from Intruders

Intruders to the school premise are always a possibility and a threat. The only feasible ways to prevent these intruders is to build a high fence around the school and provide a guardhouse near the entrance. If possible, installing surveillance cameras may also serve to improve control of the entrances and exits.

5.2.3.6 Safety in Workshops and Laboratories

In general, laboratories and workshop areas present more specific health and safety concerns than the other school facilities, especially in the prevocational workshop. For example, the workshop at the 8th Area Secondary Boys School will contain areas for carpentry, metals, and electronic and mechanical work. This will entail exposure of the students to sharp tools, heavy material, electric wires, etc. The girls' workshops at the 10th and Karameh Schools will be equipped to host activities such as home economics and sewing. This may include sharp tools, electric appliances, etc.

All of these are hazardous if not handled properly and under careful supervision. Therefore, the following precautions should be taken during the design phase:

- All labs should be located in the ground floor, and provided with an exit to outside, or it will be located near entrances and escape routes for easy evacuation in case of emergency.
- Be located as near to first aid as possible or to the medical examination room.
- Include sinks for students for clean up and flush in case of exposure to chemicals.
- Poster to demonstrate the meaning of warning signs.
- Be equipped with exhaust fans, smoke detectors, and fire alarms.
- Should have a heavy-duty entrance door for security and safety.
- The floor finish should be of non-slip material.
- The storage area should have good ventilation to mitigate odors and fumes, and be equipped with fume hood to handle odors and fumes.
- The gas cylinders closet should be vented and located exterior of the building for safety.
- Have secure and safe storage closets for materials and tools.

In addition, chemicals in laboratories should be stored and disposed of in a safe manner. There should be Material Safety Data Sheets (MSDS) regarding all chemicals found in the laboratories accessible to all students. An alarm system should be installed in case of a leak or an accidental fire.

5.2.3.7 Provisions for Students with Special Needs

Children with special needs require not only specialized facilities that would make their school stress-free; they should also feel that they are the same as all other students. It is therefore highly unadvisable that they be designated specific locations. Students who are physically challenged should be made to feel welcome in every part of the school that their fellow students have access to. Ramps, special desks, and other provisions for the optically challenged and hearing impaired need to be available at the schools, in addition to handicapped toilets with wide doors and side railings.

5.2.3.8 Earthquake Protection Measures

It is known that Aqaba is a seismically active area, which raises the possibility of the risk posed on the proposed school. Although this impact is unpredictable, it must be taken into consideration when designing the structure of the building.

5.2.3.9 Chalk Dust

Chalk dust is a natural by-product of writing with a piece of chalk on a blackboard. Made mainly from calcium carbonate, this dust is non-toxic and is ventilated outside or settles to the ground. However, some of it is inhaled by the teachers and students, and usually gets trapped in the mucus layers of the throats and upper lungs. Although it is not considered harmful, it may trigger a reaction in people with chronic breathing problems such as asthma.

In order to minimize this problem, teachers are encouraged to move students who suffer from respiratory problems away from the blackboard area. In addition, the board, trays, and erasers filled with chalk dust should be regularly cleaned.

6. ENVIRONMENTAL MANAGEMENT PLAN

In order to ensure that the schools are designed, constructed, and operated in a safe and environmentally sound manner, an environmental management plan (EMP) was developed. The following Tables 6.1, 6.2, and 6.3 present this EMP for the design, construction, and operation phases of the project separately. The tables also show the roles and responsibilities of the various relevant agencies.

Table 6.1: Proposed Mitigation Measures during Design

Environmental Impact / Issue	Proposed Measures	Roles and Responsibilities	
		Implementing	Monitoring
Construction Issues			
Health and safety	Include in bidding documents that the contractor should prepare a Health & Safety Plan that includes the relevant measures described in Jordanian Code No. 22 for Public Safety during Construction: • Proper signage in accordance with Section 1 • Provision of fire fighting measures in accordance with Section 2/5 • Provide temporary electrical connections in accordance with Section 2/12 • All openings and edges should be provided with guard rails and toe boards in accordance with Section 2/13 • Proper storage of materials in accordance with Section 3/3 • Safety measures during demolition works in accordance with Section 4/7 • Safety measures according to type of equipment in accordance with Section 5 • Personal safety during work in accordance with Section 6 • Provide medical services in accordance with Section 2/4 of the Code which includes medical examination for all workers, first aid kit and personnel, and keeping logs of all medical records In addition, also include: • Appointing an accident prevention officer at the site (Item 34 of the FIDIC 1987) • Training for all construction staff on Health & Safety Plan • Fencing around the construction site at all times	Design Consultant	USAID / MOE

Environmental Impact / Issue	Proposed Measures	Roles and Responsibilities	
		Implementing	Monitoring
Workers' sanitation	Include in bidding documents that the contractor should provide: • One sanitary facility (1 toilet with shower, 1 washing basin, 1 urinal) per 25 workers in accordance with Section 2/2 of Code No. 22 • Sanitary facilities to be covered, easily accessible, ventilated, well lit, maintained, and sanitized • Safe drinking water in accordance with Jordanian specifications distributed by pipes that are at least 2 meters away from any contaminated water source in accordance with Section 2/3 of Code No. 22	Design Consultant	USAID / MOE
Traffic disruption	Include in bidding documents that the contractor should: • Limit the use of vehicles to the site and avoid unnecessary trips • Set up a time schedule for transporting material with the purpose of avoiding traffic congestion	Design Consultant	USAID / MOE
Noise	Include in bidding documents that the contractor should: • Abide by the time and noise limits specified in the Instructions for Controlling and Preventing Noise for 2003 • Abide by noise limits for workers set out in Section 2/9 of Code No. 22, including providing workers with protection equipment whenever necessary	Design Consultant	USAID / MOE
Dust and air pollution	Include in bidding documents that the contractor should: • Provide ventilation in accordance with Section 2/8 of Code No. 22 • Abide by safety measures during painting works in accordance with Section 4/9 of Code No. 22 (4/9/2 for Lead-based paint, 4/9/3 for unsaturated polyesters, 4/9/4 for spray painting, and 4/9/5 for airless spray paints) • Avoid use of lead-based paint • Water the ground when extremely windy • Mix material in an enclosed space • Cover material when transporting in accordance with 3/2 of Code No. 22 • Prohibit open burning	Design Consultant	USAID / MOE
Waste generation	Include in bidding documents that the contractor should: • Prepare a waste management plan • Dispose of solid and liquid waste regularly and in accordance with the Solid Waste Management Bylaw (No. 27 for 2005) and Jordanian Code No. 21 for Solid Waste	Design Consultant	USAID / MOE
Water demand	Include in bidding documents that the contractor should commit to minimizing the use of water during construction works	Design Consultant	USAID / MOE

Environmental Impact / Issue	Proposed Measures	Roles and Responsibilities	
		Implementing	Monitoring
Soil and water pollution	Include in bidding documents that the contractor should: • Minimize soil exposure time during construction • Minimize the use of chemicals such as lubricants, solvents, and petroleum products	Design Consultant	USAID / MOE
Water stagnation	Include in bidding documents that the contractor should ensure that the construction site is well kept and avoid water spillage	Design Consultant	USAID / MOE
Archeological resources	Include in bidding documents that should there be any suspected archeological findings during construction, the Supervision Consultant of Antiquities should be immediately informed (Item 27.1 of FIDIC 1987)	Design Consultant	USAID / MOE
Socio-economic Issues			
Interaction between students / classes	Design separate facilities for different age groups	Design Consultant	USAID / MOE
Student psyche inside classroom	• Select stimulating colors for the classroom walls • Provide ventilation in the classroom design (such as fans) by utilizing the Jordanian Code No. 16 for Natural Ventilation and Jordanian Code No. 30 for Mechanical Ventilation giving preference to natural ventilation whenever possible taking into consideration that windows should be wide enough to allow sunlight to enter but not enough to allow too much heat during the summer • Include air conditioning wherever possible • Provide natural lighting whenever possible in accordance with Jordanian Code No. 17 • Design trees outside classroom windows whenever possible	Design Consultant	USAID / MOE / JEA
Monitor student behavior	Design supervising staff offices to overlook students' main activity areas	Design Consultant	USAID / MOE
Traffic during operation	Design proper entrances, exists, and parking areas to avoid traffic congestion during picking up and dropping off hours	Design Consultant	USAID / MOE
Public Health & Safety Issues			
Communicable disease prevention	• Include a medical examination room in the school design	Design Consultant	USAID / MOE

Environmental Impact / Issue	Proposed Measures	Roles and Responsibilities	
		Implementing	Monitoring
Sanitary facilities	• Provide 1 toilet facility for every 40 students, in accordance with Ministry of Education requirements • Provide ventilation in toilets in accordance with the Jordanian Code No. 16 for Natural Ventilation and Jordanian Code No. 30 for Mechanical Ventilation • Provide Eastern toilets which are more easily cleaned and maintained except for Kindergartens • Adhere to the Jordanian Code No. 19 for Building Sanitation	Design Consultant	USAID / MOE / JEA
Indoor and outdoor safety	• Provide naturally shaded areas in the courtyard • Design railings along the stairs and edges • Whenever applicable prepare the designs for alarm system, fire protection system, and emergency exits using: o Civil Defence conditions for stand alone extensions which does not apply in this school. o Jordanian Code No. 15 for Fire Protection o Jordanian Code No. 27 for Fire Alarm Systems o US National Fire Protection Agency (NFPA) 72 National Fire Alarm Code 2007 Edition and NFPA 101 Life Safety Code 2006 Edition as guidelines	Design Consultant	USAID / MOE / JEA / Civil Defence
Injury from car accidents	• Avoid designing entrances/exits on main roads	Design Consultant	USAID / MOE
	• Install proper signage wherever possible • Provide speed bumps and zebra crossings if possible	ASEZA ASEZA	
Safety in workshops and laboratories	• All electrical installations in the workshop should be designed in accordance with Section 3 on Protection for Safety of the Jordanian Code No. 24 for Electrical Installations if applicable to school scope of work. • All labs should be located in the ground floor, and provided with an exit to outside, or it will be located near entrances and escape routes for easy evacuation in case of emergency. • Be located as near to first aid as possible or to the medical examination room. • Include sinks for students for clean up and flush in case of exposure to chemicals. • Poster to demonstrate the meaning of warning signs. • Be equipped with exhaust fans, smoke detectors, and fire alarms. • Should have a heavy-duty entrance door for security and safety. • The floor finish should be of non-slip material. • The storage area should have good ventilation to mitigate odors and fumes, and be equipped with fume hood to handle odors and fumes. • The gas cylinders closet should be vented and located exterior of the building for safety. • Have secure and safe storage closets for materials and tools.	Design Consultant	USAID / MOE / Civil Defence

Environmental Impact / Issue	Proposed Measures	Roles and Responsibilities	
		Implementing	Monitoring
Protection from intruders	• Provide fencing for the school • Design a guardhouse at the school entrance • Provide surveillance cameras at school entrance	Design Consultant	USAID / MOE
Provisions for physically challenged students	• Design the facilities in accordance with the Jordanian Code No. 32 for Construction Requirements for the Physically Challenged • Provide an elevator-designated place for future MOE consideration	Design Consultant	USAID / MOE
Earthquake protection	Design the facilities in accordance with the Jordanian Code No. 3 for Loads and Forces (Section 4 on Earthquakes)	Design Consultant	USAID / MOE / JEA / Earthquake Commission
Flood protection	Design protection measures for local flooding for a 10-year return period of rain falling on the site and access roads	Design Consultant	USAID / MOE / JEA
Utilization of water for landscaping	Select trees that are indigenous to the area and do not require large amounts of water for irrigation	Design Consultant	USAID / MOE

Table 6.2: Proposed Measures during Construction

Environmental Impact / Issue	Proposed Measures	Roles and Responsibilities	
		Implementing	Monitoring

Environmental Impact / Issue	Proposed Measures	Roles and Responsibilities	
		Implementing	Monitoring
Health and safety	Prepare and abide by a Health & Safety Plan that includes the relevant measures described in Jordanian Code No. 22 for Public Safety during Construction: • Proper signage in accordance with Section 1 • Provision of fire fighting measures in accordance with Section 2/5 • Provide temporary electrical connections in accordance with Section 2/12 • All openings and edges should be provided with guard rails and toe boards in accordance with Section 2/13 • Proper storage of materials in accordance with Section 3/3 • Safety measures during demolition works in accordance with Section 4/7 • Safety measures according to type of equipment in accordance with Section 5 • Personal safety during work in accordance with Section 6 • Provide medical services in accordance with Section 2/4 of the Code which includes medical examination for all workers, first aid kit and personnel, and keeping logs of all medical records In addition: • Appoint accident prevention officer at the site (Item 34 of the FIDIC 1987) • Train all construction staff on Health & Safety Plan • Provide fencing around the construction site at all times	Contractor	Supervision Consultant / USAID / MOE
Workers' sanitation	Provide on site: • One sanitary facility (1 toilet with shower, 1 washing basin, 1 urinal) per 25 workers in accordance with Section 2/2 of Code No. 22 • Sanitary facilities to be covered, easily accessible, ventilated, well lit, maintained, and sanitized • Safe drinking water in accordance with Jordanian specifications distributed by pipes that are at least 2 meters away from any contaminated water source in accordance with Section 2/3 of Code No. 22	Contractor	Supervision Consultant / USAID / MOE
Traffic disruption	• Limit the use of vehicles to the site and avoid unnecessary trips • Set up and abide by a time schedule for transporting material with the purpose of avoiding traffic congestion	Contractor	Supervision Consultant / USAID / MOE
Noise	• Abide by the time and noise limits specified in the Instructions for Controlling and Preventing Noise for 2003 • Abide by noise limits for workers set out in Section 2/9 of Code No. 22, including providing workers with protection equipment whenever necessary	Contractor	Supervision Consultant / USAID / MOE

Environmental Impact / Issue	Proposed Measures	Roles and Responsibilities	
		Implementing	Monitoring
Dust and air pollution	• Provide ventilation in accordance with Section 2/8 of Code No. 22 • Abide by safety measures during painting works in accordance with Section 4/9 of Code No. 22 (4/9/2 for Lead-based paint, 4/9/3 for unsaturated polyesters, 4/9/4 for spray painting, and 4/9/5 for airless spray paints) • Avoid use of lead-based paint • Water the ground when extremely windy • Mix material in an enclosed space • Cover material when transporting in accordance with 3/2 of Code No. 22 • Prohibit open burning	Contractor	Supervision Consultant / USAID / MOE
Water demand	Commit to minimizing the use of water during construction works	Contractor	Supervision Consultant / USAID / MOE
Soil and water pollution	• Minimize soil exposure time during construction • Minimize the use of chemicals such as lubricants, solvents, and petroleum products	Contractor	Supervision Consultant / USAID / MOE
Water stagnation	Ensure that the construction site is well kept and avoid water spillage	Contractor	Supervision Consultant / USAID / MOE
Waste generation	• Prepare a waste management plan • Dispose of solid and liquid waste regularly and in accordance with the Solid Waste Management Bylaw (No. 27 for 2005) and Jordanian Code No. 21 for Solid Waste	Contractor	Supervision Consultant / USAID / MOE
Archeological resources	Any suspected archeological findings during construction, Supervision Consultant, Client and the Aqaba Department of Antiquities should be immediately informed (Item 27.1 in the FIDIC 1987)	Contractor / Supervision Consultant	Supervision Consultant / USAID / MOE
Employment opportunities	Give priority to hiring local staff	Contractor	Supervision Consultant / USAID / MOE

Table 6.3: Proposed Mitigation Measures during Operation

Environmental Impact / Issue	Proposed Measures	Roles and Responsibilities	
		Implementing	Monitoring

Environmental Impact / Issue	Proposed Measures	Roles and Responsibilities	
		Implementing	Monitoring
Student psyche inside classroom	Involved the students in the decoration of their classrooms	School Management	MOE
Employment opportunities	Give priority to hiring local staff	School Management	MOE
Sanitary facilities	• Ensure that sanitary facilities are frequently cleaned and regularly monitored	School Management	MOE
	• Monitor sewer connection and ensure adherence to standards	WAJ	MOH
Supply of potable water	Ensure supply of potable water in accordance with Jordanian Standards	WAJ	MOH
Indoor and outdoor safety	Provide constant monitoring of student activities	School Management	MOE
Injury from car accidents	• Install proper signage wherever possible • Provide speed bumps and zebra crossings if possible	ASEZA	ASEZA
Protection from intruders	Hire a guard to ensure that no strangers enter the school premise	School Management	MOE
Safety in workshops and laboratories	• Provide constant monitoring of student activities in the workshops and laboratories • Students should wear gloves and have access to a first aid kit	School Management	MOE
Earthquake protection	Train teachers on emergency evaluation and perform regular drills for the entire school	School Management	MOE
Chalk dust	• Teachers to seat students with respiratory problems away from blackboard • Regular cleaning of board, trays, and erasers	School Management	MOE
Community use of school facilities	Monitor use of school facilities by the local community	Local Community Development (ASEZA)	MOE

APPENDIX A: LIST OF PREPARERS

Name	Position/Area of Specialty
Lama Bashour	Team Leader, EIA Specialist, Engicon
Issa Abu Taha	Environmental Specialist, Engicon
Nancy Haddadin	Environmental Engineer, Engicon

Curriculum Vitae

Proposed Position	Team Leader / EIA Expert		
Name of Firm	Engicon		
Name of Staff	Lama Bashour		
Profession	Environmental and Public Health Specialist		
Date of Birth			
Years with Firm	7	**Nationality**	Lebanese
Membership in Professional Societies	-		

Key Qualifications

Ms Lama Bashour has be en with Engicon as an envir onmental specialist since 2000. Her respo nsibilities included the p reparation of Environmental Impact Asse ssment reports for several pr ojects. Exampl es of these pro jects inclu de the Ma 'an, Mafraq a nd Jera sh W astewater T reatment Plants an d Effluent Reus e and the Storag e S ystems Pro ject, which incl uded stud ying possi ble loc ations for dams alo ng the Jord an Valley. Mor e recentl y, she h as worked as a Projec t Co ordinator an d Environmental Specia list on the Municipal Infra structure an d Service D elivery Assessm ent Project, as well as the C omprehensive B asic Survey for Priorit y Areas of JICA Assistance, in which she prepared th e study on Env ironment. She was also resp onsible for preparati on of the Volume on W ater and Envir onment for Jordan's Ministr y of Water and Irrig ation's Nation al W ater Master Plan (GT Z-funded), which inv olved revie wing, anal ysing an d recommending improveme nts to the cu rrent environm ental issues as the y relate to the water sector in Jordan. Ms B ashour's e ducational background i ncludes a Masters Degree in Envir onmental Law an d Conservation from the Universit y of Kent in t he UK and a Bache lor of Sciences in Public an d Environmental Health from the American University of Beirut.

Education

2000	LLM (Masters in La w) with Merit in Environme ntal La w and Cons ervation, University of Kent, UK
1997	B Sc in Public and Environmental Health, American University of Beirut, Lebanon

Other Training

Dec 16 – 20, 2006	Advanced T raining W orkshop for Env ironmental Asse ssment Practi tioners, organized b y the W orld Bank, MET AP, Tunis In ternational C entre for Environmental Technologies, UNEP

Employment Record

Dec 2000 – Present	Engicon, Amman, Jordan
Oct 1998 – Sept 1999	American University of Beirut, Lebanon

Experience Record

Dec 2000 – Present **Engicon, Amman, Jordan**

Environmental and Public Health Specialist. Worked on the following projects:

Environmental Assessment of Nuqul Group PM4 Tissue Paper Mill Project, Jordan. The work required performing an environmental assessment study for a paper mill factory to be implemented for Nuqul Group in Eastern Urainbeh, Al-Jeeza, Amman. The EA was to be in line w ith European and W orld Bank standards as well as abide by Jordanian legislations. T he European Commission Reference Document on Best Available Techniques (BAT) in the Pulp and Paper Industry was utilized as a guideline for ensuring that the proposed technology was environmentally-friendly. The task activities were as follows:

1. Review of existing literature and available documentation on the project area.
2. Site visits to the project area.
3. Identification of the project alternatives.
4. Preliminary list of anticipated environmental impacts.
5. Consultation with relevant stakeholders.
6. Evaluation of significant environmental impacts.

7. Establishing mitigation measures.
8. Preparing an environmental monitoring and management plan.

Design of Salt/Wadi Shuaib Road and Road Connecting Wadi Shuaib to Salt Entrance. Responsible for the environmental assessment of the three project components as follows:

1. Upgrading of the existing Salt/Wadi Shuaib Road with a total length 23 km into a 4-lane divided highway in order to sustain the existing traffic volumes.
2. Design of a 10-km 4-lane divided highway from Salt/Wadi Shuaib Road to Salt/Suwaileh Road.
3. Preparation of a reconnaissance study to connect Salt/Suwaileh Road with Salt Ring Road.

The tasks comprised of the examination of regulatory framework, a scoping process, analysis of the environmental impacts, proposal of mitigation measures and preparation of an environmental monitoring and management plan.

Municipal Infrastructure and Service Delivery Assessment. Project Coordinator and Environmental Specialist. The study is part of the World Bank Regional and Municipal Development Project and was conducted for the Ministry of Planning & International Cooperation, in cooperation with the Ministry of Municipal Affairs and Cities & Villages Development Bank. It includes the following three main components:

1. Preparation of an informative framework of the need for infrastructure and services that may be found in the Jordanian municipalities;
2. Development of a methodology capable of leading to the identification of a priority list of actions, taking into account the social, environmental, and economic-financial characteristics of the territories involved;
3. Definition of a priority package of investments in infrastructure and services, characterized by the requirement of feasibility, from both the technical-design standpoint and that of economic-financial and environmental compatibility

The project was financed by the International Bank for Reconstruction and Development and was implemented in joint venture with C. Lotti & Associati and Ecoter of Italy.

In Mar 2005 – June 2005, worked as a short-term consultant for the **Food and Agriculture Organization in Rome, Italy** on the **Forestry Outlook Study for West and Central Asia.** The task required was the preparation of a *Thematic Report on Land Use Dynamics and Policy and Institutional Changes in the West Asia region*, which comprises the countries of Afghanistan, Bahrain, Cyprus, Iran, Iraq, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syria, Turkey, UAE and Yemen. The resulting report provides an overview of the key developments in land use, policy, legal and institutional changes with the objective of understanding the trends that may have direct and indirect impacts on forests and forestry in the region.

Comprehensive Basic Survey for Priority Areas of JICA Assistance. Deputy Project Coordinator and Team Leader for the sector of Environment, Health and Labour and Employment. The purpose of this project was to perform a comprehensive survey that will aid Japan International Cooperation Agency (JICA) in determining the sectors that are in most need of assistance in Jordan. The project required surveying the present situation in 23 sectors (divided into two groups: A and B), as well as the institutional and legal background under which these sectors are managed.

National Water Master Plan: Water and Environment. As part of the GTZ-funded project for the Ministry of Water and Irrigation, Team Leader for preparing the volume relating to the environmental planning framework for water sector planning in Jordan. The volume was divided into the following chapters, in accordance with the UN Guidelines for the Preparation of National Water Master Plans:

1. Institutional and Legal Issues (including water quality monitoring)
2. Environmental Impact Assessment for the Water Sector
3. Environmental Protection and Water Development Projects (such as non-conventional water resource development, groundwater development and water storage and conveyance systems)
4. Recommendations (regarding legal and institutional improvements,

environmental planning, national environmental assessment requirements, environmental monitoring and sustainable development)

Responsible for the preparation of Environmental Impact Assessment reports for the following projects:

Wastewater Collection, Treatment and Effluent Reuse from Jerash and Sukhna. Environmental Specialist for the preparation of a technical and economic feasibility study, environmental assessment, final design and tender documents for the:

- Wastewater collection, treatment and effluent reuse from the municipalities of Sakib, Raymon, Al-Kitta, Nahla and Gazza refugee camps and the adjacent area
- Wastewater collection, pumping station and transmission pipeline of Sukhna town and Sukhna refugee camp

Responsibilities included performing a Scoping Process, whereby a Scoping Session was conducted regarding the possible environmental impacts of the project. Following that was the preparation of a Scoping Statement and an Environmental Assessment Report.

Karak Water Loss Reduction Programme. Feasibility study on water loss reduction in the governorate of Karak. The study includes an actualisation of the existing water network, development of a computer model for the hydraulic network analysis, updating and extension of governorate development and population projection, development of zoning system, water loss analysis, feasibility investigation for rehabilitation of all water networks, availability of additional resources and water balance, socio-economic and environmental assessment studies and preliminary designs for rehabilitation works.

Storage Pond at Deir Alla. The Project is located near the town of Deir Alla, east of the existing King Abdallah Canal (KAC) and aims to divert the Zai Water Treatment Plant (WTP) requirement of KAC water for preliminary treatment before pumping it to Zai via the existing Intake Pumping Station (PS) and transmission system. In addition, a 500,000 cubic meter storage pond is designed as a reserve when the KAC water quality deteriorates to levels that cannot be handled by Zai WTP. A preliminary environmental assessment report was prepared.

Zarqa / Bal'ama / Irbid Road. Conducted an environmental assessment report for the study for upgrading and redesign of Zarqa/Balama/Irbid Road into a 4-lane divided highway with total length of 42 km from Al-Hashimiyah Bridge to Nuaimeh Bridge. The task comprised of the examination of regulatory framework, a scoping process and analysis of the environmental impacts.

Al Quds Junction-Zara Main Intersection. The project included the design of a 4-lane highway with service roads on both sides, to replace the existing road connecting Rama intersection through Quds intersection, with Sweimeh /Zara road, and designing Wadi Mukhaires Bridge. The task comprised of conducting an environmental impact assessment, including examination of regulatory framework, a scoping process and analysis of the environmental impacts.

Ma'an Wastewater Treatment Plant and Effluent Reuse. The project comprises of the rehabilitation and upgrading of an existing wastewater treatment plant (capacity 1590 m^3/day) and effluent reuse for the city of Ma'an. Responsibilities include performing a Scoping Process, whereby a Scoping Session was conducted regarding the possible environmental impacts of the project. Following that was the preparation of a Scoping Statement and an Environmental Assessment Report.

Al Shamiyeh Village Infrastructure Project. The project entailed the provision of infrastructure services for the Shamiyeh Village in the Southern Aqaba. Responsibilities included preparation of an environmental assessment analysing the possible adverse environmental and social impacts of this project. Work included conducting a survey whereby a sample of the residents of the village was taken for and interviewed.

Mafraq Wastewater Treatment Plant and Reuse Application. The project,

funded by US AID, entailed the rehabilitation of the existing Mafraq wastewater treatment plant and proposal of a scheme for effluent reuse. The new plant's design capacity is 6,500 CM/day. Responsibilities included organizing a Scoping Session, in accordance with USAID requirements, performing several field trips, and preparing a Pre-scoping Brief, a Scoping Statement and an Environmental Assessment report.

Storage Systems Project. Technical, economic and financial feasibility study and preliminary design of the Storage Systems Project, which required the selection of the most suitable dam site(s) on the Jordan River. Responsibilities included site visits to the four potential sites, collection of relevant information from the available literature and experts, and preparation of documents for the environmental impact assessment report.

Oct 1998 – Sept 1999 **American University of Beirut, Lebanon**

Research Assistant. Conducted research as well as laboratory work on the Leishmania parasite. Responsibilities included site visits to the north of Lebanon, where Leishmania is hypoendemic, laboratory experiments and assisting in preparation of research papers and publications.

Language Ability	*Speaking*	*Reading*	*Writing*
	Arabic	Excellent	Excellent
	English	Excellent	Excellent
	French	Good	Good

Curriculum Vitae

Proposed Position	Environmental Specialist		
Name of Firm	Engicon		
Name of Staff	Issa Abu Taha		
Profession	Geologist / Environmental Specialist		
Date of Birth			
Years with Firm	16	**Nationality**	Jordanian
Membership in Professional Societies	• Jordanian Geologists' Association		

Key Qualifications

Issa Abu Taha has 28 years of experience in geological, geotechnical and environmental investigations. His expertise extends from various large projects covering roads, bridges, tunnels and dams, multi-storey buildings, water and wastewater treatment plants, housing complexes and retaining walls. Some of the projects he has participated in include the Storage Systems Project, Rehabilitation of Wastewater Treatment Plant in Ma'an, Community Infrastructure Programme, Regional Solid Waste Management Study and the Rama Intersection / Quds Intersection Road.

Education

1978	B Sc in Applied Geology, Damascus University, Syria

Employment Record

1991 – Present	Engicon, Amman, Jordan
1985 – 1991	Geotechnical Engineering and Materials Testing Co. - Amman, Jordan
1984 – 1985	Rukun Al-Handassa and Nippon Koei Consulting Eng. - Amman, Jordan
1983 – 1984	Ali Saker Co. - Amman, Jordan
1979 – 1983	Natural Resources Authority of Jordan (NRA) - Amman, Jordan

Experience Record

1991 – Present **Engicon, Amman, Jordan.**

Senior Geologist / Geotechnical Engineer / Environmental Specialist responsible for the geological hydrogeological, geotechnical and environmental studies.

Environmental Studies

- EIA for Nuqul Paper Mill Project in East Urainbeh, Jordan
- Northern Region Solid Waste Management Study, Ekeder. Feasibility and environmental impact assessment study for the identification and evaluation of a range of investments to implement a comprehensive solid waste management system for the northern region of the country and a framework for the capacity building of a solid waste management unit at GCEP (now Ministry of Environment).
- EIA for Rama Intersection/Quds Intersection Highway
- EIA for Zarqa/Bal'ama/ Irbid Highway
- EIA for Rehabilitation and Upgrading of Ma'an Wastewater Treatment and Reuse Project
- EIA for Al Shamiyeh Village Infrastructure Project
- EIA for Mafraq Wastewater Treatment Plant and Reuse Application
- EIA for Community Infrastructure Programme Project (EIA for four refugee camps and two squatter areas)
- EIA for Storage Systems Project (project area, three proposed dam sites and water storage pond) at the area between Yarmouk River in the north and Wadi Rajib at the south. The EIA was carried out for the project area in addition three proposed dams.
- EIA for Mujib and Southern Ghors Irrigation Project
- EIA for Adasiya Deir Alla Pipeline Project

EIA for Water Availability Study of Rehab and Aqaba Combined Cycle Power Stations

Dams and Ponds

Study and Design of Itwed Dam, Saudi Arabia.

- Study and design of the spillway for Itwed Dam in the Assir region through proposing possible alternatives for the site and shape of the spillway in order to achieve a drainage of 2720 m^2/second, taking into consideration the design characteristics of the 39-m high dam.
- Study of the low area before the spillway which may become a small pond and propose alternative solutions.
- Study of the geological conditions of the spillway area
- Study and assess the design of the dam on the left embankment.

Deir Alla Storage Pond. The project aims to divert the Zai Water Treatment Plant requirement of KAC water for preliminary treatment. The project required the preparation of conceptual and detailed designs, tender documents and bill of quantities, as well as a preliminary environmental impact assessment.

King Abdullah Canal Storage Pond. Feasibility study, detailed design and preparation of tender documents for the KAC Storage Pond. The project comprises the design of 500,000 m^3 capacity storage pond and intake/outlet structures at KAC.

Equalization Pond for the Effluent Water from Central Irbid & Wadi Arab Treatment Plant. The project includes the detailed design and preparation of tender documents for detailed design of 25,000m^3 equalization pond and the associated electro-mechanical works. The project aims of reuse of effluent water for irrigation by irrigating the effluent water in to the existing 1350 mm irrigation pipe.

Storage Systems Project. Geological and hydrogeologic study of the project area along the Jordan River and its side wadis between Yarmouk River and wadi Rajib in the south. Selection of potential sites, detailed geological study of three proposed dams (Yabis, Kufranja and Rajib) and storage pond (750,000 CM), preparation of topographic and geotechnical tender documents and specifications, supervision of the work and preparation of evaluation geotechnical report.

Dams and Ponds in Karak and Tafileh Governorates. Geologic study for 15 potential dam sites to select 10 sites (capacity 20- 50.000 m^3) and evaluate its geological conditions and estimate the geotechnical parameters. The works included a hydrologic study, detailed design and preparation of tender documents.

Storage Dams in Al-Karak Governorate. Geological studies, selection of potential dam sites, detailed geology for two dam sites (Karak and Meddein), preparation of tender documents and technical specifications for geotechnical investigation, supervision of the works, evaluation of the geotechnical results, including a seismisity study, and preparation of the final geotechnical report.

Raising Kafrein Dam. Supervision of geotechnical investigation for the project.

Water, Wastewater and Infrastructure Projects

South Amman Wastewater Networks & Treatment Plant. Feasibility study, environmental impact assessment design and preparation of tender documents of the wastewater collection, treatment and effluent reuse for the communities of south Amman. The project includes the design of 600km of wastewater collection networks and three treatment. Plants.

Technical and Feasibility Study and Final Design of the Upgrading and Expansion of Water Facilities in Central Governorates (Zarqa, Madaba and Balqa). Feasibility study and preliminary design of water supply system upgrade and expansion for Zarqa, Madaba and Balqa Governorates as well as the

detailed design and preparati on of tender documents in selected areas of the three Governorates.

Feasibility Study of the Brackish Water Resources in North-West Corner of Jordan. The purpose of the study is to conduct a full hydrogeological study of the brackish w ater resources in the alluvial aquifers and to develop better understanding deeper aquifer sy stems in the project area. T he study shall determine the availability of the brackish groundw ater in the alluvial aquifers and possible utilisation from the deeper aquife r zones in terms of quantity and quality according to the criteria of safe yields

Managing Scarce W ater Reso urces in th e Mid dle East Reg ion. The Project aimed to transfer 50 MCM drinking w ater to the Amman City in the scope of this project. The system for transferring 50 MC M drinking w ater from the desalination plant to the Amman City will be based on t he existing regional w ater distribution system and on the new proposed facilities.

Design o f th e W astewater Co llection, Investment and Efflue nt Re use from Jerash an d Su khna. Preparation of a technical and economic feasibility study , environmental assessment, final design and tender documents for the two-part project which included: W astewater collect ion, treatment and e ffluent reuse from the municipalities of Sakib, Ray mon, Al-Kitta, Nahla and Gazza refugee camps and the adjacent areas in Jerash Governorate, North of Jor dan. The population to be served is around 84,000. T he projec t components included a w astewater collection system, pumping st ation, treatment plant with a capacity of 10,000 m^3/day, sludge digestion and treatment and e ffluent reuse and distribution. And wastewater collection, pum ping station and transmission pipeline of Sukhna tow n and Sukhna refugee camp, with a population of around 12,000.

Rehabilitation and Upgrading of Wastew ater Treatment Plant and Effluent Reuse for the City of Ma'an. Upgrading and expansion of the existing w aste stabilization ponds treatment plant in the city of Ma'an. The project comprises the preparation of feasibility study, environmental assessm ent and detailed design of a new modified extended aeration (UCT) treatment plant on t he design capacity of 7000 m^3/day and effluent reuse scheme.

Rehabilitation of the Roy al Pal aces Water Sy stem Al-Hummar Area. Follow up on geotechnical investigations for the detailed design, pr eparation of tender documents and construction supervision for t he rehabilitation of the w ater system in the Roy al Palaces comprising the design of 11 km of w ater mains, tw o pumping stations and 1000 m^3 reservoir.

Khaw / A l-Batrawi Wa ter Supply Line & A l-Batrawi Pumping Sta tion. Preparation of the detailed design for the:

- Construction for an underground c oncrete storage tank of 4000 m^3 in Batrawi.
- Supply, installation and operation for a new pumping station at Al-Batraw i storage tank to serve the high areas.
- Chlorination system.
- All related electromechanical works.
- Supply and installation of Ductile pipes 700 mm diameter with a total of 9 km length, extending from Khaw Pumping Station to Al-Batrawi.

Rehabilitation of (18) km Extension Irrigation Project. Feasibility study, preliminary design, detailed design and preparation of tender documents for the rehabilitation of irrigati on netw ork serving 80000 dunum s, rehabilitation of 6 existing pumping stations, design of (9) new intakes at King Abdullah Canal, design of (3) new pumping stains and 8 km of 900 mm conveyance pipelines.

Investment of the Zarqa Military Camp Existing Site. The main ob jective of the study was to prepare a master plan that fulfils the necessary requirements for the different classes of the residents of the city of Zarqa and its areas.

Caradoor We lls Wa ter Supply Project. Design and supervision of the construction of w ater conveyance, DI pipeline (600mm diameter) from Caradoor wells (10 No.) to Khaw pumping station. The purpose of the project is to convey

potable water from the wells located in Mafraq governorate to the cities of Amman and Zarqa. The project comprises preparation of wells sites, installation of submersible pumps, about 30km of pipelines, electrical control panels and 250 KVA power transformers. The works also include rehabilitation of Hallabat pumping station and installation of 2 Nos. centrifugal surface pumps.

Mafraq Wastewater Treatment Plant and Reuse Application. Rehabilitation of the existing Mafraq wastewater treatment plant and proposal of a scheme for effluent reuse. The new plant's design capacity is 6,500 CM/day. The project also includes an environmental assessment of the effect of plant construction and operation on the groundwater aquifers and the surrounding environment. The project comprises feasibility study, design and preparation of DB tender documents and construction supervision.

Rehabilitation of Greater Amman Water Supply System in Hashimi, Marka & Sahab. Design and construction supervision of the rehabilitation of the water supply network for an area of Amman with a population of 220,000, including primary distribution and house connections, in addition to rehabilitation of the existing pumping stations and reservoirs as required. The basic objective of the rehabilitation is to reduce the unaccounted for water (UFW) to 15% by reducing the pressure in the network. This is achieved by dividing the system into district zones with pressure between 2.5-5 bars.

Ekeder WWTP Project. Design and construction supervision of waste stabilization ponds treatment plant. The treatment plant is designed to receive septage disposal quantities of 4000 m^3/day. The new ponds are located on a plot acquired by WAJ (about 403 dunums) near the existing Al Ekeder disposal areas. The study included an environmental impact assessment and effluent reuse scheme.

Water Quality Model (Transport Model) in the Azraq Basin. Geological and hydrogeological evaluation of the water quality variation in the different parts of the Azraq and participation in modeling procedure.

Rehabilitation of Tal Al-Thahab Weir. Design and supervision of construction for the rehabilitation works to improve measurements, control and the physical quality of the water diverted from the Zarqa River into two carrier pipelines. The work included training Wadi Zarqa carriers and installing automatic trash racks, in addition to constructing a new desilting basin and installing four fine screens at the end of the desilting basin to prevent algae from entering the system. The work also comprised motorising existing gates and construction of an operator's building, in addition to connection to Dirar Control Centre.

Mujib and Southern Ghors Irrigation Project. Design of a diversion weir downstream of Wala and Hidan conjunction to divert approximately 35 MCM/year through a tunnel. The project also included the design of two conveyors, one to the North, to transfer 15 MCM/year to the touristic area near Suweimeh (30 km long) and one to the South, to transfer the remaining quantity of water for the Arab Potash Co. and for irrigation areas (70 km). The work entailed preparation of final design and tender documents.

Water Conveyance System from Adasiya Deir Alla-Zai Project. Feasibility study and preliminary design of the Adasiya/Deir Alla Pipeline. The system was designed to convey 90 MCM/year from Yarmouk River north of Jordan to Deir Alla-Zai pumping system 65 Km to the South. The project included the design of the conveyor system, road and wadi crossing structures, a pumping station, two header tanks at Adasiya with a capacity of 2500 CM each and a reservoir at Mukheiba with a capacity of 2500 CM to divert water to Adasiya. The work entailed topographic survey of the route, geotechnical investigation, designs and tender documents and the environmental impact assessment study.

<u>Building Projects</u>

Design of the Ministry of Finance and its Departments Complex. Geotechnical Specialist. The project is to be located in Khalda / Amman, Jordan on a land area of 47,000 square meters. The Project includes the design and

preparation of tender documents for the Ministry of Finance complex, which is comprised of 6 buildings with a total area of 115,000 m^2.

Design of Schools for the Education Reform for the Knowledge Economy Project in Zarqa and Russeifeh. Detailed design, preparation of tender documents and bill of quantities of 8 schools with an area of 4000 square metres per school. The schools are located in various areas in Zarqa and Russeifeh.

Engicon New Office Building, Amman. Architectural Design for New Engicon Office Building in Jabal Al Weibdeh / Amman, with a built up area of 3500 sq. m and comprising 6 storeys, in addition to office back up during construction phase.

Civil Works for the 400kv Samra Substation. Geotechnical Expert. Design and preparation of construction drawings for all service buildings (Administration Offices Building and Guard House), sub-structure of GIS building with Control and Protection Annex and all external civil works which include boundary walls, cables trenches and ducts, foundation pads for plant and substation equipment, for generator, gantries and open terminal equipment, security fencing and gate, external lighting, rain water drainage (intake and outlet structures, open channels, soak away pits and manholes), underground water reservoir, access road to site and its connection with the main existing highway and all roads and paved areas within the site. Works also included sub-soil investigations, electrical resistivity of the soil in accordance with approved British Standards and preparation of detailed bills of quantities for all civil works as per NEPCO technical specifications.

Highway Projects

Tasks included geological studies, selection of best routes, supervision of geotechnical works and evaluation of subsurface and geotechnical investigations, including stability. Also involved in the supervision of the construction phase in which the tasks included geotechnical consultation.

Design of Salt/Wadi Shuaib Road and Road Connecting Wadi Shuaib to Salt Entrance. The project consists of three components as follows:

1. Upgrading of the existing Salt/Wadi Shuaib Road with a total length 23 km into a 4-lane divided highway.
2. Design of a 10-km 4-lane divided highway from Salt/Wadi Shuaib Road to Salt/Suwaileh Road. Work includes drainage design and preparing final design drawings and tender documents.
3. Preparation of a reconnaissance study to connect Salt/Suwaileh Road with Salt Ring Road.

Study and Design of Safout Underpass.

- Designing an underpass below Amman – Jerash highway connecting West Safout to the eastern part.
- Designing roads to connect the underpass with local existing roads.
- Preparation of tender documents and bills of quantities.
- Follow up all related works such as structural design, hydrology, quantity survey drafting etc.

Study and Evaluation of the Amman Zarqa Highway. The project is composed of three stages for studying and improving the congested Amman-Zarqa highway with a total length of 25 km, starting from Al Nash intersection to the Zarqa Tunnel. The purpose of the study is to evaluate the existing conditions of the road in terms of traffic capacity, existing intersections, existing pavement and street lighting, as well as to evaluate the existing hydraulic structure. The second stage includes proposing improvements to increase the capacity of the highway and to improve the existing geometric elements to be Limited Access Road and to improve the existing intersection. The third stage requires the preparation of detailed design, tender documents and bill of quantities.

Zarqa/Bal'ama/ Irbid Road. Study for upgrading and redesign of Zarqa/Balama/Irbid Road into a 4-lane divided highway with total length of 42 km from Al-Hashimiyah Bridge to Nuaimeh Bridge. The work included survey works, traffic study, hydrology and hydraulic design, intersections and bridges designs, route and profiles designs in addition to designs of concrete structures and

culverts and preparation of bills of quantities and tender documents.

Al-Safi Back Road. The project consisted of two parts:

- Design of 4-lane divided highway with total length of 6 km to provide primary link between Aqaba/Entrance Highway and Existing Aqaba-Safi Road. The work included survey works, traffic study and design of two trumpet infrastructure and channels bridges crossing.
- Design of wadi diversion channels for protection Aqaba city from the flood of Wadi El-Yutum parallel to new highway crossing the existing Aqaba-Safi road and discharges the flood water into outlet basin.

Upgrading of Aqaba Back Road. Redesign and upgrading the existing Aqaba-Back Road into 4-lane divided highway with total length 11 km. The work included survey works geometric design checking the hydraulic structures and preparation of tender documents and detailed drawings.

Karak Qatrana (supervision). The project consists of construction of a 9-km, 4-lane divided highway between Al Karak-Al Qatraneh Road to Karak Industrial City. Supervision of the construction activities, which included 4.7 MCM earthworks and 1 MCM embankment, bituminous pavement layers, bases and culverts, in addition to Al-Daba Wadi Bridge and the embankment over Al-Thania box culverts.

Rama Intersection/Quds Intersection Road. Geological study of the road, supervision of the geotechnical works (sub contract), evaluation of the results and determining the geotechnical parameters needed for the design, in addition to the environmental impact assessment study in the tasks related to geology and hydrogeology. The project consisted of the design 4-lane highway with service roads on both sides, to replace the existing road connecting Rama intersection through Quds intersection, with Sweimeh /Zara road, and designing Wadi Mukhaires Bridge. The work included survey works, Geology and geotechnical study, hydrology and hydraulic design, geometric and intersection design and preparation of tender documents and bill of quantities.

Aqaba Entrance Road-Wadi Yutum Intersection. Supervision on the Aqaba entrance road – Wadi Yutum intersection with total length of 9 kilometres, this road is considered the continuation of the main road that connects Aqaba Port with all Kingdom Governorates and the surrounding countries. The work included earthworks, construction of pavement layers (since the axle-loads are high, cement treated base course has been used), flood protection works, storm water drainage, construction of interchange and a concrete bridge.

Sahab Road and Amman Outer Ring Road Intersection. This intersection is considered one of the dangerous intersections in Easter Amman area, where it connects Zarqa, Amman and the industrial city in Sahab. And since it is located near Amman Customs area, most of the trucks and trailers pass through this intersection. A traffic study has been prepared to cover all traffic coming in and out of this intersection, and according to it several alternatives have been done to separate the traffic manoeuvres taking into consideration the obstructions, land use and acquisition of land which will affect considerably the construction value of the project.

Irbid-North Shuna Highway Section III. Updating the design of a 12-km, 2-lane highway, which was designed by JCE in 1991, to a 4-lane divided highway. The work included detailed survey and geotechnical investigation, geometric design, drainage structures, two interchanges and preparation of tender documents and detailed drawings.

Jarash-Ajloun Road. Preliminary design of a 4-lane, 17-km highway connecting Jerash to Ajlun. The project included site investigation, traffic studies, pavement design, design of at least one interchange and design of drainage structures.

Private Consultancy Assignments (1991 – 2001)

Providing Consultancy Services in the field of geological, geophysical, hydrogeological and Geotechnical investigations for different projects such as dams, roads, landslides and buildings, in addition to Environmental Assessment

studies.

- Gypsum quarry at Mujib area (Envir onmental Impact Assessment), study submitted to the General Corporation for Environment Protection.
- Al-Salt Sewerage Treatment Plant Extension Project, (Geology and instability problems), Study for Arab Center for Geotechnical Studies
- Geological and Geotechnical studies of Al-Khanasiri Dam Site, a study for Rukun Al Handaseh, submitted to Ministry of Agriculture).
- Geological investigation of proposed dams at Wadi Araba (Wadi Rahma, Abu Barqa and Wadi Mousa) a study for Consolidated Consultants.
- Iraq El-Amir W astewater T reatment Plant (Geology , hydrogeology and instability problems), a study w ith Jo rdan University and Remal Consulting Engineering
- Zarqa River Convey ance, a study for Consolidated Consultants and Harza (Geology and ground water regime)
- Geophysical survey "Resistivity In vestigation of Disi-Amman Pipeline corrosion Prohibition Project". This survey was carried out in cooperation with Dr. Z. Al-Isaa. University of Jordan.
- Shortest connection betw een the Shidiyya mine and the existing line (Geologic Study), for Consolidated Consultants.
- Geophysical investigation for several private projects
- Geophysical investigation for tw o lands lides locations along Amman-Jerash Road (a study with Arab Center for Geotechnical Studies)
- Geological evaluation of Al-Rabw a lands lide, a study w ith International Center submitted to Greater Amman Municipality.
- Kaolinitic Clay Exploration – Batn El Ghoul Project, Public Mining Co. (Economic geologic study).
- Economic ge ological stud y o f iron an d he avy min eral de posits at Perp ra, Somaliland, a study for Delta Metal Co.-UAE.

1985 – 1991 **Geotechnical Engineering and Materials Testing Co. - Amman, Jordan**

As Seni or En gineering Ge ologist – Pr ojects Manag er i n char ge of Project management, field drilli ng and sampli ng operation, in-situ testing, loggi ng, laboratory testing and geological, hydrogeological and geotechnical analysis on a variety of projects.

Duties included arranging and organizing geotechnical data in the field and in the office, as well as conduct ing seism ic and electrical resistivit y o peration, installation of geotechnical instrumentation and grouting operations. In addition to the management and execution of anchored - micro piled retain ing systems. The following is a list of projects involved in:

1. Dam s

- Flood Water Potential Study in the Hammad Basin of Jordan (Phases 1&2)
- Geotechnical Investigation of Abu Hifna and Northern Dam Sites
- Geotechnical Investigation of the Karameh Dam Project (Final Stage)
- Reconnaissance Investig ation of five prop osed d am site s in Muji b Ba sin (Nukheila, Mujib, Wala, Rumeil and Suteida Sites)

2. Ro ads

- Investigation of cut & fill sections along Irbid - North Shuna Road (6 km)
- Investigating T haghrat Asfour to Je rash Ro ad Brid ges, C ulverts, cuts and tunnels
- Investigation Wadi Seer to Iraq El Amir Bridges
- Reconnaissance inv estigation stud y of th e S weimeh to Hammamat M a'in Road (6 km)
- Investigating a pre-stressed bridge at Sweimeh - Ghor El Safi Alignment
- Reconnaissance investi gation of W adi Seer to Iraq El Amir Alig nment (3 km)
- Reconnaissance investigation of Deir-Alla to Subaihi Road (5 km)
- Reconnaissance investigation of Algnayeh to Al-Sukhneh Alignment (6 km)
- Reconnaissance investigation of Berain to Al-Mastaba Alignment (6 km)

3. La ndslides

- Site investigation for Na'ur – Dead Sea Road, (Landslide No. 4) - Stage I
- Soil investigation for Na'ur – Dead Sea Road (Landslide No.4) - Stage II

4. **Multi-Storey Buildings, Hangers and Housing Projects**
   Around 1000 sites including different types of buildings, factories and plants, of which are Al-Batra wi H ousing in Z arqa, Alia Township Housi ng in Jiza, Mafraq Development Scheme and UDD Housing in Russifa

5. **Supporti ng Projects**
   Where piling, doweling and anchoring were carried out to support unstab le old buildings, unstable overturned retaining works of which are the following:
   - Wadi Seer Police Station Building and Retaining Wall
   - Madaba Police Station Building
   - The National Orthodox School Retaining Wall
   - Shmeisani Building

6. **Grouting, s upervising a nd performing gro uting operations for the following:**
   - Biomedical Instruments T echnicians Training Institute Building at Al-Hussein Medical City, Amman
   - Dikes (1) & (2) in the Arab Potash Co. to prevent seepage
   - The Hussein Sport City – Amman

1984 – 1985 **Rukun Al-Handassa and Nippon Koei Consulting Eng. - Amman, Jordan**

Supervised a n extens ive ge otechnical inv estigation for Mujib an d T annur Dam Sites (Geotechnical investigation for Mujib and Southern Ghors Irrigation Project - Stage II)

1983 – 1984 **Ali Saker Co. - Amman, Jordan**

Asphalt pla nt mana ger/Material En gineer involved in m anagement an d quality control for construction material.

1979 – 1983 **Natural Resources Authority of Jordan (NRA) - Amman, Jordan**

Geologist inv olved in surface geo logical stud ies (geomorp holigically stratigraphical and structural), determination of raw materials deposits, laboratory testing (sed imentology), sup ervising dr illing and c ore s ampling, lo gging an d correlation of subsurfac e materials, photo-geologic studi es, prep aration of geological mapping and preparation of final reports. The work was performed for the following projects:
- Quartz sandstone of South Jordan
- Clay Deposits of Batn El-Ghoul, South Jordan
- Oil Shale between Hasa and Jurf Eddarawish area
- Geological survey of middle and South Jordan

During his work at NRA, h e particip ated in a two mo nth trainin g course in edementology in the BGR-Hannover, Germany.

Language Ability	*Speak*	*ing*	*Reading*	*Writing*
	Arabic	Excellent Exce	llent	Excellent
	English	Excellent Exce	llent	Excellent

Curriculum Vitae

Proposed Position	Environmental Engineer		
Name of Firm	Engicon		
Name of Staff	Nancy Haitham Haddaden		
Profession	Environmental Engineer		
Date of Birth			
Years with Firm	1	**Nationality**	Jordanian
Membership in Professional Societies	• Jordanian Engineers Association		

Education

2007	Bachelor of Science in Civil Engineering, Water Resources and Environmental Engineering Division), Jordan University of Science & Technology (JUST) Irbid / Jordan

Other Training

- Project Management Awareness Seminar: Project Management Enabler – METHOD
- Training experience: Jordan River Foundation, Community Empowerment Program. 25 June 2006 till 24 August 2006
- Course in Environmental Impact Assessment at Consulting Engineering Center
- Course in AutoCAD at Engineering Training Center
- Big Minds: Series of workshops covering communication skills, creative thinking, problem-solving skills and leadership skills.
- Course in Stress Management

Employment Record

19 Feb 2007 - Present **Engicon, Amman, Jordan**

Environmental Assessment for Construction and Renovation of Schools in Jordan. The program aims to provide by 2008 up to 28 new schools in all governorates of Jordan with approximately 24 classrooms each, immediately benefiting about 18,200 students. The program will also renovate around 100 existing schools throughout the country. In accordance with USAID and national regulations, an environmental assessment was conducted for all these activities. The task activities was as follows: Implementing all required site visits, preparing for scoping sessions, writing Scoping Statement (SS), EA and reports

Feasibility Study , EIA, Preliminary and Final Design of the Amman Ring Road, Phases 2 & 3, Jordan. Feasibility study, environmental impact assessment and preliminary and final design for the western and northern legs of the Amman Ring Road (Phases 2 & 3), with a total length of about 80 km.
Tasks included providing assistance to the partners of Engicon, coordinating meetings, site visits and helping in writing parts of the EA study

Design of Jordan National Financial Centre (JNFCP). The project is located on a plot 14000 sq. m adjacent to the existing Jordan Securities Commission Building in Arjan area, Amman, Jordan. The total built up area is about 73000 m^2. Engicon's services included geotechnical, surveying, traffic and environmental studies, architectural, interior design, landscaping, structural, civil, electrical, mechanical, instrumentations and acoustic design, in addition to preparation of specifications, BOQ and construction tender packages. Task includes preparing TOR, and base-line report and EA

Upgrade of Mafraq Wastewater Treatment Plant. The main objective of the project is to prepare a final design for the upgrading of Mafraq treatment plant based on the concept of low cost/ low technology prepared by another consultant. The project also included updating the environmental assessment, preparation of bidding documents, conducting a host country competitive process to select a construction contractor and supervise the construction work as an optional task. The new treatment plant will have a capacity of 6550 m^3/day and a reuse system. Participated in the scoping session.

Jul. 2007 - Aug. 2007	**Energie Baden Württemberg / EnBw, Stuttgart-Germany: Intern** Joined the team on their daily service operations, visited water pumping stations, main pumping stations, emergency pumping stations, wastewater treatment plant of Stuttgart, and pipe system construction sites. Attended sessions about electrical and mechanical equipments, regular water sample experiments in the laboratory, and an overview of the master plan of the company regarding the distribution of water for Stuttgart.
Sept. 2006 – Feb 2007	**United Nations High Commissioner for Refugees, Jordan: Intern** Translated and edited film content from displaced persons locations in Southern Iraq for production of UNHCR Iraq Operation visibility material; edited and reviewed Situation Report contributions for Protection and Programme Units. American Chamber of Commerce, Jordan: Volunteer business developer Substitute English teacher for children between 2 and 3 years old

Others

<u>Projects carried out at University as an undergraduate</u>

- Graduation Project: Environmental Assessment of the Impacts of Red Sea Dead Sea Canal Project on the Socio-Economic and Archaeological Environments (95%)
- Aquatic Chemistry Project: Effect of the Red Dead Canal on the Composition of the Dead Sea Water (95%)
- Water Resources Project: Climate Change (90%)
- Environmental Engineering Project: Environmental Health / Carcinogens (80%)
- Transportation Engineering Project: Developing Salt City (90%)

Computer Skills	Microsoft Office (Word, Excel and Power Point), Prokon, SMADA , LINDO MINEQL+, AutoCAD			
Language Ability	*Speaking*		*Reading*	*Writing*
	Arabic	Excellent	Excellent	Excellent
	English	Excellent	Excellent	Excellent
	French	Good	Good	Good

APPENDIX B: BIBLIOGRAPHY OF REFERENCES USED

1. Aqaba Special Economic Zone Authority, ASEZA Design Guidelines 2001
2. Department of Statistics, Employment and Unemployment Survey of 2006
3. Department of Statistics, Population and Housing Census of 2004
4. Department of Statistics, Statistical Yearbook, 2005
5. Fielding, R. Learning, Lighting an d Color: Lighting Design for Sch ools an d Universities in the 21 st Century published in the Intern ational Association of Lighting Designers (www.pldplus.com)
6. General Co rporation fo r Environment Protection, Jordan Country Study o n Biological D iversity and Plant Biodiversity and Taxonomy, 2 000, United Nations Environment Programme
7. General Co rporation fo r Environment Protection, Jordan Country Study o n Biological Diversity, 1998
8. Government of Jordan, Air Protection Bylaw for 2005 (No. 28 for 2005)
9. Government of Jordan, Education Law (No. 93 for 1994)
10. Government of Jordan, Environment Protection Law (No. 52 for 2006)
11. Government of Jordan, Environmental Impact Assessment Bylaw for 2005
12. Government of Jordan, Instructions for Noise Prevention for 2003
13. Government of Jordan, Jordanian Building Codes
14. Government of Jordan, Law for Pro tection of Cultural and Heritage Sites (No. 5 for 2002)
15. Government of Jordan, Public Health Law (No. 54 for 2002)
16. Government of Jordan, Regulation for Protection of the Environment in ASEZ (No. 21 for 2001)
17. Government of Jordan, Soil Protection Bylaw (No. 25 for 2005)
18. Government of Jordan, Solid Waste Management Bylaw (No. 27 for 2005)
19. Government of Jordan, Water Authority Law (No. 19 for 1988)
20. Jordan Meteorological Department Website (www.jmd.gov.jo)
21. King Hussein Website (www.kinghussein.gov.jo)

22. Ministry of Education, Aqaba Education Directorate, General Education Situation for 2006/2007

23. Ministry of Health Website (www.moh.gov.jo)

24. Ministry of Tourism & Antiquities Website (www.mota.gov.jo)

25. National Electric Power Company, Annual Report for 2005

26. The 2006 IUCN Red List of Endangered Species Website (www.iucnredlist.org)

27. Water Authority of Jordan, Annual Report for 2005

28. Zuheir S. Amr, "Mammals of Jordan", 2000, United Nations Environment Programme

APPENDIX C: LIST OF ATTENDEES TO SCOPING SESSION

Agency/Organization Name	
Al Balqa' University / Aqaba College	Nedal Al Oran
Al Qweira Secondary Female School	Sara Njadat
Al Qweira Secondary Female School	Tagreed Al Hweiti
Aqaba Education Director	Talal Mohamad Al Bdoor
Aqaba Health Director	Dr. Ibrahim Al Ma'ya'
ASEZA	Eng. Omar Al- Rousan
ASEZA	Dr. Saleem Al Mughrabi
ASEZA Eng.	Khawla Fakhouri
ASEZA	Eng. Iman Al-Khouz
ASEZA	Eng. Osama Hayajneh
ASEZA	Shireen Abu Al Ez
ASEZA / Local Community Development	Karima Al Thabet
ASEZA/Planning Engineer	Eng. Samah Abdel Khaleq
Civil Defence	Mohamad Ameen Al Nawaiseh
Civil Defence	Engineer Faisal Al Shamayleh
Consolidated Consultants (CC)	Ruba Al Khouri
Consolidated Consultants (CC)	Omar Amawi
Education Support Progarmme	Gabi Foead Hallaq
Fatimah Al Zahra' School	Manal Ibrahim Mohamad Al Jaber
General Federation of Jordanian Women/Aqaba Branch	Najat Sameeh Al Hlawi
Headmistress/Fatima Al Zahra' School	Subhiyeh Mohammad Saeed Al Kabariti
Headmistress/Princess Bassma School	Najah Abdel Fattah Ismail
Headmistress/Secondary Eighth School	Kholoud Mahmod Al Esali
Jordan Environment Society	Ghazi Al Amareen
Jordan Environment Society/Aqaba	Baker Mohamad Obeidat
Jordan Society for the Prevention of Roads Accidents	Mohamd Saleem Abu Mousa
Jordan TV	Bassem Abu Hamad
Jordan TV/Local News	Ali Hussien
Jordan TV/Local News	Qassem Al Sayyed

Agency/Organization Name	
Jordan TV/Local News	Yousef Mashaqbeh
Ministry of Education	Eng. Rula Nawaf Jaradat
Ministry of Education	Eng. Maysoun Ahmad Al Hiyari
Ministry of Education Eng.	Jasser Atyeh
Ministry of Education	Monther Al Qaraen
Ministry of Education/Engineering Studies Manager	Eng. Iman Arabiyat
Ministry of Tourism & Antiqities	Ruba Saleem Al Qsous
Parent/Princess Bassma School	Alia Hussien Salman Al Qwiedat
Parent/Secondary Eighth School	Sa'ed Zawaeideh
School Health Supervisor/Aqaba Health Directorate	Dr. Hussein Abdel Kareem Al Dmeissi
Secondary Ayla School	Jehad Khader Abu Ajamyeh
Secondary Ayla School	Ismaeel Kamel Al Sheikh Theeb
Secondary Ayla School for Boys	Ziad Musbah Al Farran
Shrouq Project	Habeeb Ghazaleh
Teacher/Secondary Eighth School for Girls	Fatima Abdel Kareem Al Rawashdeh
That Al Sawari School	Najwa Ahmad Mohamad Harzallah
USAID	Dr. Amal Hijzzi
USAID Dav	id Bruns
USAID	Dr. Issam Omar

APPENDIX D: CORRESPONDENCE

بسم الله الرحمن الرحيم

المملكة الأردنية الهاشمية

وزارة السياحة والآثار

الرقم: 13/14823

التاريخ: 25/6/2007

Mr. Alberto Treves

Project Manager
CDM International Inc.

Fax. 5664178 Amman

Referring to your letter dated , April 12, 2007 concerning the Jordan schools constructions and rehabilitation program ,(building three schools in Aqaba) and if any known archeological resources are found in the area you mentioned in your ref. letter.
I would like to inform you that H.E. the Director General of the Department of Antiquities has informed me that no evidence of any archeological remains show in the site that could delay the work .

Therefore , we do appreciate your cooperation with the Antiquities office in Aqaba during your works .

Best regards .

Osama Dabbas
Minister of Tourism & Antiquities

C.C.;- Antiquities Department
:-Site Management Unit .

Attached are ASEZA's comments on the Environmental Assessment Report for 3 proposed new schools in Aqaba. These schools are the Eighth Secondary Boys' School, the Tenth Secondary Girls' School and Al-Karamah Secondary Girls School.

The issues mentioned in the letter and our response to each issue follow. For clarity, the issues are stated in **bold type**.

1. **All Projects within the Aqaba Special Economic Zone shall be subject to the provision of the regulation for the protection of Environment in ASEZ, Regulation no. 21 – 2001. Accordingly, it should be stated clearly that the environmental clearance shall be issued by ASZA Authority.**

   Reg. 21 for the year 2001of ASEZA for the protection of Environment has been attached in the revised EA - Clearance of ASEZA shall be obtained by MoE.

2. **The CV of the technical expertise conducting the Environmental Impact Assessment EIA study should be included in the modified report that's needs to be submitted to ASEZA for approval.**

   Acknowledged and done.

3. **Assess all aspects related to the laboratories including but not restricted to chemical handling, storing and disposal, safety, firefighting, etc…**

   Acknowledged and incorporated in the revised EA.

سلطة منطقة العقبة الإقتصادية الخاصة
AQABA SPECIAL ECONOMIC ZONE AUTHORITY

Ref: EB/15881/8437 الرقم: .....

Date: 22/10/2007 التاريخ: .....

Dated: ..... الموافق: .....

Mr. David Burns
Acting director,
Social sectors Office, USAID

Subject: Environmental Assessment Draft Report for Jordan School Construction and Rehabilitation Program, Phase-1 Aqaba Schools

Dear Mr. Burns,

Reference is made to your letter bearing no number dated September 30, 2007 regarding the above-mentioned subject.

We would like to inform you that the submitted draft EIA report is accepted however you to take the cited below notes into consideration while preparing the modified Environmental Impact Statement Report.

1. All projects within the Aqaba Special Economic Zone (ASEZ) shall be subject to the provision of the regulation for the protection of Environment in ASEZ, Regulation no 21 for the year 2001. Accordingly, it should be stated clearly that the environmental clearance shall be issued by ASEZA Authority (ASEZA).

2. The Curriculum Vitae (CV) of the technical expertise conducting the Environmental Impact Assessment (EIA) study should be included in the Modified Report that's needs to be submitted to ASEZA for approval.

3. Assess all aspects related to the laboratories including but not restricted to chemical handling, storing and disposal, safety , firefighting, etc.....

We emphasize that this letter represents in no way an environmental clearance for your project.

Yours Sincerely,

Dr. Bilal Al-Bashir

Deputy Chief Commissioner / Commissioner for Environment

ص.ب ٢٥٦٥ العقبة ٧٧١١٠ الأردن تلفون ٠٠٠٩١٠٢٠٩ ٢ ٩٦٢+ فاكس ٠٥٦٩١٠٢٠٩ ٢ ٩٦٢+
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URL : www.aqabazone.com E-mail: info@aseza.jo

THE HASHEMITE KINGDOM
OF JORDAN
MINISTRY OF EDUCATION

المملكة الأردنية الهاشمية
وزارة التربية والتعليم

51965

Ref. No. USAID – 278 – C
Date 16/10/2007

الرقم .....
التاريخ .....
الموافق .....

Att : Mr . David Burns .
Acting Director ,
Social Sectors Office , USAID / JORDAN .

Subject : Environmental Assessment Draft Report for the Jordan Schools Construction and Rehabilitation Program , Phase- 1 , Aqaba Schools

Dear Mr. David ,

In reference to your letter dated 30/09/2007 , concerning the above mentioned project , we would like to inform you that the Environmental Assessment Draft Report has been reviewed and the Ministry Of Education approved it . Consequently , the Ministry Of Education would like to assure that Jordan Schools Project Team will design and construct the schools according to the measures which have been developed in the report .

Best Regards ,

Minister Of Education

Att: Eng. Sana' Batarseh

هاتف: ٥٦٠٧١٨١ / ١١ فاكس: ٥٦٦٦٠١٩ ص.ب: (١٦٤٦)

Attached are the Ministry of Environment's comments on the Environmental Assessment Report for 3 proposed new schools in Aqaba. These schools are the Eighth Secondary Boys' School, the Tenth Secondary Girls' School and Al-Karamah Secondary Girls School.

The issues mentioned in the letter and our response to each issue follow. For clarity, the issues are stated in **bold type**.

1. **An Arabic summary of the report is to be provided**

   All our produced reports and deliverables shall be in English per our contract with USAID.

2. **The noise impact on students from surroundings and the noise impacts generated by schools on the neighbors during the operation phase.**

   Noise is an important issue in the design of schools. The proposed designs address noise within the learning environment in some key ways. First, the sound transmission between classrooms will be largely abated because of the qualities of the typical wall assembly. Walls will typical rise to the underside of the slab above, and are of solid construction. The next typical source of objectionable noise within the classroom is mechanical equipment. Again, the system selection process took into consideration acoustical issues. The results should provide a classroom environment with good speech intelligibility; we have adhered to the Jordanian Noise Prevention Instructions 2007.

3. **The recent version of Instructions for Noise Prevention has been issued in 2007.**

   Acknowledged.

4. **The impact of chalk dust inside classrooms is to be noticed and mitigated.**

   This issue was discussed with the Ministry of Education in the planning phase. The ministry has expressed a preference for chalk on chalkboards over markers on marker boards due to the unbudgeted operational cost of the markers as a consumable supply. In light of this fact, frequent cleaning of chalk dust will be important to avoid its build-up in the classroom.

بسم الله الرحمن الرحيم

THE HASHEMITE KINGDOM OF JORDAN

Ministry of Environment

AMMAN

المملكة الأردنية الهاشمية

وزارة البيئة

عمان

المملكة الأردنية الهاشمية

الرقم .....

التاريخ .....

الموافق .....

Ref. : 4.7.5981

Date : 11.10.2007

Mr. David Bruns
Acting Director,
Social Sectors Office
USAID – Jordan

Subject: Comments on Environmental Assessment Draft Report for Jordan School Construction and Rehabilitation Program, Phase -1Aqaba Schools.

Dear Mr. Bruns,

Please find below our comments on the above mentioned report:

1. An Arabic summary of the report is to be provided.
2. The noise impact on students from surroundings and the noise impacts generated by schools on the neighbors during the operation phase is to be assessed and mitigated.
3. The recent version of Instructions for Noise Prevention has been issued in 2007.
4. Dust impact of using unsuitable chalks inside classrooms is to be noticed and mitigated.

I look forward to an increased cooperation between our agencies. Meanwhile, please accept my best regards.

Sincerely,

Khaled Anis Irani

Minister of Environment

هاتف ٥٥٦٠١١٣ - فاكس ٥٥٦٠٢٨٨ - ص.ب ١٤٠٨ عمان - ١١٩٤١ - الأردن
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E-mail: moenv@moenv.gov.jo
Web site : www.moenv.gov.jo

قرار رقم ٣/ ٢٠٠٧

APPENDIX E: REGULATION FOR PROTECTION OF THE ENVIRONMENT IN ASEZ (NO. 21 FOR 2001)