資　料　編

資料１．調査団員氏名、所属

第１回現地　準備調査

団員名	分野	所属
森　　尚樹	総括	JICA 地球環境部　　次長
青木　一誠	計画管理	同部　環境管理第二課　職員
松岡　慶二	業務主任／下水道計画／環境社会配慮	（株）エヌジェーエス・コンサルタンツ
渡部　　隆	下水処理施設計画・設計	（株）エヌジェーエス・コンサルタンツ
近田　泰章	下水管敷設計画・設計	（株）エヌジェーエス・コンサルタンツ
夏井　明生	電気設備計画・設計	（株）エヌジェーエス・コンサルタンツ
中村　一彦	積算/調達/施工計画	（株）エヌジェーエス・コンサルタンツ

第２回現地　準備調査

団員名	分野	所属
松岡　慶二	業務主任／下水道計画／環境社会配慮	（株）エヌジェーエス・コンサルタンツ
渡部　　隆	下水処理施設計画・設計	（株）エヌジェーエス・コンサルタンツ
近田　泰章	下水管敷設計画・設計	（株）エヌジェーエス・コンサルタンツ
夏井　明生	電気設備計画・設計	（株）エヌジェーエス・コンサルタンツ
中村　一彦	積算/調達/施工計画	（株）エヌジェーエス・コンサルタンツ

第３回現地　DFR 報告

団員名	分野	所属
田中　　泉	総括	JICA　パレスチナ事務所　所長
青木　一誠	計画管理	JICA　地球環境部　環境管理第二課　職員
松岡　慶二	業務主任／下水道計画／環境社会配慮	（株）エヌジェーエス・コンサルタンツ
中村　一彦	積算/調達/施工計画	（株）エヌジェーエス・コンサルタンツ

資料 2．調査工程
第１回現地　準備調査

ＪＩＣＡ団員		コンサルタント団員				
総括	計画管理	業務主任	処理施設	管路施設	積算･調達	電気設備
		成田発・イスタンブール経由移動				
成田発・パリ経由移動		ラマラ着、調査準備				
ラマラにてPWAのミーティング出席（官団員未明着）						
ジェリコ訪問、ジェリコ市との会議・現地視察						
農業省訪問、アルビーレ処理場視察、ラマラ日本公使館訪問						
日本大使館・JICA事務所訪問・出国移動		ジェリコ入りし調査開始、事務所準備、ジェリコ市協議				
帰国		予定地詳細踏査、報告書作成				
		予定地詳細踏査、ジェリコ市協議、資料収集				
		ナブロス訪問	収集資料整理	ナブロス訪問	収集資料整理	出国移動
		担当分野調査				帰国
		同上				
		同上				
		ジェリコ市との打ち合わせ、担当分野調査				
		担当分野調査				
		同上・団内会議				
		PWAとの協議資料作成	担当分野調査			
			担当分野調査			
		PWA本部にPWA担当者との会議：計画内容の説明				
		担当分野調査				
		担当分野調査	出国移動	担当分野調査	出国移動	
		処理場用地視察	帰国	処理場用地視察	帰国	
		平面計画見直し		平面計画見直し		
		同上		同上		
		協議準備		協議準備		
		PWA/ｼﾞｪﾘｺ市協議		PWA/ｼﾞｪﾘｺ市協議		
		担当分野調査		担当分野調査		
		ラマラにてテレビ会議		ラマラにてテレビ会議		
		大使館報告・JICA報告		大使館報告・JICA報告		
		出国移動		出国移動		
		帰国		帰国		

第２回現地　準備調査

工程	日程	曜日	コンサルタント団員				
			業務主任	処理施設	管路施設	積算･調達	電気設備
1	1/30	日	成田発・パリ経由移動				
2	1/31	月	ジェリコ着、ジェリコ市挨拶調査開始				
3	2/1	火	担当分野調査				
4	2/2	水	担当分野調査				
5	2/3	木	PWAとの協議、計画内容の説明、環境専門家との協議				
6	2/4	金	担当分野調査				
7	2/5	土	担当分野調査				
8	2/6	日	収集資料整理、団内会議				
9	2/7	月	担当分野調査				
10	2/8	火	担当分野調査				
11	2/9	水	担当分野調査				成田発・パリ経由移動
12	2/10	木	担当分野調査				ジェリコ市着電力会社協議
13	2/11	金	担当分野調査・ボーリング調査開始するも機械交換の必要				
14	2/12	土	担当分野調査				
15	2/13	日	収集資料整理、団内会議				
16	2/14	月	担当分野調査				
17	2/15	火	担当分野調査				
18	2/16	水	担当分野調査、ボーリング再開、汚水サンプリング立ち会い				
19	2/17	木	担当分野調査、ボーリング立ち会い、汚水サンプリング立ち会い				
20	2/18	金	担当分野調査、ボーリング立ち会い				
21	2/19	土	担当分野調査、ボーリング立ち会い				
22	2/20	日	担当分野調査、ボーリング立ち会い（この日終了）				
23	2/21	月	担当分野調査・事業費見直し分送付				
24	2/22	火	担当分野調査				
25	2/23	水	担当分野調査				
26	2/24	木	担当分野調査				
27	2/25	金	担当分野調査				
28	2/26	土	担当分野調査・団内会議、インターコンチネンタルホテル訪問				
29	2/27	日	収集資料整理		出国移動	収集資料整理	出国移動
30	2/28	月	E/N、GA立会い	担当分野調査	帰国	担当分野調査	帰国
31	3/1	火	PWA協議資料作成	担当分野調査		担当分野調査	
32	3/2	水	同上	同上		同上	
33	3/3	木	PWAとの協議：計画内容の説明			PWAとの協議：計画内容の説明	
34	3/4	金	担当分野調査			担当分野調査	
35	3/5	土	ジェリコ市協議			ジェリコ市協議	
36	3/6	日	団内会議			団内会議	
37	3/7	月	環境ﾐｰﾃｨﾝｸﾞ出席			環境ﾐｰﾃｨﾝｸﾞ出席	
38	3/8	火	帰国報告会資料作成	担当分野調査		担当分野調査	
39	3/9	水	大使館・ＪＩＣＡ報告・出国移動			大使館・ＪＩＣＡ報告・出国移動	
40	3/10	木	帰国			帰国	

第３回現地　DFR 説明

工程	日程	曜日	JICA団員		コンサルタント団員	
			総括	計画管理	業務主任	積算･調達
1	7/5	火	成田/中部発・インチョン経由移動、ラマラ泊			
2	7/6	水	PWA、ジェリコ市、PIEFZAおよびMoFとの協議、ミニッツ説明、報告書のアウトラインの説明、質疑			
3	7/7	木	PWA他との協議、計画内容の追加説明、ミニッツ最終化、サイン			
4	7/8	金	日本大使館訪問、調査内容、協議について説明			
5	7/9	土		資料整理	ジェリコ訪問、現地追加調査	
6	7/10	日		PWA、ジェリコ市と協議、アルビーレ市･MDLF訪問		
7	7/11	月		ナブルス市訪問、GIZ訪問		
8	7/12	火		PIEFZA訪問、JICA報告、帰国出発		
9	7/13	水		機内インチョン経由成田/中部着		

資料 3.関係者（面会者）リスト

第1回現地　準備調査

所属	氏名	職位	備考
パレスチナ水公社 Palestinial Water Authority (PWA)	Dr. Shaddad Al Attili	Minister	
	Mr. Nael Tahseen	Project Manager	
	Mr.Adel Yashin	Director/WW	
	Ms. Beesan Osama	MSc. Engineer	
ジェリコ市　Jericho Municipality	Mr Hassen Saleh	Mayor	
	Mr.Basel Hijaji	Head of Engineering Department	
	Mr. Jalal Bsharat	Engineer of water supply	
	Mr. Ibrahim Abu Seiba	Enigineer for enigineering Department	
在イスラエル日本大使館	山本　英昭	パレスチナ日本副代表	
	高橋　紀之	二等書記官	
JICA　パレスチナ事務所	田中　泉	所長	
	向井　直人	次長	
	久保　英士	所員	
	Dr Abdel Nasser Makky	Project Coodinatror	
アルビーレ処理場 Al-Bireh WWTP	Ms. Lamia Hamayel	Waste Water Engineer	
ナブルス市　Nablus Municipality	Eng. Adly R. Yaish	Mayor	
	Dr. Hafez Q. Shaheen	Deputy Mayor for Planning & Technical Affairs	
	Eng. Salah A. Rahman Shaikha	Water Supply & Sanitation Engineer	

第2回現地　準備調査

所属	氏名	職位	備考
パレスチナ水公社 Palestinial Water Authority (PWA)	Dr. Shaddad Al Attili	Minister	
	Mr. Nael Tahseen	Project Manager	
	Ms. Beesan Osama	MSc. Engineer	
ジェリコ市　Jericho Municipality	Mr Hassen Saleh	Mayor	
	Mr.Basel Hijaji	Head of Engineering Department	
	Mr. Jalal Bsharat	Engineer of water supply	
	Mr. Ibrahim Abu Seiba	Enigineer for enigineering Department	
在イスラエル日本大使館	山本　英昭	パレスチナ日本副代表	
	高橋　紀之	二等書記官	
JICA　パレスチナ事務所	田中　泉	所長	
	向井　直人	次長	
	久保　英士	所員	
	Dr Abdel Nasser Makky	Project Coodinatror	

第3回現地　DFR 報告

所属	氏名	職位	備考
パレスチナ水公社 Palestinial Water Authority (PWA)	Dr. Shaddad Al Attili	Minister	
	Mr. Nael Tahseen	Project Manager	
	Mr.Adel Yashin	Director/WW	
	Ms. Beesan Osama	MSc. Engineer	
ジェリコ市　Jericho Municipality	Mr.Basel Hijaji	Head of Engineering Department	
在イスラエル日本大使館	山本　英昭	パレスチナ日本副代表	
	高橋　紀之	二等書記官	
JICA　パレスチナ事務所	田中　泉	所長	
	久保　英士	所員	
	Dr Abdel Nasser Makky	Project Coodinatror	
アルビーレ市 Al-Bireh Municipality	Eng.Musa Jwayyed Ms. Lamia Hamayel	City Engineer Waste Water Engineer	
地方開発借款基金 Municipal Development & Lending Fund	Mr.Abdel Mugbni Nofal	Director General	
ナブルス市 Nablus Municipality	Eng.Suleiman Saed Abu Chosh	Msc. Environmental Engineering Corperate Planner	
GIZ　ラマラ事務所	Mr. Nadim Mulhem Mr. Ramez EL-Titi	Head of Water Programme Project adviser for Water Programme	
PIEFZA:Palestinian Industrial Estates & Free Zones Authrity	Eng. Alaa Melhim Mr. Takeo Matsuzawa Eng. Mohammed Thekri	JAIP Project Director Chief Advisor PM of Bethlehem Industrial Estate	

資料４．協議議事録

4-1 第１回現地調査時 M/M：A-6～A-27

4-2 第 3 回現地 DFR 報告時　M/M: A-28～A-60

資料 4-1　第１回現地調査時の JICA と PWA の M/M

MINUTES OF MEETING
BETWEEN
JAPANESE PREPARATORY SURVEY TEAM
AND
THE PALESTINIAN WATER AUTHORITY
ON
THE JERICHO WASTEWATER COLLECTION, TREATMENT SYSTEM
AND REUSE PROJECT

In response to the request from the Palestinian Authority (hereinafter referred to as "PA"), the Government of Japan decided to conduct the Preparatory Survey of the Project for Jericho Wastewater Collection, Treatment System and Reuse Project (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (hereinafter referred to as "JICA") .

JICA implemented the Preparatory Survey (Pre F/S and F/S) from July to August 2010. JICA confirmed that conditions which were stipulated in the Minutes of Meeting between the Palestinian Water Authority (hereinafter referred to as "PWA") and JICA signed on 8th August 2010 have been achieved by the Palestinian side to move forward to further study.

JICA sent the Preparatory Survey (Basic Design) Team (hereinafter referred to as "the Team") to the West Bank, which is headed by Mr. Naoki Mori, Deputy Director General, Global Environment Department, JICA, and is scheduled to stay in the country from 13th December 2010 to 16th December 2010.

The Team held discussions with the officials concerned of the Palestinian side and conducted field surveys in the study area.

In the course of discussions and field surveys, both parties have confirmed the outline and schedule of the survey, Japan's Grand Aid Scheme, necessary actions to be taken by the Palestinian side and so forth which are described in the attachment of this minutes of meeting.

Ramallah, 13th January, 2011

Mr. Naoto Mukai
Senior Representative
JICA Palestine Office
Japan International Cooperation Agency

Minister Dr. Shaddad Al Attili
Head of
Palestinian Water Authority

Dr. Estephan Salameh
Special Advisor to the Minister
Ministry of Planning & Administrative
Development

ATTACHMENT

1. Outline of the Project

1-1. The outline of the Project will be analyzed and agreed with both sides through the Preparatory Survey. Findings through the Pre F/S and F/S are utilized for the Basic Design.

1-2. Final decision of the outline of the Project will be determined by the Government of Japan.

2. Outline of the Preparatory Survey (Basic Design) (hereinafter referred to as "the Survey")

2-1. Overall schedule of the Survey is attached as Annex -1.

2-2. The Survey is divided into two phases as the Basic Design 1 (B/D 1) and the Basic Design 2 (B/D 2).

2-3. The Team will analyze and finalize the scope of the Project in B/D 1. In this process, target area and other critical issues of the Project will be re-examined and cost estimation will be carried out through B/D 1. B/D 1 will be completed by around early January, 2011

2-5. Through B/D 1, JICA will make a report on the Project to the government of Japan for its appraisal. Before a submission of the report, the Project scope should be finalized and mutually agreed between the Palestinian side and JICA.

2-6. Upon the submission of the report, the government of Japan will make an appraisal of the Project. Following this, the Team will implement B/D 2 for further study, such as land survey, environmental and social consideration, detailed cost estimation and so forth.

2-7. Draft report of B/D 2 will be ready in June 2011, and then JICA will explain it to the Palestinian side

2-8. Final report of the Survey will be submitted in August 2011.

3. Main Contents of B/D 1

3-1. To finalize the scope of the Project, following items in particular should be re-examined and mutually agreed between the Palestinian side and JICA.

1) Target service area
2) Target service population
3) Design sewage rate
4) Sewerage facilities including sewer pipeline network, sewage treatment plant
5) Cost estimation
6) Reuse of treated sewage

3-2 JICA will make a report for the government of Japan.

4. Main Contents of B/D 2

4-1. Based on the scope of the Project which is finalized through B/D 1, further survey such as following items will be carried out.

1) Drawings of sewerage facilities
2) Natural condition survey

ES SA

3) Social condition survey
4) Environmental and Social consideration
5) Procurement planning

5. Japan's Grant Aid Scheme

5-1. The Palestinian side understands the Japan's Grant Aid Scheme explained by the Team, as described in the Inception Report. The Inception Report is attached as Annex-2.

5-2. The Palestinian side will take the necessary measures, as described in the Inception Report, for smooth implementation of the Project, as a condition for the Japanese Grant Aid to be implemented.

5-3. JICA will advise the Palestinian side if there are any other undertakings based on the result of this study.

6. Other Relevant Issues

6-1. JICA explained that it is difficult to cover cost of implementation for all areas, population and sewerage facilities including sewer pipelines which were proposed in the Pre F/S and the F/S. JICA reiterated that financial contribution from the Palestinian side is indispensable for successful implementation of the Project and the Palestinian side agreed on their necessary financial contribution to the Project.

6-2. JICA confirmed the status of achievement of the conditions which are stipulated in the Minutes of Meeting between the PWA and JICA signed on 7th February 2010.

6-3 JICA reiterated that those conditions should be achieved in accordance with the road map as stipulated in the Minutes of Meeting between PWA and JICA signed on 8th August 2010.

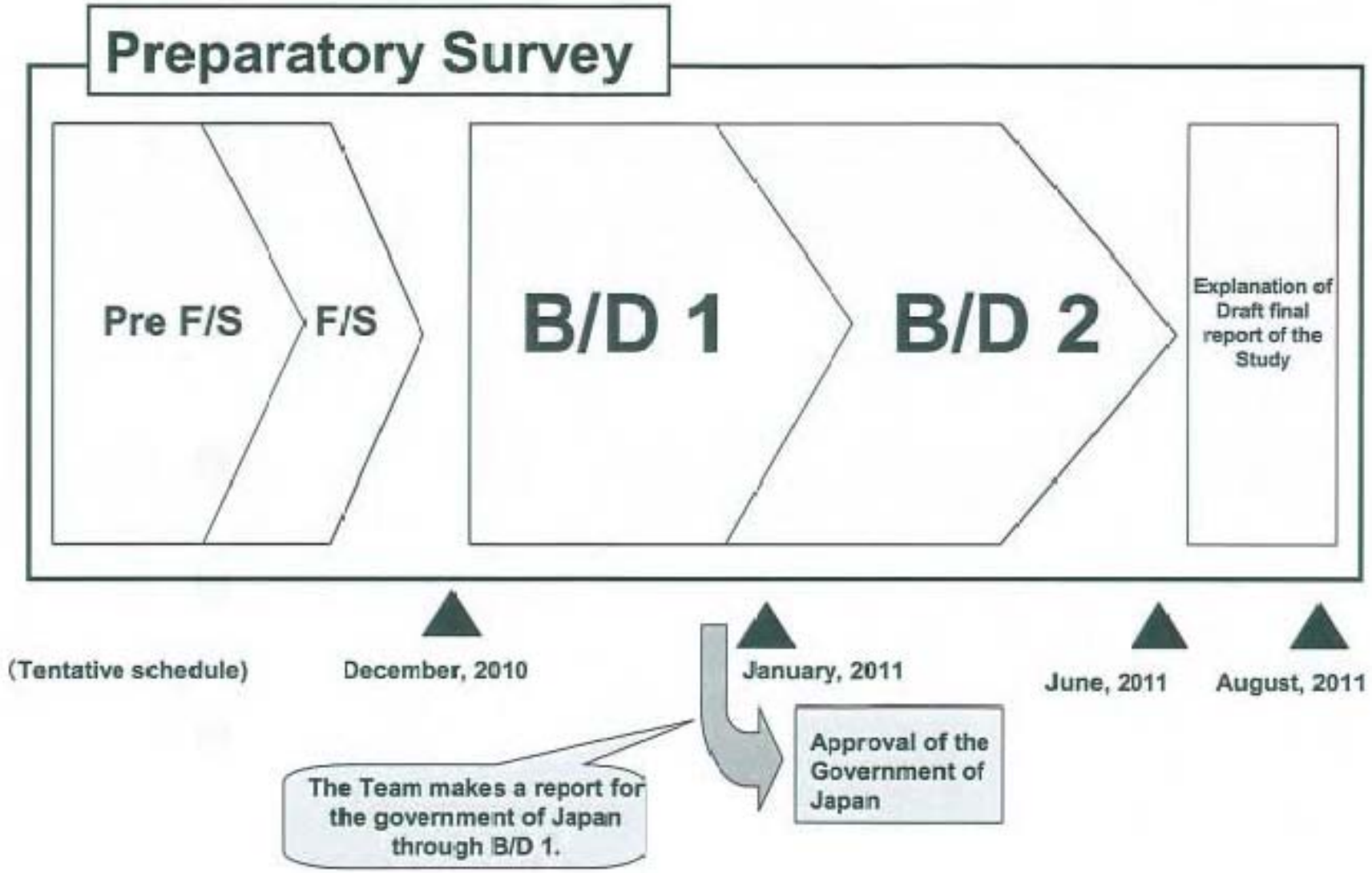
6-4. The current status of achievements is shown in the road map attached hereto. The road map is attached as Annex-3.

6-5. JICA confirmed with PWA that PWA should confirm with the Israeli side on the effluent quality through Joint Water Committee during the Survey.

6-6. Relevant Palestinian authorities are requested to assist the Team for the smooth implementation of the Survey as stipulated in the Inception Report, section 3.5.

Annex-1: Overall Schedule of the Survey
Annex-2: Inception Report
Annex-3: Road Map

Annex-1


Preparatory Survey
Pre F/S
F/S
B/D 1
B/D 2
Explanation of Draft final report of the Study
(Tentative schedule)
December, 2010
January, 2011
June, 2011
August, 2011
The Team makes a report for the government of Japan through B/D 1.
Approval of the Government of Japan

Annex-2

The Palestine Water Authority
Jericho Municipality

THE PREPARATORY SURVEY (BASIC DESIGN) ON THE JERICHO WASTEWATER COLLECTION, TREATMENT SYSTEM AND REUSE PROJECT

INCEPTION REPORT

December 2010

Prepared by

THE PREPARATORY STUDY TEAM

JAPAN INTERNATIONAL COOPERATION AGENCY

Inception Report for the Preparatory Study (Basic Design) on the Jericho Wastewater Collection, Treatment System and Reuse Project

Table of Contents

ES SA

1. Introduction

In response to a request from the Palestinian Authority (hereinafter referred to as "PA"), the Government of Japan (hereinafter referred to as "GOJ") decided to conduct the Preparatory Survey on the Jericho Wastewater Collection, Treatment System and Reuse (hereinafter referred to as "the Study") and entrusted it to the Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent the Preparatory Survey Team (hereinafter referred to as "the Team"), headed by Mr. Naoki MORI, Deputy Director General, Environmental Management Group, Global Environment Department, JICA.

This inception report has been prepared to explain Japan's Grand Aid scheme, the characteristics of the Preparatory Survey (Basic Design), objectives and methods of the Survey, and to confirm mutual understandings regarding basic items of the Project.

2. Japan's Grant Aid

2.1 Japan's Grant Aid Scheme

The Grant Aid is non-reimbursable fund provided to a recipient country to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for its economic and social development in accordance with the relevant laws and regulations of Japan. The Grant Aid is not supplied through the donation of materials as such.

2.1.1 Grant Aid Procedures

The Japanese Grant Aid is supplied through following procedures :

·Preparatory Survey

- The Survey conducted by JICA

·Appraisal &Approval

-Appraisal by the GOJ and JICA, and Approval by the Japanese Cabinet

·Authority for Determining Implementation

-The Notes exchanged between the GOJ and a recipient country

·Grant Agreement (hereinafter referred to as "the G/A")

-Agreement concluded between JICA and a recipient country

·Implementation

-Implementation of the Project on the basis of the G/A

2.1.2 Preparatory Survey

(1) Contents of the Study

The aim of the preparatory Survey is to provide a basic document necessary for the appraisal of the Project made by the GOJ and JICA. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of relevant agencies of the recipient country necessary for the implementation of the Project.
- Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, financial, social and economic point of view.
- Confirmation of items agreed between both parties concerning the basic concept of the Project.
- Preparation of a outline design of the Project.

ES SA

- Estimation of costs of the Project.

The contents of the original request by the recipient country are not necessarily approved in their initial form as the contents of the Grant Aid project. The Outline Design of the Project is confirmed based on the guidelines of the Japan's Grant Aid scheme.

JICA requests the Government of the recipient country to take whatever measures necessary to achieve its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization of the recipient country which actually implements the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country based on the Minutes of Discussions.

(2) Selection of Consultants

For smooth implementation of the Survey, JICA employs (a) registered consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

(3) Result of the Survey

JICA reviews the Report on the results of the Survey and recommends the GOJ to appraise the implementation of the Project after confirming the appropriateness of the Project.

2.1.3 Japan's Grant Aid Scheme

(1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the Exchange of Notes(hereinafter referred to as "the E/N") will be singed between the GOJ and the Government of the recipient country to make a pledge for assistance, which is followed by the conclusion of the G/A between JICA and the Government of the recipient country to define the necessary articles to implement the Project, such as payment conditions, responsibilities of the Government of the recipient country, and procurement conditions.

(2) Selection of Consultants

In order to maintain technical consistency, the consulting firm(s) which conducted the Survey will be recommended by JICA to the recipient country to continue to work on the Project's implementation after the E/N and G/A.

(3) Eligible source country

Under the Japanese Grant Aid, in principle, Japanese products and services including

ES SA

transport or those of the recipient country are to be purchased. When JICA and the Government of the recipient country or its designated authority deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm are limited to "Japanese nationals".

(4) Necessity of "Verification"

The Government of the recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by JICA. This "Verification" is deemed necessary to fulfill accountability to Japanese taxpayers.

(5) Major undertakings to be taken by the Government of the Recipient Country

In the implementation of the Grant Aid Project, the recipient country is required to undertake such necessary measures as Annex.

(6) "Proper Use"

The Government of the recipient country is required to maintain and use properly and effectively the facilities constructed and the equipment purchased under the Grant Aid, to assign staff necessary for this operation and maintenance and to bear all the expenses other than those covered by the Grant Aid.

(7) "Export and Re-export"

The products purchased under the Grant Aid should not be exported or re-exported from the recipient country.

(8) Banking Arrangements (B/A)

a) The Government of the recipient country or its designated authority should open an account under the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"). JICA will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.

b) The payments will be made when payment requests are presented by the Bank to JICA under an Authorization to Pay (A/P) issued by the Government of the recipient country or its designated authority.

ES SA

(9) Authorization to Pay (A/P)

The Government of the recipient country should bear an advising commission of an Authorization to Pay and payment commissions paid to the Bank.

(10) Social and Environmental Considerations

A recipient country must carefully consider social and environmental impacts by the Project and must comply with the environmental regulations of the recipient country and JICA socio-environmental guidelines.

2.2 Grant Aid Procedures

Following Table 2.1 shows "MAJOR UNDERTAKINGS TO BE TAKEN BY EACH GOVERNMENT" and Figure 2.1 indicates "FLOW CHART OF JAPAN'S GRANT AID PROCEDURES", respectively. In this project

ES SA

Table 2.1 Major Undertakings to be Taken by Each Government

Annex-3

No.	Items	To be covered by Grant Aid	To be covered by Recipient Side
1	to secure [a lot] /[lots] of land necessary for the implementation of the Project and to clear the [site]/[sites];		●
2	To construct the following facilities		
	1) The building	●	
	2) The gates and fences in and around the site		●
	3) The parking lot	●	
	4) The road within the site	●	
	5) The road outside the site		●
3	To provide facilities for distribution of electricity, water supply and drainage and other incidental facilities necessary for the implementation of the Project outside the [site]/[sites]		
	1) Electricity		
	a. The distributing power line to the site		●
	b. The drop wiring and internal wiring within the site	●	
	c. The main circuit breaker and transformer	●	
	2) Water Supply		
	a. The city water distribution main to the site		●
	b. The supply system within the site (receiving and elevated tanks)	●	
	3) Drainage		
	a. The city drainage main (for storm sewer and others to the site)		●
	b. The drainage system (for toilet sewer, common waste, storm drainage and others) within the site	●	
	4) Gas Supply		
	The gas supply system within the site	●	
	5) Telephone System		
	a. The telephone trunk line to the main distribution frame/panel (MDF) of the building		●
	b. The MDF and the extension after the frame/panel	●	
	6) Furniture and Equipment		
	a. General furniture		●
	b. Project equipment	●	
4	To ensure prompt unloading and customs clearance of the products at ports of disembarkation in the recipient country and to assist internal transportation of the products		
	1) Marine (Air) transportation of the Products from Japan to the recipient country	●	
	2) Tax exemption and custom clearance of the Products at the port of disembarkation		●
	3) Internal transportation from the port of disembarkation to the project site		●
5	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the purchase of the products and the services be exempted		●
6	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		●
7	To ensure that the Facilities be maintained and used properly and effectively for the implementation of the Project		●
8	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project		●
9	To bear the following commissions paid to the Japanese bank for banking services based upon the B/A		
	1) Advising commission of A/P		●
	2) Payment commission		●
10	To give due environmental and social consideration in the implementation of the Project.		●

(B/A : Banking Arrangement, A/P : Authorization to pay)

ES SA

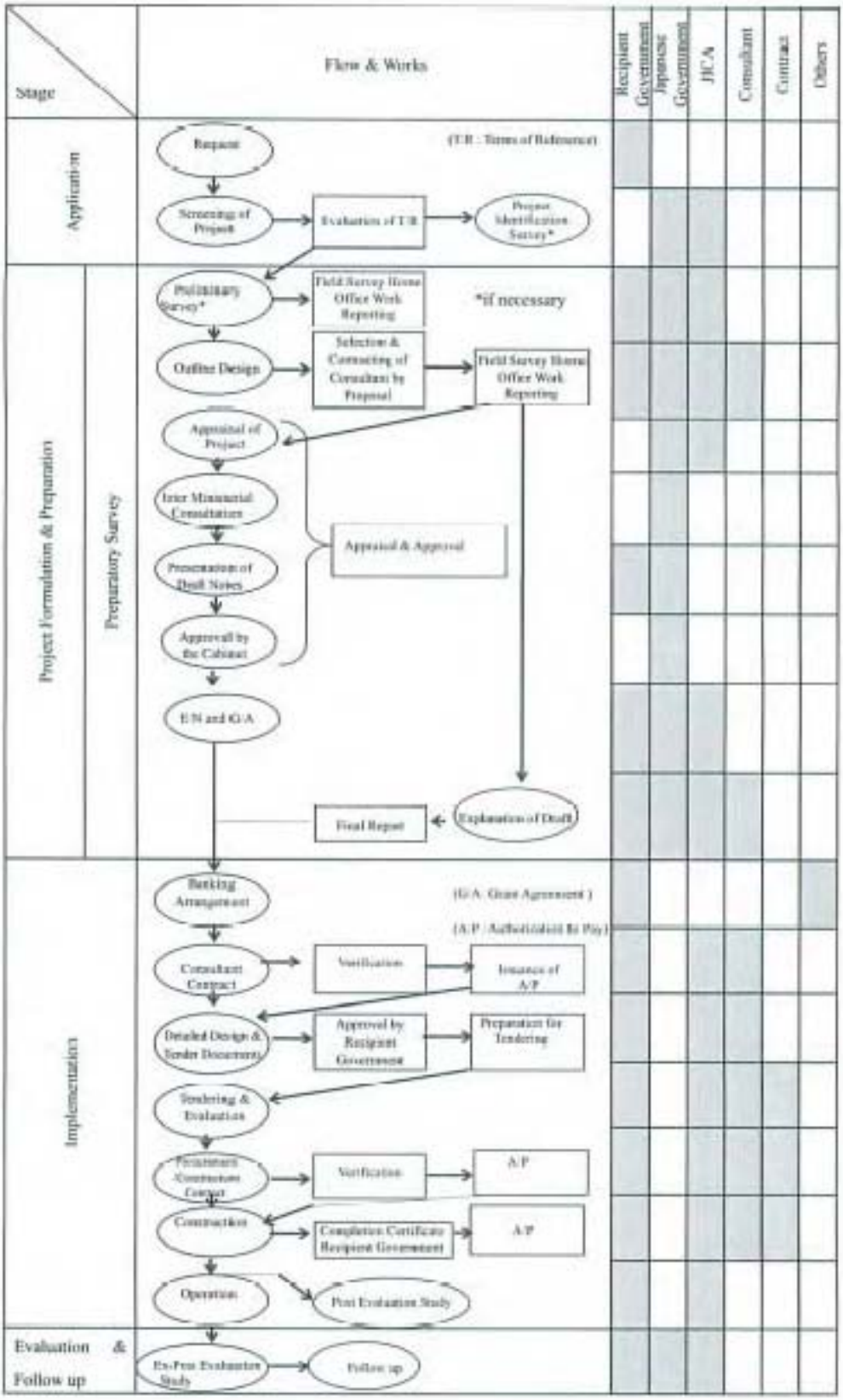


Figure 2.1 Flow Chart of Japan's Grant Aid Procedures for the Project

ES SA

3. Implementation of the Survey

3.1 Status of the Survey

The Study investigates the background, purpose, project benefits of the contents of the request from the Palestinian Authority and sector's O&M capacity needed for project implementation to verify their relevancy from technical and socio-economical viewpoint.

Through discussion with relevant authorities, basic concept of the project is mutually confirmed to conduct basic design and project implementation plan.

The aims of the Survey are to collect the basic materials for decision-making for the Japanese Government to approve the implementation of this project by Japan's Grant Aid Scheme.

3.2 Study Schedule

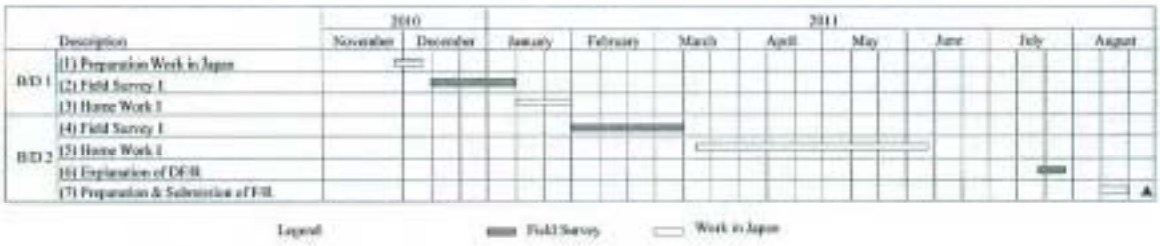


Figure 3.2 Tentative Schedule of Basic Design Study

3.3 Member of the Team

Table 3.1 Member of the Team

Name	Position	Organization
Mr. N. Mori	Team Leader of the Study Team	JICA
Mr. I. Aoki	Planning Management	
Mr. K. Matsuoka	Leader of the Consultant Team/Sewerage System Planning/ Environmental and Social Consideration	NJS Consultants Co., Ltd
Mr. T. Watanabe	Sewage Treatment Facility Planning/Design	
Mr. Y. Konda	Sewer Pipeline Planning/Design	
Mr. K. Nakamura	Cost Estimation/Procurement Planning/Construction Planning	
Mr. A. Natsui	Electric Equipment Planning	

ES SA

3.4 Proposed Itinerary of the Team

Table 3.2 Proposed Itinerary of the Team

No.	Date		Activities	Member						
				N. Mori	I. Aoki	K. Matsuoka	T. Watanabe	Y. Kondo	K. Nakamura	A. Natsui
1	11-Dec	Sat	Move			○	○	○	○	○
2	12-Dec	Sun	Preparation in Ramallah			○	○	○	○	○
3	13-Dec	Mon	Cortesy call to JICA/related Agencies, Explantion of IC/R	○	○	○	○	○	○	○
4	14-Dec	Tue	Meeting for MM, Field Survey	○	○	○	○	○	○	○
5	15-Dec	Wed	Meeting, Signing on MM	○	○	○	○	○	○	○
6	16-Dec	Thu	Data Collection, Field Survey, etc., **Move (Mr. Mori, Mr. Aoki)**	○	○	○	○	○	○	○
7	17-Dec	Fri	Data Collection, Field Survey, etc.	○	○	○	○	○	○	○
8	18-Dec	Sat	Internal Meeting, etc.			○	○	○	○	○
9	19-Dec	Sun	Internal Meeting, etc., **Move (Mr. Natsui)**			○	○	○	○	○
10	20-Dec	Mon	Data Collection, Field Survey, etc.			○	○	○	○	○
11	21-Dec	Tue	Data Collection, Field Survey, etc.			○	○	○	○	○
12	22-Dec	Wed	Data Collection, Field Survey, etc.			○	○	○	○	
13	23-Dec	Thu	Data Collection, Field Survey, etc.			○	○	○	○	
14	24-Dec	Fri	Data Collection, Field Survey, etc.			○	○	○	○	
15	25-Dec	Sat	Internal Meeting, etc.			○	○	○	○	
16	26-Dec	Sun	Internal Meeting, etc.			○	○	○	○	
17	27-Dec	Mon	Data Collection, Field Survey, etc.			○	○	○	○	
18	28-Dec	Tue	Data Collection, Field Survey, etc.			○	○	○	○	
19	29-Dec	Wed	Data Collection, Field Survey			○	○	○	○	
20	30-Dec	Thu	Data Collection, Field Survey, **Move(Mr. Watanabe, Mr. Nakamura)**			○	○	○	○	
21	31-Dec	Fri	Data Collection, Basuc Design Report, etc.			○	○	○	○	
22	1-Jan	Sat	Data Collection, Basuc Design Report, etc.			○		○		
23	2-Jan	Sun	Internal Meeting, etc.			○		○		
24	3-Jan	Mon	Data Collection, Basuc Design Report, etc.			○		○		
25	4-Jan	Tue	Data Collection, Basuc Design Report, etc.			○		○		
26	5-Jan	Wed	Data Collection, Basuc Design Report, etc.			○		○		
27	6-Jan	Thu	Data Collection, Basuc Design Report, etc.			○		○		
28	7-Jan	Fri	Move (Jericho - Tel Aviv) Explanation to JICA office/Explanation to Embassy of Japan			○		○		
29	8-Jan	Sat	Move (Tel Aviv-Istanbul)			○		○		
30	9-Jan	Sun	Move (→Japan)			○		○		

IC/R: Inception Report
MM: Minutes of Meeting

3.5 Items Requested by the Team to the Recipient Side

Relevant Palestinian Agencies are requested to assist the Team for the smooth implementation of the Study as follows:

(1) The Palestinian Authority shall accord privileges, exemptions and other benefits to the Team in accordance with the Minutes of Meeting between the Government of Japan and the Palestinian Water Authority (PWA) signed on August 8, 2010.

(2) The Palestinian Authority shall bear claims, if any arises, against the members of the Team resulting from, occurring in the course of, or, otherwise connected with, the discharge of their duties in the implementation of the Survey, except such claims arise from gross negligence or willful misconduct on the part of the Team.

(3) The Palestinian Water Authority (PWA) shall be the executing agency and coordinating body in relations with international, other governmental and non-governmental organizations for smooth implementation of the Survey.

(4) PWA shall at its own expense, provide the Team with the following, in cooperation with other organizations concerned:

a) Security-related information as well as measures to ensure the safety of the Team;
b) Information on as well as support in obtaining medical service;
c) Available data (including maps and photographs) and information related to the Study;
d) Counter personnel; and,
e) Arranging meetings with officers concerned.

(5) To prepare the answers for the Questionnaire presented by the Team.

(6) To secure the permissions of photographs and entry into private properties and restricted areas for proper execution of the Study, if necessary.

(7) Subject to approval by PWA, to make arrangements to allow the Team to bring back to Japan any necessary data, maps and materials related to the Survey.

ES SA

4. Contents of the Survey

4.1 Objectives of the Survey

The Study has the following objectives:

(1) To identify and confirm the components of the proposed Project,
(2) To coordinate with development plan at national, provincial, sectoral and other levels,
(3) To appraise and evaluate the technical and economical viability of the Project,
(4) To prepare a general layout and basic design,
(5) To estimate the cost of the Project and the schedule required for implementing its construction and/or procurement

4.2 Contents of the Study

The followings are the major work items:

(1) Preparation of the ultimate sewerage system plan, future system development plan for specified area to be certainly served, phased development scheme, projection of population, design sewage rate and sewage quality in every 5 years
(2) Decision of target sewer pipelines, target sewage treatment facilities and their allocation
(3) Preparation of preliminary design and construction method of sewerage system and cost estimation
(4) Support in establishment of environmental impact analysis and impact mitigation plan
(5) Financial analysis of the project
(6) Formulation of O&M structure, O&M budget and tariff system
(7) Understanding of residents' awareness toward sewerage system through Social Condition Survey
(8) Proposal of house connection promotion plan
(9) Proposal of human resource development plan for O&M skills
(10) Consultation with related Palestinian agencies regarding the abovementioned work items
(11) Study for disposal and reuse of treated sewage and sludge from sewage treatment facilities.

4.3 Aims of the Field Survey

To achieve the objectives of the Survey, the Team will conduct the following during field survey:

(1) To study the current situation of the concerned sector,
(2) To confirm the central/executing/operating agency with its administration, budget, staff, manpower and their relationships,
(3) To assure the financial capability of the executing agency,

ES SA

(4) To coordinate with other donors, if any,
(5) To carry out field survey of the Project site (conditions: weather, topography, geology, hydrogeology and water supply facility: operation/maintenance),
(6) To collect and analyze data, information and materials,
(7) To study local conditions on procurement, construction and/or transportation,
(8) To study tax and levy system and
(9) Others, if any

Based on the survey results, the Team prepares the development plan of the proposed sewerage facilities, facility design, O&M plan and structure, tariff schedule, environmental impact analysis and impact mitigation plan through consultation with relevant Palestinian agencies.

4.4 Studies in Japan

The results of the field survey are analyzed in Japan. After consultation with JICA and concerned parties in Japan, the Team will make the layout and design of facilities and/or equipment, which will be incorporated to the scope of the Project. It is important to note that the capability of the executing/implementing agency to operate and maintain the facilities and equipment will affect the decision of the appropriate scope of the Project.

The result of the design, called the "Basic Design" is summed up to the draft report of the Survey. Its contents are explained and discussed with the officials of Palestinian Authority as JICA dispatches the Basic Design Explanation Team.

ES SA

5. Description of the Project

Japan side understands following descriptions of the Project.

5.1 Background of the Project and its Aims

Jericho-Jordan Valley Area is located in world famous Rift Valley. Owing to its topographical features, domestic sewage generated in urban areas cannot be discharged to other river basin and is forced to remain within the city area. Due to the lack of appropriate sewage treatment facility, sanitary condition has been deteriorated. Further, soil and groundwater contamination by sewage has been worried and as the groundwater vein contamination was confirmed on January 2010, sewage treatment has become a urgent matter.

While, since available surface water source is quite limited, most of existing potable water sources is groundwater but due to the relationship between Israel, the adjoining country, potential development groundwater source is also limited. As Israeli Government has been concerning about the adverse effect of Jericho's soil and groundwater contamination on their country, proper sewage treatment is considered as a significant issue in a context of peace of the Middle East.

From the viewpoint of efficient utilization of limited water resources, re-use of treated sewage is regarded as the one of the new water sources. Agricultural development has been expected in Jericho City and the construction of the Agro-industrial Park is examined as the core project in "Peace and Prosperity Corridor Concept" promoted by the Japanese Government. Integrated sewage treatment is also examined based on the premises of proper primary treatment of sewage generated in Agro-industrial Park. Therefore, the construction of sewerage system is considered as a principal project to improve the sanitary environment and to preserve water resources.

Based on such circumstances, the Palestinian Authority requested to the Government of Japan the construction of sewerage system in Jericho City located in the west bank of Jordan River by the Grant Aid scheme. In response to this request, JICA conducted basic study on April and October 2009 to collect and arrange the basic information. Further, they conducted the preparatory survey (Pre F/S and F/S) from July to August of 2010 to examine the facility construction sites and sewage treatment method. Anticipated that this project will be examined by the Japanese Cabinet on this coming February 2011, the necessity and the relevancy of the project will be examined, appropriate cooperation plan will be prepared, proper facility design and cost estimation will be conducted by the Survey.

5.2 Items reviewed through this Survey

Contents of the requests as of F/S in August 2010 are follows:

Target Service Area	Jericho City, An Nuwi'ma, 'Ein ad Duyuk, Ein as Sultan Camp, Aqubet Jabar Camp, Agro-industrial Park (after the primary treatment)
Target Service Population	53,000 person (Year of 2025)

ES SA

Design Sewage Rate	Daily Average	: 11,000 m^3/day
	Daily Maximum	: 15,400 m^3/day
	Hourly Maximum	: 33,000 m^3/day
Requested Sewerage Facilities	Sewer Pipeline Network (Total length is unknown)	
	Sewage Treatment Plant (Reaction Tanks, Mechanical and Electrical Equipment)	

Based on the basic concept of the Grant Aid Scheme, target year will be re-examined. Due to the budget limitation, target sewer pipeline network will also be restricted and thus, target service area will be screened by prioritization in each construction phase. Further, even sewerage system were constructed, sewage will not be incoming if house connections are not implemented. Therefore, connection ratio will be properly set in each construction phase. So, the current system scale assuming that generated sewage within the target area will be collected and treated will be reviewed.

ES SA

6. Items to be Discussed

After discussion with the authorities concerned in Japan, the following items will be discussed by both sides:

1) Confirmation on the contents of the Project

2) Verification on position of the Project

3) Investigation of O & M status

4) Field survey on proposed facility construction sites

5) Study on natural conditions

6) Data collection on water supply projects in Jericho City

7) Execution of social condition survey

8) Examination on sewer pipeline routes

9) Confirmation on environmental and social consideration

10) Preparation of sewerage system development plan

11) Conduct project financial analysis

12) Arrangement of undertakings by Palestinian side

13) Preparation of plans for technical cooperation and soft component

14) Examination on treatment of sewage generated in the Agro-industrial Park

15) Conduct survey on material/equipment procurement condition through local contractors and consultants

16) Verification on licensing system for construction works in Palestinian Area

17) Collection of data related to contingencies

18) Examination on climate change countermeasures

ES SA mr

Category	Timeline (to be revised) (*)		2010 July		Dec-2011 August		2011 Sep - Dec	2012 April- 2014 Mar	2014-2015	Notes	Current situation
	Tasks	Responsible Entity	Pre F/S	F/S	B/D	E/N	D/D	Construction	O&M		
Approval status of the Project	Approval of standard for effluent of wastewater by JWC	PWA	Basic concept of the standard be clarified	The standard is confirmed	The standard is approved by JWC						Application has been already submitted to JWC. Sub-committee has already generally approved. However, Israeli is waiting for "design dimension" which shows the treatment method and component. During B/D, as soon as the design fixes, it will be submitted to the Israeli side.
	Approval of environmental and social impact assessment by relevant national authority	PWA	Procedure of the ESIA be confirmed		ESIA is approved						PWA will implement it. PWA already requested MoPAD to allocate around 50,000 US$ to conduct the ESIA study. PWA is drafting the TOR.
	Land acquisition for the Project site	MOF PWA Jericho	Procedure of land acquisition be confirmed		Land acquisition is approved		Land acquisition is completed				The new location of the proposed WWTP is owned by the Religion Ministry (A Waqf land). PWA and Jericho municipality sent request to rent that land. In addition, PWA obtained written commitment from MoF to give renting expenses.
Law and regulation	Legislation which enables mixed treatment of industrial wastewater and domestic sewage	PWA	Basic concept of the legislation be confirmed		Draft legislation be prepared		Approved				PWA is waiting for cabinet approval of bylaw. PWA still pushing to obtain the cabinet approval since it is required for other projects.
	Legislation of mandatory connection to from each household to sewer by beneficiaries of the Project	PWA	Basic concept of the legislation be confirmed		Draft legislation be prepared		Approved				
	Legislation of payment of service fee by beneficiaries of the Project	PWA	Basic concept of the legislation be confirmed		Draft legislation be prepared		Approved				
Organizational and institutional building	Responsible organizational and institutional structure (including securing humans resource and development) of the Project in the each steps such as planning, designing, operation, maintenance	PWA	Basic concept of the structure be confirmed	Responsible units be decided			The units established	Training for capacity development			PWA already has «Projects Management Unit (PMU)» that has the responsibility of follow up the funded projects all over the West Bank.
	Responsibility of the Project (including sharing expense) after the Project (inet wastewater from Agro-Industrial park	PWA	Basic concept of the responsibility be confirmed	The responsibility is confirmed by written agreement with the park						The timeline can be changed in accordance with an organizational structure of agro-industrial park	The MOU has been already signed with three original copies
	Organization and institution (including securing humans resource and development) to implement O&M of the Project	Jericho	Basic concept of the organization be confirmed	Responsible units be decided			The units established	Training for capacity development			Jericho Municipality expands the water department to be water and sanitation department.
Securing a source of revenue	Decision making with regard to expense sharing between Jericho city and the Project beneficiaries through service fee	PWA Jericho	Basic concept of the expense sharing be confirmed		Decided						Jericho Municipality has already started to raise the water tariff and its cooperation with PWA on this issue.
	Budget allocation for construction of branch sewer	Jericho	Basic concept of the budget allocation be confirmed	Budget allocation procedure be confirmed		Budget allocation procedure started		Budget be allocated			PA through MoF allocate 2 millions US$ to cover the obligation expenses by the recipient. However, the gap between the estimation cost and the approved budget by Japanese government will be discussed through MoF.
	Budget allocation for O&M of the Project	Jericho	Basic concept of the budget allocation be confirmed	Budget allocation procedure be confirmed		Budget allocation procedure started		Budget be allocated			Jericho municipality is aware of this issue and ready to cover the deficit in the O&M cost.
Organization for inspection	Organization and institution for quality inspection of inflow of industrial wastewater to sewerage plant	EQA	Basic concept of the organization be confirmed				Responsible organization and procedure be set up				PWA and EQA are working on this and working to obtain more authorization from the cabinet.
	Organization and institution for enforcement of regulation on inflow of industrial wastewater to sewerage plant	EQA	Basic concept of the organization be confirmed				Responsible organization and procedure be set up		Enforcement		
	Organization and institution for quality inspection of treated wastewater from the sewerage plant	PWA EQA	Basic concept of the organization be confirmed				Responsible organization and procedure be set up				
The Project implementation	Service fee collection system (including consideration of possibility of simultaneous collection with water supply, electricity bill, penalty rule for non-payment and its enforcement)	PWA Jericho	Basic concept of the collection system be confirmed		System be confirmed		System be established		Enforcement		PWA will submit bylaw to the cabinet for the approval.
	Promotion of connection to sewer from each household (including target, responsible entity for the connection, expense sharing, penalty rule for non-connection and its enforcement)	Jericho	Basic concept of the connection be confirmed		Measures be confirmed		Measures be established		Enforcement		It will be within the coming bylaw.
Reuse of treated wastewater	Target volume, target crops, diversification of users, system for collection of user fee, securing of safety of treated wastewater	MOA Jericho	Reuse of treated wastewater be confirmed		Measures be confirmed						There is a plan for irrigation scheme and PWA has very strong relation with MoA to work against drains for the future reuse.
	Water quality standard of reuse of treated water and the system of inspection	PWA	Basic concept of the standard be confirmed	Standard be confirmed		System be confirmed	System be established				The standard will be according to the MOU signed on the JWC.
Others	Utility (Electrical) system for the Project	PWA	Basic concept of the utility system be confirmed	Confirmed	Design of electricity supply be confirmed						Basic design of the electricity supply will be confirmed during Basic Design.

(*) subject to change due to administrative procedure, budget availability and/or birth of the concerned authorities of both Palestinian and Japanese side

資料4-2 第3回現地DFR報告時のJICAとPWAのM/M

MINUTES OF MEETING
BETWEEN
JAPANESE PREPARATORY SURVEY TEAM
AND
THE PALESTINIAN WATER AUTHORITY
ON
THE JERICHO WASTEWATER COLLECTION, TREATMENT SYSTEM
AND REUSE PROJECT

In July 2011, the Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched a Preparatory Survey Team on the Project for Jericho Wastewater Collection, Treatment System and Reuse Project (hereinafter referred to as "the Project"). Since December 2010, JICA has carried out the preparatory survey on the Project. Through discussion, field survey and technical evaluation of the results in Japan, JICA has prepared the draft preparatory survey report (hereinafter referred to as "the Draft Report").

In order to explain and consult with the Palestinian Water Authority (hereinafter referred to as "PWA") on the components of the Draft Report, JICA has sent the Draft Report Explanation Team (hereinafter referred to as "the Team") to Palestine, headed by Mr. Izumi Tanaka from 6th to 7th July 2011.

As a result of discussions, both sides confirmed the main items described in the Attachment.

Ramallah, 7th July, 2011

Mr. Izumi Tanaka
Chief Representative
Japan International Cooperation Agency
Palestine Office

Dr. Shaddad Al Attili
Minister
Palestinian Water Authority

Dr. Estephan Salameh
Special Advisor to the Minister
Ministry of Planning & Administrative
Development

Attachment

1. Components of the Draft Report

The Team explained an outline of the result of the survey to the Palestinian side. The Palestinian side agreed and accepted in principle, the contents of the Draft Report explained by the Team. Both sides confirmed the contents of the Project as shown in ANNEX-1.

2. Japan's Grant Aid Scheme

The Palestinian side understood the Japan's Grant Aid Scheme and the necessary measures to be taken by the Palestinian side as explained by the Team as per the Minutes of Meetings signed by both sides on 8th August 2010.

3. Schedule of the Survey and Project Approval

3-1. Schedule of the Survey

JICA will complete the final report and send it to PWA by the end of August 2011.

3-2. Project Approval

The Project was approved by the Japanese Cabinet on February 28th, 2011. Exchange of Notes (E/N) was agreed and concluded between the Palestinian Authority and the Government of Japan. Grant Agreement (G/A) was agreed and signed between the Palestinian Authority and JICA on February 28th, 2011.

4. Other relevant issues

4-1. Project Cost Estimation

The Team explained that the cost estimation of the Project as described in ANNEX-2. Both sides agreed that the Project Cost Estimation should never be duplicated or released to any outside parties and should be kept CONFIDENTIAL before signing of all the Contract(s) for the Project. Both sides also understood that the Project Cost Estimation is not final and is subject to change.

4-2. Funding by the Palestinian side

The Team explained the necessary budget have to be allocated by the Palestinian side for the implementation of the Project. The amount of the budget will be 11,790 thousand NIS. 2 million dollars has been already committed by the Ministry of Finance on January 4th, 2011. Breakdown of the budget is shown in ANNEX-2. The Palestinian side agreed the necessary budget allocation and explained that a letter from the Ministry of Finance will be sent to PWA regarding the budget allocation.

4-3. Progress of the Road map for the Project implementation by Palestinian Side

The Palestinian side explained the progress of the Road map to Japanese side. The latest Road map is attached as ANNEX-3. Japanese side took note of the progress and advised further acceleration of the preparation for the Project implementation.

4-4. Land Acquisition

PWA explained that the commitment from Al Waqf Ministry to lease the land for the Project. In addition, the cabinet established a committee headed by the Ministry of Finance to accelerate the process in accordance with the Palestinian law. JICA understood the situation and asked PWA for further acceleration of the process.

4-5. Extension of sewer network and house connection

The Team explained the necessity to accelerate the extension of sewer network and the individual housing connection. The Palestinian side understood its necessity and importance. The details will be discussed between JICA and Palestinian side through the Project implementation.

4-6. Establishment of tariff collection system

The Team explained the necessity to establish the sewerage tariff collection system from the users. The Palestinian side understood its necessity and importance.. The details will be discussed between JICA and Palestinian side through the Project implementation.

4-7. Utilization of Remaining Funds

The Team explained the possibility of utilization of remaining funds for the construction of sewer networks. Both sides agreed that remaining funds may be considered for the construction of sewer networks if any funds remain after completion of the construction of waste water treatment plant and sewer networks which were included in the contents of the Project.

4-8. Environmental and Social Considerations

4-8-1. Environmental Checklist

The environmental and social considerations including major impacts and mitigation measures for the Project are summarized in the Environmental Checklist attached as ANNEX-4.

4-8-2. Monitoring for Environmental and Social Considerations

Monitoring for Environmental and Social considerations will be conducted by PWA and Jericho municipality in accordance with the Monitoring Plan for the Project described in the Preparatory Suvey Report. The results of monitoring will be provided by PWA and Jericho

municipality to JICA on a yearly basis until six(6) years after the completion of the Project by filling in the Monitoring Form attached as ANNEX-5 as part of progress reports of the Project.

4-9-3. Disclosure of Monitoring Result

PWA agreed that JICA may disclose the monitoring results conducted by PWA/Jericho municipality, which will be shown in the Monitoring Form attached as ANNEX-5. JICA explained that JICA will disclose further information, when third parties request, subject to approval of PWA.

ANNEX-1: The Outline of the Survey
ANNEX-2: Project Cost Estimation
ANNEX-3: Road Map
ANNEX-4: Environmental Checklist
ANNEX-5: Monitoring Form

ANNEX - I

PREPARATORY SURVEY

ON

THE JERICHO WASTEWATER COLLECTION, TREATMENT

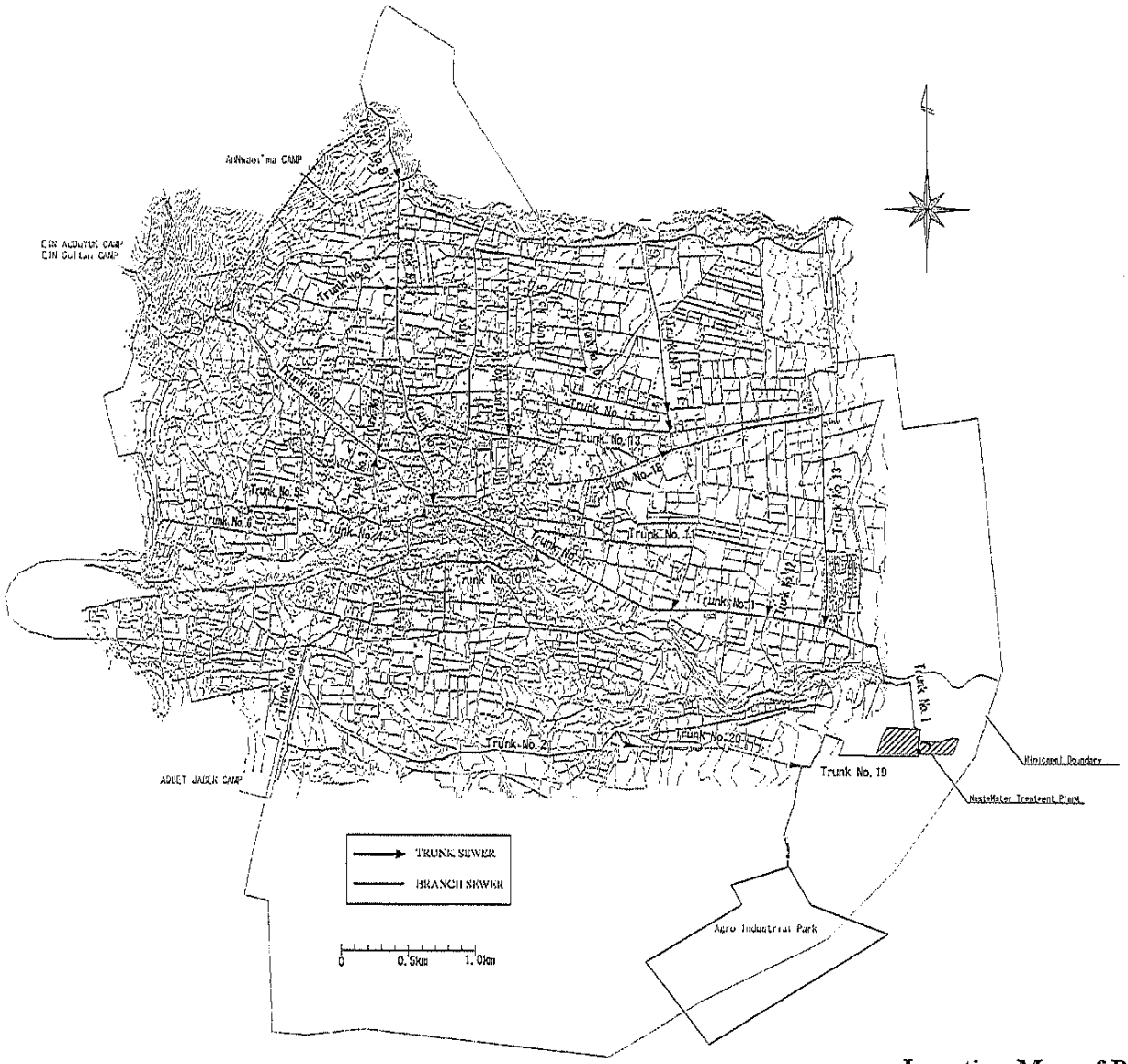
SYSTEM AND REUSE PROJECT

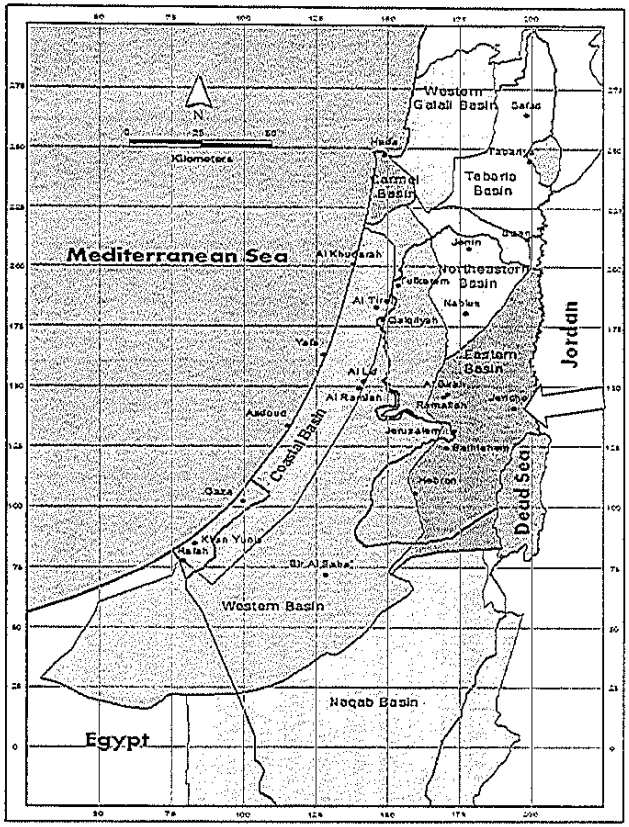
OUTLINE OF THE SURVEY

JULY 2011

NJS CONSULTANTS CO., LTD

Contents





Location Map of Proposed Sewerage System

1. Capacity Calculation of the System

The design wastewater quantity and quality of the Project is calculated as shown in Table 1-1 and 1-2.

Table 1-1 Design Wastewater Amount and Quality

Areas/Year		2010	2015	2020	2025	Ultimate
Jericho Municipality	Population (P)	25,895	28,792	32,042	35,692	35,800
	C. Population (P)	0	14,396	25,634	32,123	35,800
	C. Ratio (%)	0	50	80	90	100
	WW Volume(m^3/d)	0	2,403	4,291	5,391	6,006
Surrounding Areas	Population (P)	14,088	17,263	20,722	24,466	24,600
	C. Population (P)	0	0	10,361	17,126	24,600
	C. Ratio (%)	0	0	50	70	100
	WW Volume(m^3/d)	0	0	1,067	1,882	2,703
Agro-Industrial Park	Inflow Ratio(%)	0	0.23	100	100	100
	WW Volume(m^3/d)	0	270	1,180	1,180	1,180
Total	Population(P)	39,983	46,055	52,764	60,158	60,400
	C. Population(P)	0	14,396	35,995	49,249	60,400
	WW Volume(m^3/d)	0	2,673	6,538	8,453	9,889
Average Concentration (mg/L)	BOD	---	342	400	401	408
	TSS	---	392	452	456	466
	T-N	---	64	71	73	76

Note) Target Year:2020, Ultimate: Population in 2025 with 100% of connection
WW = Wastewater, C. Population = Connected Population, C. Ratio = Connected Ratio, P = Person

Table 1-2 Design Wastewater Amount and Quality

Items		Target Year		Amount Ratio	Application to facility design
		2020	Ultimate Plan		
Wastewater Amount (m^3/day)	Daily Average	6,600	9,900	1.0	Reactor during winter season and sludge drying bed
	Daily maximum	9,800	14,400	1.5	Other WWTP facilities
	Hourly Maximum	19,100	29,000	2.9	Sewer pipes and pipes in WWTP
Wastewater Quality (mg/L)	BOD	500	500	---	Mass balance, reactor capacity and air blower capacity
	TSS	500	500	---	
	T-N	75	75	---	

2. Design of WWTP

The quantity and quality of inflow/outflow are determined in Table 2-1.

Table 2-1 Design Wastewater Amount and Treated Wastewater Quality

Items	Incoming Wastewater Quantity and Quality			Effluent Quality
	Q_{DA}	Q_{DM}	Q_{HM}	
WW Quantity (m^3/day)	6,600	9,800	19,100	---
BOD (mg/L)	500			20
TSS (mg/L)	500			30
T-N (mg//L)	75			50

Design concept of the WWTP facilities is as shown in Table 2-2.

Table 2-2 WWTP Facilities Design Concept

Facilities and Equipment	Contents
Receiving Tank for Vacuum Tanker Truck	To receive wastewater collected by vacuum tanker trucks and remove gravel and sand. It comprises of screen channel and grit chamber. The retention time of grit chamber is 1 hour. An agitator to avoid floatation of scum and sand pumps to remove settled sand are provided.
Grit Chamber	It is composed of inlet channels, two screen channels and two trains (one for stand-by) of grit collector and a distribution chamber. Manual and auto screens are provided in the screen channel. Sand pumps and a sand separator are equipped on the slave of structure. The settled sand in the receiving tank for vacuum tanker truck is transferred and also treated by this sand separator. A scum skimmer and weir-type flow meter are installed in the distribution chamber.
Reactor, Clarifier	Pollutants contained in wastewater is dissolved and removed. Two trains of the reactor tank with shape of OD tank have retention time exceeding 1 day against maximum wastewater quantity. Surface load of two trains of the circular clarifier is less than 12 m^3/m^2/day. Oxygen is supplied through hyper fine bubble diffusers and the agitation is executed by horizontal shaft propellering agitators. Nitrification and denitrification is carried out by an intermittent aeration. A center-pole type sludge collector is installed to the clarifier.
Chlorine Disinfection Tank	Equipped with the deforming pump, utility pump and weir-type flow meter. Sodium hypochlorite is applied for disinfection and the injection rate is 2 to 4 mg/L. The Retention time shall be more than 15 minutes.
Gravity Sludge Thickener	The thickened surplus sludge is transferred to sludge drying beds. The solid loading shall be less than 60kgDS/m^2/day and the sludge density is 0.6% at inlet and 1.3% at outlet.
Sludge Drying Bed	Dries thickened surplus sludge. Sludge depth is 30cm and dried solid is hauled outside of beds after 14 days drying period. Half of planned beds are to be constructed under this project.
Electrical Equipment	Power is received from Jerusalem District Electricity Company (JDECO). The major equipment can be operated by an engine-driven generator and by a solar panel with a capacity of 100 kW. Surplus power is returned to power grid. The operation supervision is carried out through a monitoring screen connected to a computer in administration building, but basically the facilities shall be manually operated at site.

WWTP layout plan, flow sheet, hydraulic profile and SCADA system diagram are shown in Figure 2-1, 2-2, 2-3, and 2-4, respectively.

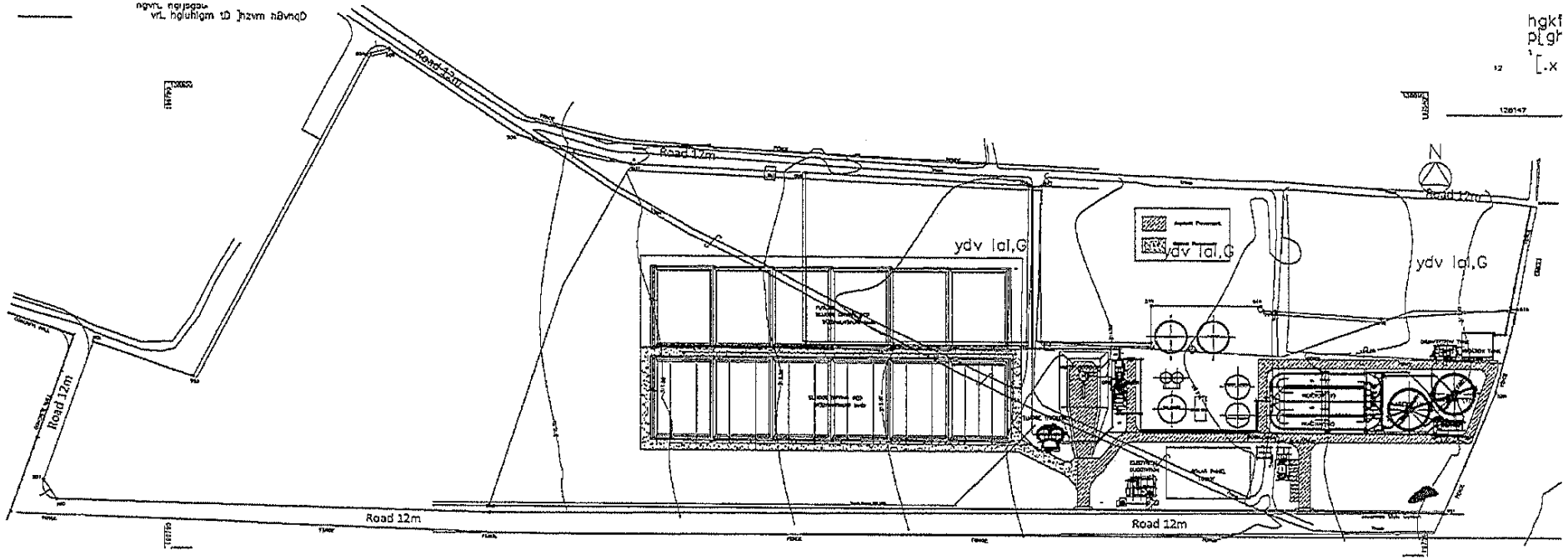


Figure 2-1 WWTP Layout plan allocated on the Regal Survey Map

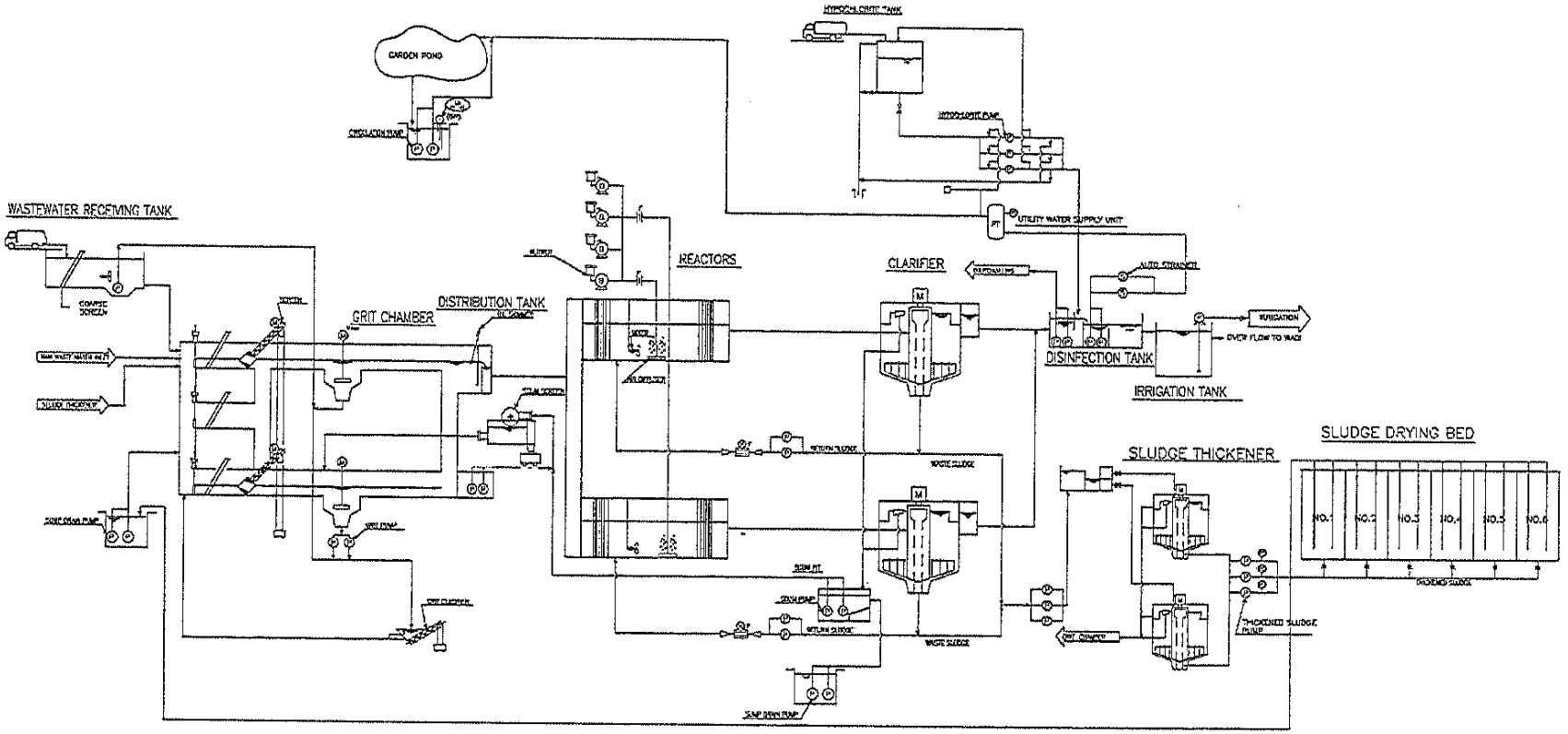


Figure 2-2 WWTP Flow Sheet

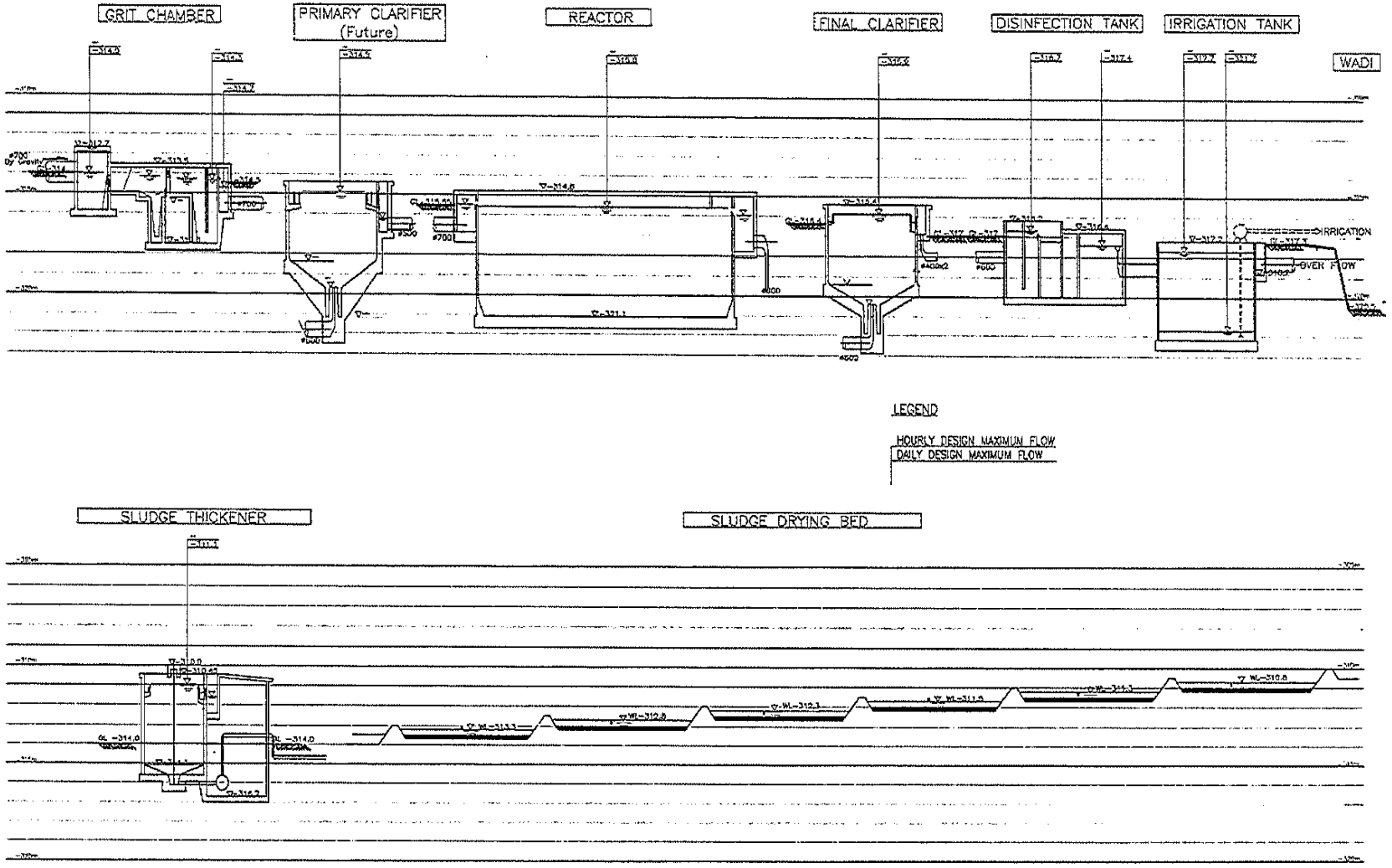


Figure 2-3 WWTP Hydraulic Profile

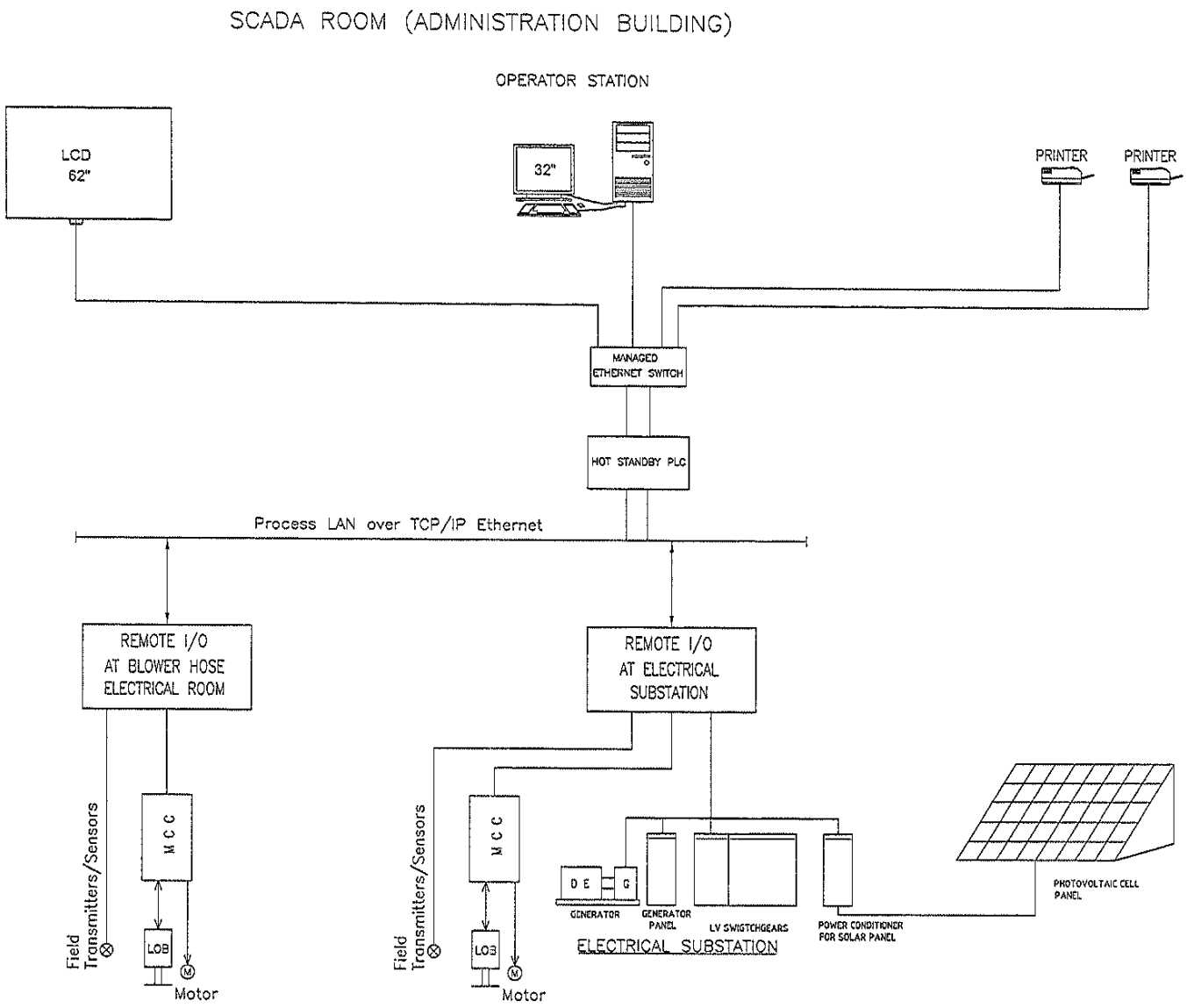


Figure 2-4 SCADA System Diagram

3. Sewer Pipe network Plan

As a result of the study, trunk sewers No. 1, 2, 3, 4, 7, 9, 10, 11, 13, 18, 19 were identified as the subject for construction in the Project. Major trunk sewers that run through the central area of the Municipality and one runs from Agro-industrial Park were selected as shown in Figure 3-1. Table 3-1 shows the length of trunk sewer, its diameter and served population by each sewer.

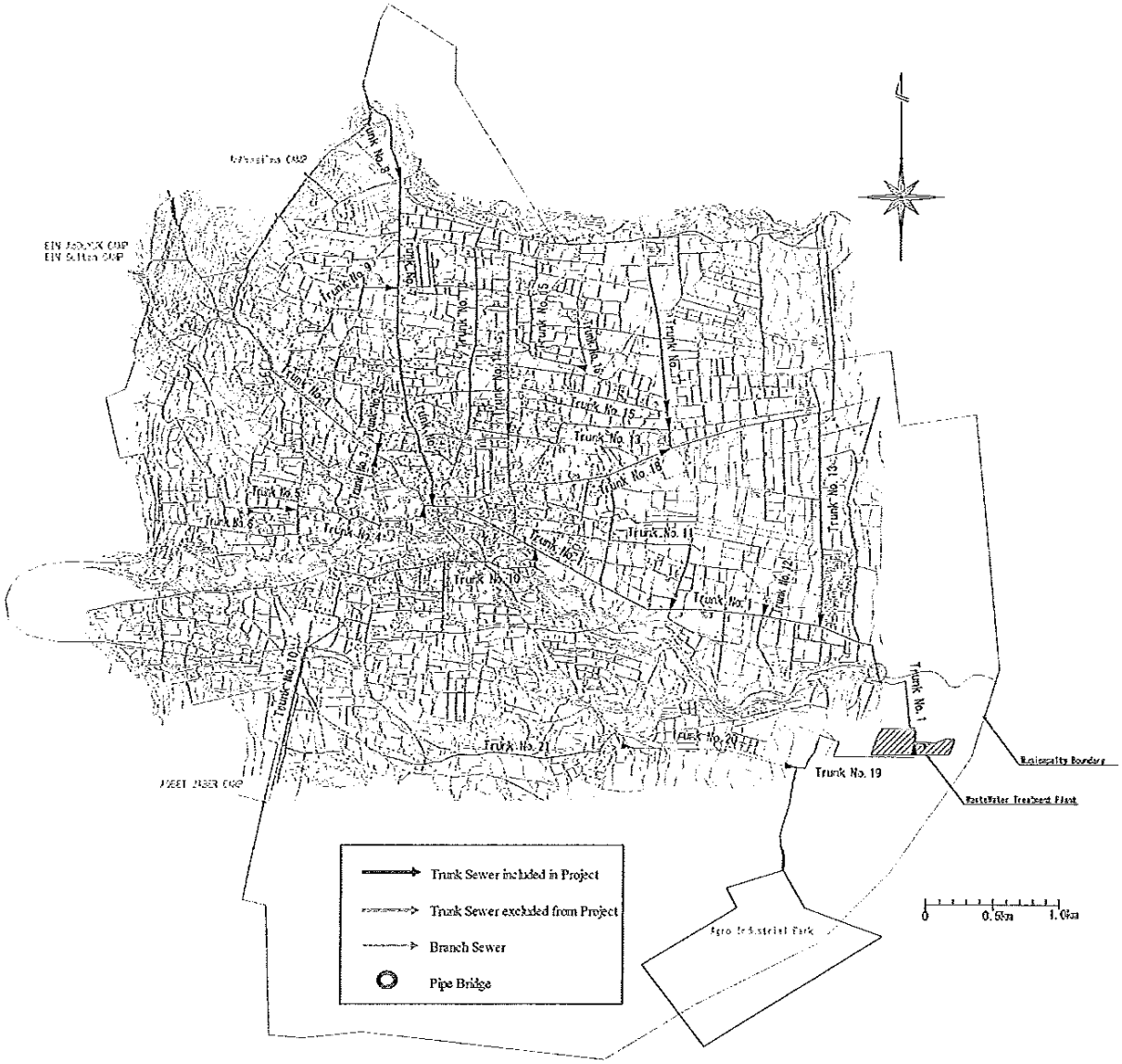


Figure 3-1 Trunk Sewer Location

The total length of the selected trunk sewers is 25.4km and the present service ratio in 2010 is 25 % and 21 % in 2025 when most of open land is expected to be developed.

Table 3-1 Service Ratio by Sewer Network Development

Number	Pipe Length (m)	Pipe Dia.(mm)	Served Population		Note
			2010	2025	
1	7,014	200 to 700	1,295	1,302	Included
2	178	195	17	23	Included
3	162	200 to 250	127	140	Included
4	1,627	200	374	539	Included
5	490	200	75	88	
6	111	200	12	16	
7	2,487	400	524	618	Included
8	808	200	172	198	
9	825	200	120	138	Included
10	3,146	400	1,868	2,078	Included
11	1,121	200	380	453	Included
12	120	200	208	239	
13	5,887	200 to 400	1,460	1,730	Included
14	477	195	131	146	
15	2,050	200 to 250	328	376	
16	306	200	130	150	
17	1,103	200	521	576	
18	988	200	304	420	Included
19	1,974	300 to 400	100	200	Included
20	1,251	250	30	300	
21	1,867	250	30	300	
Total	32,125		8,205	9,731	
Included Area	25,409		6,569	7,642	
Branch	15,990	200	5,671	7,838	
Total Population in Municipality			25,900	35,800	
Ratio of Trunk Sewer coverage (%)			25.4	21.3	
Ratio covered by sewers including branch sewer (%)			47.3	43.2	

Table 3-2 shows the project effect generated by branch sewer development. As shown in the table, the project effect by development of branch sewer connecting to Trunk No.10 is extremely high. Therefore, the Study Team would like to recommend that some branch sewers be installed by Palestinian side for further increase of service ratio.

Especially, branch sewers shown in Figure 3-2 are recommendable for effective service ratio increase.

Table 3-2 Population served by Branch Sewers

Connecting Trunk No.	Collection Area (ha)	Served Population	Pipe Length(m)	Pipe Diameter (mm)
1	19.84	1,239	2,496	200
10	75.30	4,336	7,091	200
11	23.04	857	2,653	200
13	32.20	1,407	3,750	200
Total	150.38	7,839	15.990	—

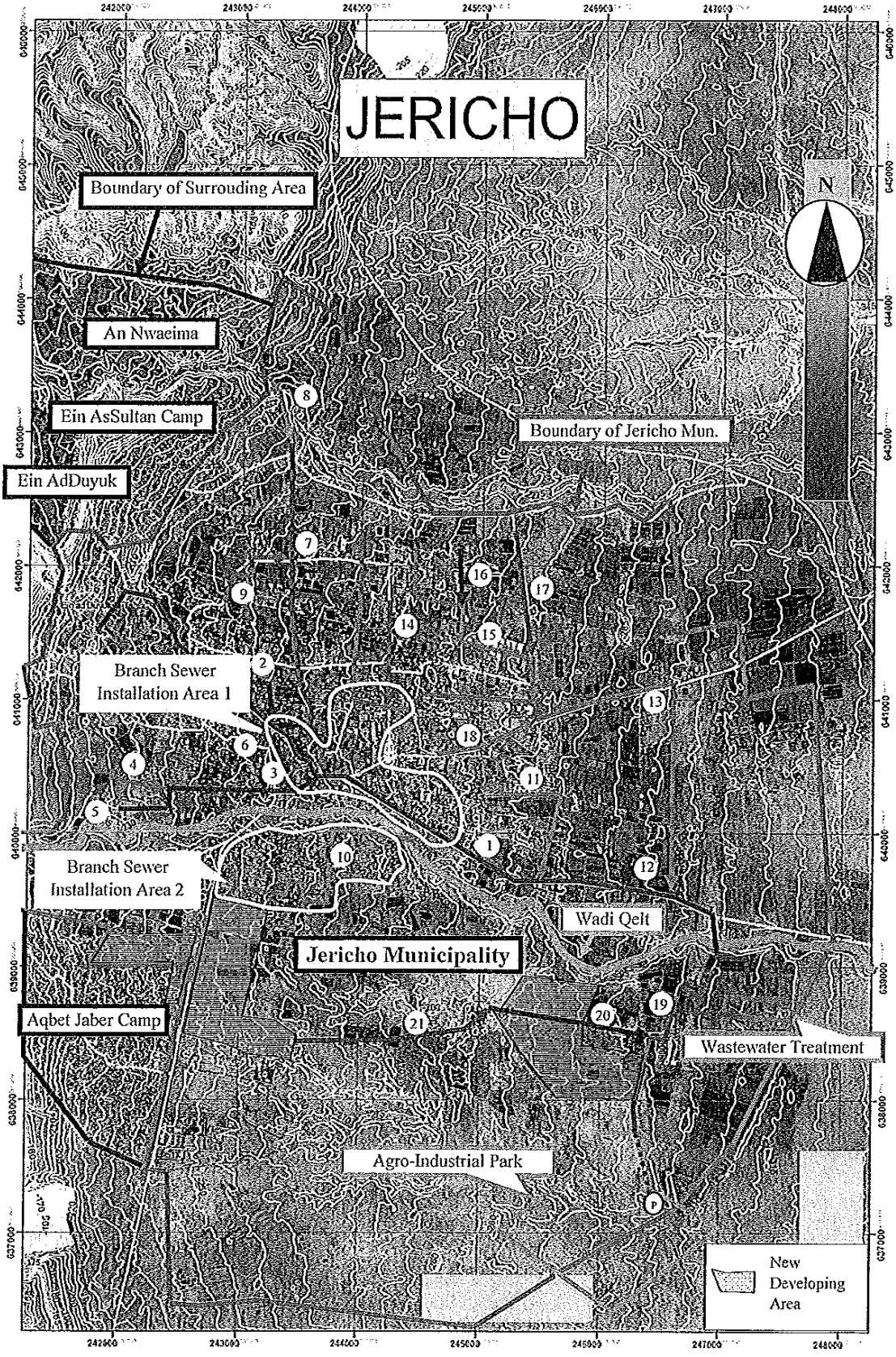


Figure 3-2 Area of Recommended Branch Sewers

4. Equipment Procurement Plan

Required water quality monitoring items for daily operation and administration of the wastewater treatment plant are shown Table 4-1. Equipment required for monitoring items is as shown on Table 4-2.

Table 4-1 Required Water quality monitoring and water quality test for operating in WWTP

Category	Item
Water quality	pH, BOD, COD, SS, T-N, Coliform
Water Condition	DO, MLSS, ORP, SV30, Water Temperature, Transparency , Moisture Contents of various Sludge, Microscopic Tests

Table 4-2 Water Quality Analysis Apparatus

Item	Contents
Procured Equipment	Water quality test equipment(portable pH meter, portable DO meter, portable MLSS meter, ORP meter, work table, electrical balance, incubator, refrigerator, Purify water equipment, dryer, Vacuum Pimp, colony counter, T-N/T-P testing kit, water quality test equipment, portable thermometer, perspective meter, chemical storage cabinet, oven, microscope etc)

5 Necessary Preparation and Procedures for the Project

(1) Necessary preparations and current condition

With the progress and completion of the project, Jericho Municipality needs to establish organization and procedures for operation and management of the system, such as; securing operators at WWTP, and accountant for tariff collection and accounting; preparation and formulation of legislation for sewer connection; institutional arrangement for sewerage department; designating qualified contractors for sewer connection; developing ideas for incentive to promote early connection to sewer network; preparation for reasonable tariff system; and so on. At present, due to insufficient personnel number in Jericho Municipality, it seems difficult for the municipality to implement variety tasks, plans and actions for launching the sewerage project except construction work.

(2) Desirable assistance

Following points should be solved and established before the completion of the construction work under the projects are; securing the necessity personnel, implementing the system, confirmation of tariff structure and tariff collection method, launching the sewerage department, preparation of a setup for house connection construction work and incentive for house connection, etc. These preparatory works and required decision cannot be implemented only by the department in charge. The decision is necessary to be made between PWA, Jericho Municipality and other related parties such as audit organization from citizen through the meeting among parties. For this reason, two years of period is deemed appropriate for preparation of organization and implement of the whole process.

The construction work will start in April, 2012. It is necessary for PWA and Jericho Municipality to proceed the preparation work for the sewerage project at that time. An assistant activity is desirable to start

in April, 2012 at the timing of a contract signing of contract for construction work. On the other hand, even if above-mentioned activity is done, further assistance would be needed at the beginning of the operation stage for a year at least. Institution specialist, financial specialist, auditing specialist and sewer connection specialist will be necessary to have the project operation smoothly for three years in total from the start of the construction work.

For operation and maintenance of the WWTP and sewer network, technical assistance of the Contractor is needed at the time of commissioning. With regard to operation of the WWTP, it will take three years to receive the planned quantity of sewage. Therefore, it is desirable to provide operators appropriate training for this three years. During training of operators, the data from other existing WWTPs in Palestine can be collected and the improvement plan for those plants is prepared through the technical assistance.

6. Implementation Schedule

In implementation schedule, a period of 4.5 months for detailed design, 5.5 months for bidding/preparation work, 21 months for procurement and construction work. Further, a period of commissioning and turning over of the facility shall be added for implementation schedule, and total implementation schedule is approximately 31 months. Construction work of the WWTP takes a long term of 24 months at the shortest after implementing the construction work. Total length of the project implementation from detailed design stage to completion of the work, would be approximately 2.5 years. Implementation plan is as shown on Figure 6-1.

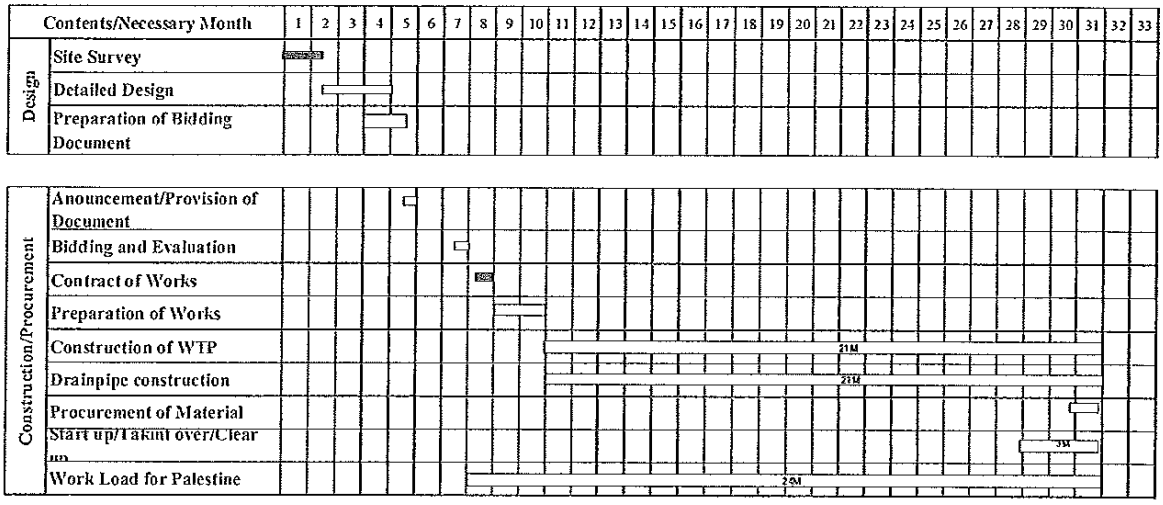


Figure 6-1 Implementation Schedule

7. Operation and Maintenance Cost

Table 7-1 shows the operation and maintenance cost (O&M Cost) for the project in the target year of 2020 without depreciation cost, which was calculated as 2,215 thousands NIS/year, which is almost same to the calculated O&M cost.

Table 7-1 Estimated O&M Cost for this Project (NIS/year)

Items	Computation	Total
Labor Cost	・Total 20 person (6,000×3 +3,000×11 +2,000×6)×12×1.8NIS/person・month= 1,360,000 NIS/year	1,360,000
Chemical Cost	・Sodium Hypochlorite (Average injection rate : 3 ppm counted as effective Cl) 1,120 NIS/m^3×0.2 m^3/day×365 day=81,000 NIS/year	81,000
Power Expense	Power expense : 886,400 kWh/year×0.66 NIS/kWh=585,000 NIS/year Saving by Solar Panel : 100 kW×8 h/day×0.6×0.66 NIS/kWh×365 day/year= -116,000 NIS/year	469,000
Sludge Disposal Cost	Basically disposal within WWTP site or used by farmers	0
Equipment Maintenance Cost	About 1% /year of mechanical/electrical equipment cost (Early stage of operation)	267,000
Total		2,177,000

Table 7-2 shows unit O&M costs by connection ratio. When connection ratio is lower than the original plan, the unit O&M cost will be much increased, and then the tariff must be set at high. Therefore, expansion of sewer network and connection to each user is quite important in order to increase the connection ratio. The tariff should not be lower than the calculated cost, because the sewage works must keep some saving for emergency contingency, such as unexpected repair work for facilities.

In this case, the depreciation cost is considered not being included in the cost for tariff because the facilities will be constructed under a grant aid. However, since the facilities must be replaced in future, the cost for such work should be included in the tariff.

Table 7-2 Unit O&M Cost by Connection Ratio

Year	Case	Connection Ratio (%)			Wastewater Quantity (m^3/d)	Annual O&M Costs(1,000NIS/y)		Unit O&M Cost (NIS/m^3)	
		Municipality	Surrounding	Agro-industrial Park*2		Including	Excluding	Including	Excluding
2020	1*1	80	50	100	6,540	4,392	2,177	1.8	0.9
	2	60	30	50	4,470	4,196	1,981	2.6	1.2
	3	50	20	33	3,520	4,037	1,822	3.1	1.4
2025	4*1	90	70	100	8,450	4,523	2,308	1.5	0.7
	5	60	30	50	4,650	4,213	1,998	2.5	1.2

Note: including=including depreciation, excluding= excluding depreciation

*1: Original plan, *2: This case is discharge ratio to design discharge quantity

8. Obligations of Recipient Country

The scope to be covered by Palestinian Interim Self-Government Authority and the Jericho Municipality in the project are as shown below. Besides of the costs for such works, cost for tax exemption and transportation in Palestine territory shall be covered by the recipient country:

a) Land Acquisition : Present 8.4ha, in Future 13ha
WWTP Site (Present 8.4 ha) : 1 Lot of Land

As the proposed land is public land owned by the Ministry of Religion, land purchase is not needed but land lease fee, compensation fee for lending agricultural land and transplanting fee for existing plants should be covered.

b) Fence for WWTP : Total length 1,710m

c) Access Road : Total length 1,380m

d) Power cable installation : Approx. 800m

e) Water supply pipe installation : Approx. 1,000m

f) Sewer pipe installation in priority areas : Approx. 16km

g) Installation of connection pit : for 2,000 households

h) Bank commissions

10. Environmental and Social Consideration

As the results of scoping to environmental and social impacts, almost no negative impacts will be observed in the operation stage. Only the issues during sewer pipes installation and construction of the WWTP requires some measures to mitigate the negative impacts as described below.

1) The countermeasures for the issues of noise/vibration nuisance and traffic congestion during installation of sewer pipelines are needed
2) The countermeasures are needed to be prepared if ruin/relic is found during excavation work for installation of sewer pipelines
3) The countermeasures for the nuisance of dust generation by vehicles during WWTP construction are needed
4) Prior to the commencement of construction of the WWTP, "The Solid Waste Management Plan" is needed to be formulated taking especially the reuse of waste materials into consideration.

All the necessary items, contents and timing to be considered for the monitoring are summarized in Table 10-1

Road map for the implementation of the JERICHO WASTEWATER COLLECTION, TREATMENT SYSTEM AND REUSE PROJECT (DRAFT)

Category	Timeline (to be revised) (*)		2010 July		Dec-2011 August	2011 Sep - Dec	2012 April- 2014 Mar	2014-2015	Notes	Current situation
	Items	Responsible Entity	Pre F/S	F/S	B/D	D/D	Construction	O&M		
Approval status of the Project	Approval of standard for effluent of wastewater by JWC	PWA	Basic concept of the standard be clarified	The standard is confirmed.	The standard is approved by JWC.					Application has been already submitted to JWC and agreed in principle. Final report of the survey will be submitted to JWC.
	Approval of environmental and social impact assessment by relevant national authority	PWA	Procedure of the ESIA be confirmed		ESIA is approved					EQA commented on the EIA. PWA is preparing to answer the comment. EIA will be approved by the end of this month.
	Land acquisition for the Project site	MOF PWA Jericho	Procedure of land acquisition be confirmed		Land acquisition is approved.	Land acquisition is completed.				The new location of the proposed WWTP is owned by the Religion Ministry (Al Waqef land). Special Committee was established to accelerate the process on 22 June, 2011.
Law and regulation	Legislation which enables mixed treatment of industrial wastewater and domestic sewage	PWA	Basic concept of the legislation be confirmed		Draft legislation be prepared	Approved				PWA is waiting for cabinet approval of bylaw. MOLG has already endorsed the bylaw. PWA is still pushing to obtain the cabinet approval; since it is required for other projects.
	Legislation of mandatory connection to from each household to sewer by beneficiaries of the Project	PWA	Basic concept of the legislation be		Draft legislation be prepared	Approved				
	Legislation of payment of service fee by beneficiaries of the Project	PWA	legislation be confirmed		Draft legislation be prepared	Approved				
Organizational and Institutional building	Responsible organizational and institutional structure (including securing humane resource and development) of the Project at the each stage such as planning, designing, operation, maintenance	PWA	Basic concept of the structure be confirmed	Responsible units be decided		The units established	Training for capacity development			PWA already has Projects Management Unit (PMU) that has the responsibility of follow-up the funded projects all over the West Bank.
	Responsibility of the Project (including sharing expense) when the Project treat wastewater from Agro-Industrial park	PWA	Basic concept of the responsibility be confirmed	The responsibility is confirmed by written agreement with the park.					The timeline can be changed in accordance with an organizational structure of agro-industrial park.	The MOU has been already signed with three original copies.
	Organization and institution (including securing humane resource and development) to implement O&M of the Project	Jericho	Basic concept of the organization be confirmed	Responsible units be decided		The units established	Training for capacity development			Jericho Municipality expands the water department to be water and sanitation department.
Securing a source of revenue	Decision making with regard to expense sharing between Jericho city and the Project beneficiaries through service fee	PWA Jericho	Basic concept of the expense sharing be confirmed		Decided					Jericho Municipality has already started to raise the water tariff and do cooperation with PWA in this issue.
	Budget allocation for construction of branch sewer	Jericho	Basic concept of the budget allocation be confirmed	Budget allocation procedure be confirmed	Budget allocation procedure started		Budget be allocated			PA through MOF allocates 2 millions US$ to cover the obligation expenses by the recipient. Further necessary budeget (1.5 million US$) will be allocated by PA through MOF.
	Budget allocation for O&M of the Project	Jericho	Basic concept of the budget allocation be confirmed	Budget allocation procedure be confirmed	Budget allocation procedure started		Budget be allocated			Jericho municipality is aware of this issue and ready to cover the deficit in the O&M cost.
Organization for inspection	Organization and institution for quality inspection of inflow of industrial wastewater to sewerage plant	EQA	Basic concept of the organization be confirmed			Responsible organization and procedure be set up				PWA will monitor the WWTP and EQA will monitor whole environmental matters. Necessary instruments and capacity for the monitoring is lacking.
	Organization and institution for enforcement of regulation on inflow of industrial wastewater to sewerage plant	EQA	Basic concept of the organization be confirmed			Responsible organization and procedure be set up		Enforcement		
	Organization and institution for quality inspection of treated wastewater from the sewerage plant	PWA EQA	Basic concept of the organization be confirmed			Responsible organization and procedure be set up				
The Project implementation	Service fee collection system (including consideration of possibility of simultaneous collection with water supply, electricity bill, penalty rule for non-payment and its enforcement)	PWA Jericho	Basic concept of the collection system be confirmed		System be confirmed	System be established		Enforcement		PWA submited bylaw to the cabinet for the approval.
	Promotion of connection to sewer from each household (including target, responsible entity for the connection, expense sharing, penalty rule for non-connection and its enforcement)	Jericho	Basic concept of the promotion be confirmed		Measures be confirmed	Measures be established		Enforcement		It will be within the coming bylaw.
Reuse of treated wastewater	Target volume, target crops, identification of users, system for collection of user fee, securing of safety of treated wastewater	MOA Jericho	Basic concept of the reuse of treated wastewater be confirmed		Measures be confirmed					There is a plan for irrigation scheme and PWA has very strong relation with MOA to work against drying for the future years.
	Water quality standard of reuse of treated water and the system of inspection	PWA	Basic concept of the standard be confirmed	Standard be confirmed		System be established				The standard is based on the MOU signed in the JWC.
Others	Utility (Electricity) system for the Project	PWA	Basic concept of the utility system be confirmed	Confirmed	Design of electricity supply be confirmed.					Basic design of the electricity supply will be confirmed during Basic Design.

(*) subject to change due to administrative procedure, budget availability and so forth of the concerned authorities of both Palestinian and Japanese side

Environmental Check Lists : Sewerage (1)

Category	Environmental Item	Main Check Items	Yes or No	Confirmation of Environmental Considerations
1. Permits and Explanation	(1) EIA and Environmental Permits	(a) Have EIA reports been already prepared in official process? (b) Have EIA reports been approved by authorities of the host country's government? (c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(a) Y (b) N (c) – (d) N	(a) It was already made and submitted to EQA. (b) The limit duration which EQA shall answer to proponent was expired, then now PWA is inquiring the result to EQA. (c) Currently no official reply from EQA (d) Not necessary.
	(2) Explanation to the Public	(a) Are contents of the project and the potential impacts been adequately explained to the local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the local stakeholders? (b) Have the comment from the stakeholders (such as local residents) been reflected to the project design?	(a) Y (b) Y	(a) The contents and influences of the Project had been already explained in the stakeholder meetings in Jericho Municipality, and the approval of acquisition for WWTP site was already obtained from Ministry of Religious Affairs. (b) Proper response was already done.
	(3)Study of Alternative plans	(a) Have alternative plans of the project been examined with social and environmental considerations?	(a) Y	(a) Several options for the location of WWTP site and the wastewater treatment process were examined.
2. Policies for prevention of pollution	(1)Water Quality	(a) Do pollutants, such as SS, BOD, COD, pH contained in treated effluent from a sewage treatment plant comply with the country's effluent standards? (b) Does untreated water contain heavy metals?	(a) Y (b) N	(a) The T-N value of effluent is exceeded the standard of agreement with Israel, but Israel authority agreed the value. (b) No factories which discharges heavy metal exist in and around the Project site.
	(2) Wastes	(a) Are wastes, such as sludge generated by the facility operations properly treated and disposed of in accordance with the country's standards?	(a) -	(a) Dried solid will be stored at the WWTP site and then it will be used for farmlands.
	(3) Soil Contamination	(a) If wastes, such as sludge are suspected to contain heavy metals, are adequate measures taken to prevent contamination of soil and groundwater by leachates from the wastes?	(a) Y	(a) Heavy metal will not be contained in sewage.
	(4) Noise and Vibration	(a) Do noise and vibrations generated from the facilities, such as sludge treatment facilities and pumping stations comply with the country's standards?	(a) Y	(a) There is a standard for noise level and the standard for industrial area will be adopted for the WWTP. The Project will comply with the standard.
	(5) Odor	(a) Are adequate control measures taken for odor sources, such as sludge treatment facilities?	(a) Y	(a) Grit chamber and sludge thickener, which probably generate smell, will be located in the center of the wastewater treatment plant(WWTP) site and far away from the boundary. In addition, trees will be planted surrounding the site.
	(1) Protected Areas	(a) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(a) N	(a) There is no protected area, and the site is currently a farmland.

Environmental Check Lists : Sewerage (2)

Category	Environmental Item	Main Check Items	Yes or No	Confirmation of Environmental Considerations
3.Natural Environment	(2) Ecosystem	(a) Does the project site and discharge area encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem? (d) Is there a possibility that the project will adversely affect aquatic environments, such as rivers? Are adequate measures taken to reduce the impacts on aquatic environments, such as aquatic organisms?	(a) N (b) N (c) - (d) N	(a) There is no such area. (b) There is no such area. (c) No impact is anticipated. (d) There is no surface aquatic environment. The discharge water properly treated and most of it is used for irrigation. Therefore, there are no possibility of adverse impact on the aquatic environment.
4.Social Environment	(1)Transfer of people	(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement? (b) Is adequate explanation on conpensation and resettlement given to affected persons prior to resettlement? (c) Is the resettlement plan, including conpensation with full replacement costs, restoration of livlihoods and living standards developed based on socioeconomic studies on resettlement? (d) Is the compensation going to be paid prior to the resetlement? (e) Is the compansation policies prepared in document? (f) Does the resettlement plan pay particular attention to vulnerable groups or persons, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous people? (g) Are agreements with the affected persons obtained prior to resettlement? (h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan? (i) Are any plans developed to monitor the impacts of resettlement?	(a) N (b) - (c) - (d) - (e) - (f) - (g) - (h) - (i) - (j) -	(a) No resettlement (b) Not necessary (c) Not necessary (d) Not necessary (e) Not necessary (f) Not necessary (g) Not necessary (h) Not necessary (i) Not necessary (j) Not necessary
	(2) Living and Livelihood	(a) Is there a possibility that changes in land uses and water uses due to the project will adversely affect the living conditions of inhabitants? (b) Is there a possibility that the project will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary?	(a) N (b) Y	(a) There is no possibility of adverse impact, and there is only positive impact on the environment because wastewater will be properly treated and the treated water can be used for irrigation. (b) There is little possibility of noise and odor problem in construction and operation stage because there is no housing surrounding WWTP site. Countermeasures of traffic jam and dust during constriction need to be prepared for housing along the access rord.
	(3) Heritage	(a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage sites? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a) Y	(a) When sewer pipes are installed in a specific area, it is possible that some ruin or relic will be found. In such case, it will be dealt with properly
	(4)Landscape	(a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	(a) N	(a) There is a farmland around the WWTP site. Since the height of structures in WWTP is low and trees will be planted in the site, the landscape which can be looked down the Jordan River Basin will not be negatively affected.
	(5) Ethnic Minorities and Indigenous Peoples	(a) Are considerations given to reduce the impacts on culture and lifestyle of ethnic minorities and indigenous peoples? (b) Are the rights of ethnic minorities and indigenous peoples in relation to lands and resources respected?	(a) N (b) -	(a) There is no ethnic minorities (b) Not necessary

Environmental Check Lists : Sewerage (3)

Category	Environmental Item	Main Check Items	Yes or No	Confirmation of Environmental Considerations
	(6)Work Condition	(a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project? (b) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials? (c) Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.? (d) Are appropriate measures taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents?	(a) Y (b) Y (c) Y (d) Y	(a) Project will be carried out under the law in Palestine. (b) Every necessary facility will be prepared. (c) Every necessary procedure will be prepared and carried out. (d) Safety staff will be assigned and a proper safety plan will be formulated.
5. Others	(1) Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)? (b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts? (c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts? (d) If the construction activities might cause traffic congestion, are adequate measures considered to reduce such impacts?	(a) Y (b) N (c) Y (d) Y	(a) Necessary measures will be prepared. (b) No adversely affect (c) Countermeasures for traffic jam and dust nuisance will be prepared. (d) Traffic of the target area is not so busy, but countermeasures, such as detour, will be prepared.
	(2) Monitoring	(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts? (b) What are the items, methods and frequencies of the monitoring program? (c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)? (d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	(a) Y (b) - (c) Y (d) -	(a) A monitoring program will be prepared. (b) Shown in attachment (c) Adequate framework will be established (d) Not yet decided, however the monthly reports shall be prepared and submitted to EQA in a certain frequency. The frequency will be decided under the discussion between EQA and PWA
	Note on Using Environmental Checklist	(a) If necessary, the impacts to transboundary or global issues should be confirmed (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming).	(a) -	(a) Influent by the water contamination to Jordan River and Dead Sea is considered, but this problem will not be taken place because the wastewater will be treated properly and treated water will be used for irrigation. Since wastewater currently discharged into wadi and infiltrate in to the ground will be treated properly, this Project will contribute to the global environment

1) Regarding the term "Country's Standards" mentioned in the above table, in the event that environmental standards in the country where the project is located diverge significantly from international standards, appropriate environmental considerations are made, if necessary. In cases where local environmental regulations are yet to be established in some areas, considerations should be made based on comparisons with appropriate standards of other countries (including Japan' experience).

2) Environmental checklist provides general environmental items to be checked. It may be necessary to add or delete an item taking into account the characteristics of the project and the particular circumstances of the country and locality in which it is located.

A. Plan for Environmental Monitoring

Division	Items	Contents	Agency	Frequency	Timing
Grasping of Present Condition	Along the Sewer-pipes	・Facilities required paying special attention; such as hospitals and schools	PWA	At preliminary survey in EIA	EIA
		・Traffic density and noise by the hour			
		・Situation of Traffic congestion generation			
		・Locations and kinds of historical heritage			
	Surrounding conditions of WWTP	・Land utilization conditions			
		・Facilities in surrounding areas			
		・Surrounding housings and others			
		・Dust generation situation by wind			
		・Landscape			
	Effluent Water	・Condition of effluent point			
		・Groundwater quality (Survey of Wells)			
		・Water quality of Dead Sea			
	Solid Waste	・Collection and disposal methods for domestic solid waste in municipality			
	Management	・Collection and disposal methods for industrial solid waste in municipality			
		・Reusing ways for dried sludge from WWTP			
Mitigation Countermeasures and check	Installation of Sewer-pipes	・Countermeasure for noise/vibration	Prepared by the Contractor and reviewed by Consultant/PWA	The Contractor shall prepare as "Environment Protection plan" in the planning of Construction Plan	Formulation of Construction Plan
		・Traffic countermeasures including detour			
		・Historical ruins and procedures of handling when			
		・Construction time scheduling			
	Construction of WWTP	・Countermeasure for noise/vibration			
		・Traffic countermeasures			
		・Countermeasures to facilities requiring paying attention			
		・Prevention measure for dust			
		・Consideration to landscape			
	Treated Water	・Treated water quality, quality of groundwater, influence to quality of Dead sea			EIA
	Solid Waste Management	・Solid Waste Management Plan (Recycling, Disposal of domestic waste and industrial waste)			Formulation
		・Treatment and disposal/reuse of dried sludge and screenings in operation phase			of Construction
Monitoring during Construction	Installation of Sewer-pipes	・Noise/vibration during construction(working points and nearby facilities requiring paying attention	Prepared by construction contractor and reviewed by Consultants/PWA	Daily	During Construction
		・Generation of traffic congestion by construction and effect by countermeasures		Daily	
		・Finding ruin/relic and handling procedures when		Daily	
	Construction of WWTP	・Nuisance by Noise/vibration and influence to surrounding		Daily	
		・Generation of traffic congestion by vehicles for		Daily	
		・Generation condition of dust and effect of mitigation		Daily	
	Solid Waste Management	・Observance situation of Solid Waste Management Plan		Weekly	
		・Disposal methods and quantities of domestic/industrial		Weekly	
		・Recycling methods and quantities		Weekly	
Monitoring in Commissioning Operations	WWTP	・Detection of odor by monitor	Conducted by construction contractor and	As required	During Test Operations
		・Measurement of Noise/Vibration		Moring,Evening, Night	
		・Quality tests of wastewater and treated water		Weekly	
		・Water content and odor measurement for dried sludge		Every Disposal	
Monitoring in operation phase	Sewer-pipe	・Occurrence of odor nuisance and clogging	Conducted by Jericho Municipality and reviewed by EQA	As required	Operation Phase
		・Generation of caving-in		As required	
	WWTP	・Complaint for odor/noise/vibration		As required	
		・Regular analysis for treated water		Monthly	
		・Quantity/purpose of reused treated water, complaint by		As required	
		・Quantity/purpose of reused dried sludge, complaint by		As required	

B. Monitoring Form

1. Grasping of Present Condition

1-1 Stakeholder Meeting

Items	Situation of Monitoring Period		
Pointed items by stakeholders in the first meeting	Speaker	Contents	Countermeasures
Pointed items by stakeholders in the second meeting	Speaker	Contents	Countermeasures

1-2 Grasping Condition in the Surrounding Area

Facilities	Situation of Monitoring Period		
	Items	Condition	Note
WWTP Site	Natural condition		
	Landscape		
	Water environment		
	Collection/Disposal of solid waste		
	Land-use condition		
	Houses/facilities in surrounding area		
Along the sewer installation route	Natural condition		
	Land-use condition		
	Soil condition		
	Traffic network		
	Traffic condition		

1-3Water Quality of Wells (No of well, sampling date, temperature)

Item	unit	value	Standard for farmland	Analysis method	Note
pH	(--)				
SS	(mg/L)				
BOD	(mg/L)				
COD	(mg/L)				
T-N	(mg/L)				
T-P	(mg/L)				
Iron	(mg/L)				
Oil & Grease	(mg/L)				
Total dissolved solid	(mg/L)				
Temperature	℃				

1-4 Noise Level at WWTP Site

Item	time	Value range (dB)	Standard at site	Measured Method	Note
Noise at morning					
Noise at daytime					
Noise at night					

1-5 Condition of EIA Approval

Proposed entity	Items	Contents	Countermeasure

2. Monitoring for Construction Stage

2-1 Check for EMP (Environmental Management Plan)

Category	item	Results/pointed items	Countermeasure
General	Policies		
	Organization		
	Connection system		
Construction for WWTP	Traffic		
	Noise/vibration		
	Dust		
	Sludge disposal		
	Domestic wastewater		
	Littering in the site		
	Monitoring plan		
	Correction		
Sewer installation	Traffic		
	Noise/vibration		
	Dust		
	Sludge disposal		
	Littering in the site		
	House along the load		
	Monitoring plan		
	Correction		
Solid-waste management Plan	Generation projection		
	Segregation/disposal of domestic waste		
	Recycling of package materials		
	Treatment and disposal of construction waste		
	Safety storage and disposal of hazardous waste		
	Monitoring plan		
	Correction		

2-2 Monthly Monitoring Sheet

Category	Item		Contents	Countermeasure /Note
Construction of WWTP	Problems and Complaint			
	Traffic	Traffic jam		
		Noise/vibration		
		Dust		
		Others		
	Construction	Noise/vibration		
		Dust		
		Soil disposal		

		Clearing up of site			
		others			
	Construction office	Clearing up			
		Domestic wastewater			
		others			
Sewer installation	Problems and Complaint				
	Traffic	Detour			
		Traffic jam			
		Noise/vibration			
		Dust			
		Others			
	Excavation	Breasting			
		Influence to traffic			
		Influence to along structures			
		Ruin/relic			
		Soil disposal site			
		Others			
Solid-waste Management	Problems and Complaint				
	Generation amount(t/m)	Domestic			
		Package			
		Construction			
		Hazardous			
	Disposal (t/m)	Contents	Amount	Place of disposal	
		Domestic			
		Package			
		Construction			
		hazardous			
	Recycling	Contents	Amount(t/m)	Ratio (%)	Method
		Domestic			
		Package			
		Construction			
		Hazardous			
Evaluation	Construction of WWTP				
	Sewer installation				
	Solid-waste management				
	Others				

3. Monitoring for Commissioning after Completion of Construction

3-1 Water quality

Item	unit	Inflow	Outflow	Effluent standard	Analysis method	Note
pH	(--)					
SS	(mg/L)					
BOD	(mg/L)					
COD	(mg/L)					
T-N	(mg/L)					
T-P	(mg/L)					
Oil & Grease	(mg/L)					
Total dissolved solid	(mg/L)					
Coliform	(n/100cc)					
Chlorine ion	(mg/L)					
Boron	(mg/L)					
Na	(mg/L)					
Silver(Ag)	(mg/L)					
Arsenic(As)	(mg/L)					
Cadmium(Cd)	(mg/L)					
Chromium(Cr)	(mg/L)					
Cobalt(Co)	(mg/L)					
Copper(Cu)	(mg/L)					
Fluorine(Fl)	(mg/L)					
Iron(Fe)	(mg/L)					
Mercury(Hg)	(mg/L)					
Lithium(Li)	(mg/L)					
Temperature	℃					

3-2 Noise

Item	Time	Place	Value range (dB)	Measured Method	Note
Noise at daytime		Outside of blower room			
Noise at morning, daytime and night		North boundary at daytime			
		At morning			
		At night			
		South boundary at daytime			
		At morning			
		At night			
		East boundary at daytime			
		At morning			
		At night			

3-3 Oder Perception Test in WWTP Site

Place	Measured results	Method	Note
3m away from grit chamber			
3m away from sludge thickener			

3m away from sludge drying bed			
Front of administration building			
North boundary			
South boundary			
East boundary			
West boundary			

4. Monitoring for Operation Stage

4-1 Water Quality

Item	unit	Inflow	Outflow	Effluent standard	Analysis method	Note
pH	(--)					
SS	(mg/L)					
BOD	(mg/L)					
COD	(mg/L)					
T-N	(mg/L)					
T-P	(mg/L)					
Oil & Grease	(mg/L)					
Total dissolved solid	(mg/L)					
Coliform	(n/cc)					
temperature	℃					

4-2 Environmental Monitoring Monthly Sheet

Items		Situation	Countermeasure /Note
Problems and Complaint			
Traffic			
Operation	Inflow quality		
	Wastewater by Tanker		
	Treatment at grit chamber		
	Treatment at reactor		
	Reusing for irrigation		
	Noise/vibration		
	Sludge treatment/reuse		
	Environment in the site		
	Odor		
	Others		

資料 5． 現地調査結果

資料 5-1 地質調査結果

1． 報告書本文

A-62 ～ A-104

2． 結果概要

ボーリングは、下水処理場サイトについては深さ 20m で５本実施し、市内の道路沿いには深さ 10m を１本、深さ 5m を 9 本実施した。位置は報告書本文に示すとおりであるが、市内のワジ横断部の２箇所（②、④）はサイホン又は水管橋の基礎を想定して深さ 10m として計画したが、④については、砂利層に当たって 5m 以上掘削が出来なかったので、5m で打ち止めた。

ボーリングに当たっては、1m 毎に標準貫入試験を行い、性質が異なる層毎に室内試験を行った。いずれのボーリング孔でも地下水は確認できなかったが、N 値及び室内試験の結果は、資料表 5-1-1 に示す通りであり、ほとんどの層が安定したシルト質土で、部分的に礫層が存在する。基本的には地盤は強固であり、N 値は最小で６、粘着力 C は 30kN/m2 以上、内部摩擦角φは 12 度以上となり、さらに土の水分による安定性を示す液性限界（値が低い方が安定)、塑性限界（値が高い方が安定）等のアッターベルク限界から見ても安定した土質であることが判る。

処理場用地については、支持力が重要であるが、場内の施設で最も面積当たりの荷重が大きいのは反応槽であり、その運転中の重量は 97kN/m^3 である。従って、地盤は長期許容支持力が 100kN/m^2 の支持力があれば良い。

一方、N 値が最小の６を示したボーリング孔 S3 の位置は反応槽の位置である。N 値と支持力の関係は、経験的に砂質土で支持力＝N×10kN/m^2、粘質土で＝N×25kN/m^2 程度とされており（地盤工学会編「N 値および C,φ」より)、シルト質土はその中間と考えると以下となる。

支持力＝(10+25)/2×6＝105kN/m^2

また、粘着力 30kN/m^2 程度の土の支持力は通常 100kN/m^2 程度と言われており、この結果に一致する。しかし、必要な支持力に余裕はないので、主要な構造物の地盤では平板載荷試験を行って、支持力が不足する場合には入れ替え転圧等を行う。このような比較的軟弱な層は、その厚さが薄いのでこのような工法が適する。

管路が敷設される市内の道路沿いについては、掘削困難なほど強固ではなく、掘削面は安定する強固さはあり、地下水がないので施工は容易であると考えられる。なお、ワジの横断部は水管橋の基礎を設置する必要があるが、N 値は 20 以上あるので十分な強度がある。

資料表 5-1-1　地質調査結果

場所 Place	No.	標高 Elevation m	深さ depth m	最小N値 Min-N Number	含水率 Moisture Content(%)	粒度 <0.075mm %	液性限界 LL %	塑性限界 PL %	粘着力 C kN/m²	内部摩擦角 Ø °	分類 Classification
処理場サイト WWTP Site	S1	-311.263	0-4	12	20.5	67	38.1	10.2	39	15	ML
			4-20	10	33.2	70	40.1	9.7	38	15	ML
	S2	-313.602	0-1.5	13	12.5	74	40.2	13.9	40	12	ML
			1.5-20	9	32.5	80	45.6	14.3	39	15	ML
	S3	-315.577	0-5	6	12.9	71	38.2	11.0	37	16	ML
			5-20	19	29.9	83	41.5	14.3	38	15	ML
	S4	-316.187	0-2	15	11.8	79	40.1	15.5	39	14	ML
			2-20	16	31.0	81	40.9	15.9	40	15	ML
	S5	-317.336	0-3	15	12.2	84	41.1	14.9	40	15	ML
			3-15	20	38.5	90	45.9	13.5	41	15	ML
			15-20	31	32.0	79	44.1	14.0	35	17	ML
市内道路沿い Along the Roads in Municipality	1	-301.682	0-5	13	9.9	68	36.1	9.1	35	16	ML
	2	-309.245	0-1.5	22	10.2	62	35.2	8.5	33	17	ML
			1.5-5	27	17.7	58	37.3	7.4	32	18	ML
			5-10	21	18.4	64	36.8	8.8	34	16	ML
	3	-293.057	0-1.5	42	8.8	77	34.4	11.5	37	15	ML
			1.5-3	12	18.1	82	36.9	14.0	39	16	ML
			3-5	19	19.3	80	37.0	13.9	38	16	ML
	4	-268.461	0-5	>50	4.3	47	33.5	13.3	32	18	GP
	5	-264.650	0-5	33	9.0	45	34.5	14.9	33	16	GP
	6	-239.252	0-5	>50	8.1	49	33.9	14.7	32	19	GP
	7	-263.504	0-1.5	26	7.5	54	33.3	14.0	35	16	ML
			1.5-5	34	8.4	14	35.0	14.0	29	20	ML
	8	-246.504	0-2	26	9.0	28	31.8	18.1	30	16	ML
			2-5	30	16.9	76	29.9	15.0	34	15	ML
	9	-282.959	0-1.5	>50	11.0	74	41.1	15.6	34	16	ML
			1.5-5	33	13.8	93	47.9	24.8	39	13	ML
	10	-279.643	0-0.5	36	6.0	33	34.0	14.1	32	17	ML
			0.5-5	13	7.9	90	42.9	17.2	40	13	ML

Note: ML-低可塑性シルト、GP－均粒度礫

GEOTECHNICAL SURVEY

FOR

JERICHO WASTEWATER TREATMENT

PLANT AND SEWAGE TRUNK LINES

Prepared for:
OSAILY GENERAL CONTRACTING COMPANY
NJS CONSULTANTS

Prepared by:
HIJJAWI CONSTRUCTION LABS

MARCH– 2011

M-S/Osaily General Contracting Co.

Ref. : SI/625
Date : 6/3/2011
Project – PREPARATORY SURVEY ON THE JERICHO WASTEWATER COLLECTION, TREATMENT SYSTEM AND REUSE PROJECT
Subject – Geotechnical Survey – Final Report

Dear Sirs,

With reference to your request and your agreement with M-S/NJS Consultants, we are pleased to submit this report with findings and results of tests carried out for the above mentioned project.

We look forward for further cooperation and would like to take this opportunity to highly considerate your confidence in our laboratories. For any clarification concerning this report, please contact us at your convenience.

Yours sincerely,

Dr. Sami A. Hijjawi
General Manager

CONTENTS

1. INTRODUCTION

1.1 GENERAL

This report presents the outcome of the geotechnical survey carried out for the proposed construction site of Jericho Wastewater Treatment Plant and sewage trunk lines in the city of Jericho.

1.2 PURPOSE AND SCOPE

Investigation of the underground conditions at a site is prerequisite to the economical design of the substructure elements. It is also necessary to obtain sufficient information for feasibility and economic studies for any project.

For this particular project, and due to the type of proposed structures, which highly depend on the nature of soils, the site investigation becomes of special importance to obtain sufficient information about the geotechnical parameters of the ground.
In general, **the scope of this site investigation** was to provide the following:

- Core drilling for bedrock, soil and gravel deposits
- Standard Penetration Tests (SPT) at every 1.0m interval in each borehole
- Preparation of investigation report with borehole logs, SPT results, and all data related to the works and findings

This was accomplished through the close cooperation of **HCL**'s geotechnical engineer and the technical staff of its Geotechnical Department.

2. FIELD EXPLORATION AND TESTING

2.1 DRILLING

2.1.1 The geotechnical investigation program agreed upon with **Hijjawi Construction Labs** to explore the subsurface conditions included the drilling of five boreholes at the proposed site to a depth of 20m each at the location of the wastewater treatment plant site and ten boreholes at the sewage trunk lines to a depth of 5m each (one to a depth of 10m). All depths are from the existing on the date of exploration ground levels.

The test borings were located in the field at each site by the Consultants representative by measuring relative to the property corners and other identifiable landmarks using the provided site plan with the proposed locations of boreholes. The locations of the test borings are shown on the attached boring location map for each site.

Soil logs for the test borings shown on the Boring Location Plan are presented in the Appendix to this report. Soil samples were obtained from the test borings and returned to our office for further review and laboratory analyses. The soils observed during logging of the test borings were classified according to the Unified Soils Classification System (USCS), utilizing field classification procedures outlined in ASTM D 2488.

The borings were advanced using a truck mounted, Mobile B-31 drilling rig. Standard Penetration Tests were performed, and representative samples were collected in accordance with ASTM D 1586 sampling procedures.

Depths referred to in this report are relative to the existing ground surface elevations at the time of our field investigations. The surface and subsurface conditions described in this report are as observed at the site at the time of our field investigation.

Soil logs for the test borings shown on the Boring Location Plans are presented in the Appendix to this report for each site.

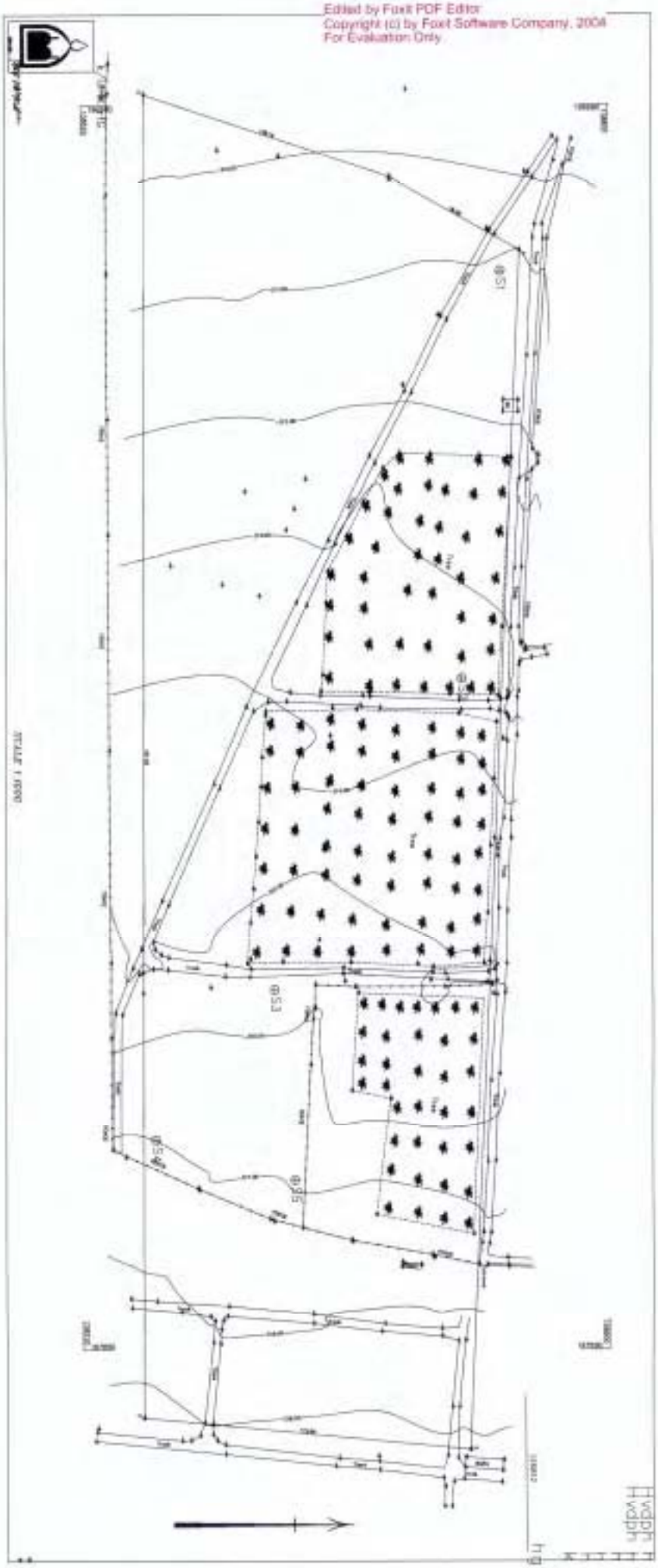
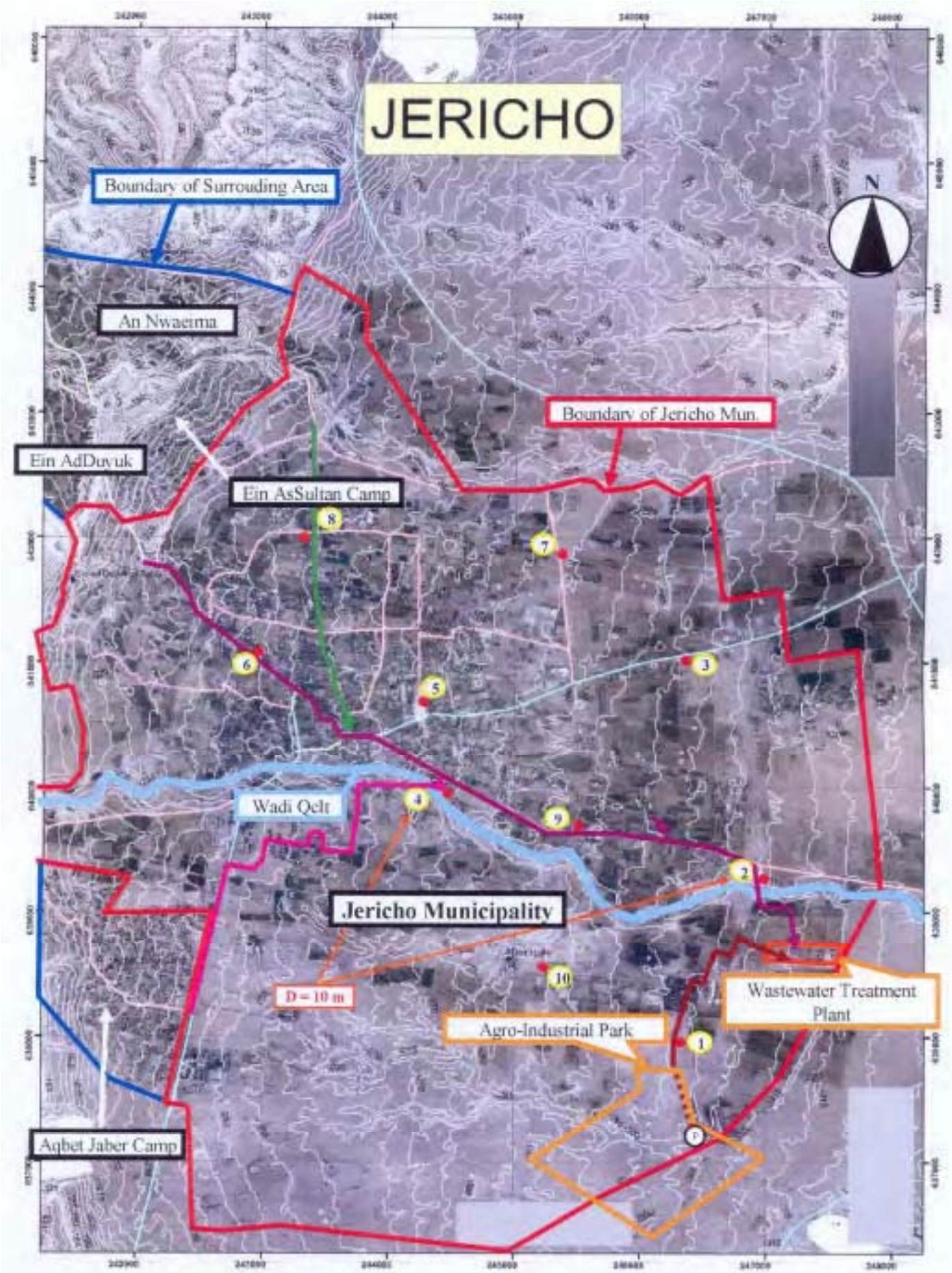


Fig. 1 Locations of boreholes at the Wastewater Treatment Plant



Schematic Plan of Sewer Network and Soil Investigation Points Number

Table. 1 Locations of boreholes

1- Treatment Plant Site					
Boring No.	**S1**	**S2**	**S3**	**S4**	**S5**
N	138739.996	138728.234	138585.188	138570.019	138635.669
E	197071.943	197298.63	197454.326	197522.671	197564.184
Level(m)	-311.263	-313.602	-315.577	-316.187	-317.336
2- Sewage Trunk Lines					
Boring No.	**1**	**2**	**3**	**4**	**5**
N	138215.473	139232.255	141045.653	139949.521	140613.677
E	196387.213	197019.648	196396.093	194438.978	194255.337
Level(m)	-301.682	-309.245	-293.057	-268.461	-264.65
Boring No.	**6**	**7**	**8**	**9**	**10**
N	141151.929	141963.149	142034.777	139654.583	138576.025
E	192826.843	194769.155	193382.333	195468.175	195195.384
Level(m)	-239.252	-263.504	-246.504	-282.959	-279.643

2.2 SAMPLING

Samples were collected continuously within the drilled depths upon your request in all boring locations within the proposed project area. Sampling locations are shown on the attached above figures.

According to the drilling requirements, continuous sampling was carried out. For this purpose:

- thin wall tubes were used for sampling of cohesive undisturbed relatively cohesive soil formations (ASTM D1587),
- split spoon samplers with accessories were used for SPT testing and sampling (ASTM D1586),
- Down the hole hammer (DTH) was used to drill in un-cemented formations containing gravels and boulders.

Soil samples were obtained from the test borings and placed in core boxes and delivered to the laboratory for further testing and analysis. The soils observed during

logging of the test borings were classified according to the Unified Soils Classification System (USCS), utilizing field classification procedures outlined in ASTM D 2488.

Samples in the split spoon

Drilling at borehole No.6 (Trunk lines)

The borings were advanced using a truck mounted, Mobile B-31 drilling rig. Standard Penetration Tests were performed, and representative samples were collected in accordance with ASTM D 1586 sampling procedures.

Depths referred to in this report are relative to the existing ground surface elevations at the time of our field investigation. The surface and subsurface conditions described in this report are as observed at the site at the time of our field investigation.

2.3 SAMPLING RECOVERY

Samples were collected from the whole strata within the depth of boreholes. It can be said that the sampling recovery was around 100% in all boreholes.

2.4 FIELD TESTING – STANDARD PENETRATION TEST (SPT)

The Standard Penetration Test (SPT) was carried out in all boreholes (wherever applicable) at 1.0m interval as required. The test was carried out by means of the 50.8 mm outside diameter split - spoon sampler, which was driven to penetration of 450 mm by repeated blows of a 63.5 Kg monkey falling through 760 mm. The number of blows for the last 300-mm of driving was recorded as the standard penetration number (N-value).

The records from the SPT are given in the borehole logs.

3. GENERAL GEOLOGY OF THE SITE

3.1 JERICHO GENERAL GEOLOGY

The geology of Jericho district is characterized by the Jordan rift valley deposits which are mainly composed of Marl & Pleistocene Alluvial formations [Environmental; Profile for the West Bank – Jericho District Profile – ARIJ Institute, 1995]. The geologic formations in the eastern part of Jericho district are:

I. Alluvium Formation:

This formation covers the area adjacent to the Jordan Valley starting by a width of 1 km in the north and 5 kms in the south. It is of the Pleistocene to Recent in age. It is bounded structurally by the Jordan rift regional fault in the east and another fault of 12 km long in the west.

II. Lisan & Samra Formation:

This formation covers the greatest part of the Jericho district. It is of the Pleistocene to Recent age, and includes three local faults of up to 3 kms long. This area is bounded by the alluvium formation in the east and by a greater fault of about 13 kms long in the west. It is mainly composed of marl, chalk and conglomerates.

3.2 SOILS

The Jordan Valley is the only eco-geological system in Jericho district. Nine soil associations can be distinguished in this system:

3.2.1. Alluvial Arid Brown Soils

This type of soil association is located mainly in the Jericho city and Al-Auja areas. It covers an area of about 6,470 hectares. It is exists of alluvial fans and plains, formed as a result of erosion of calcareous silty and clayey materials. This soil type supports

Herbaceous vegetation of desert annual halophytes and glycophytes and responds well to irrigation, producing various crops, mainly subtropical and tropical fruits, such as citrus, bananas, and dates, as well as winter vegetables.

3.2.2. Loessial Arid Brown Soils

This type of soil association is found on moderate slopes to the west and northwest of the Jericho district, covering an area of about 1,290 hectares. The soil is formed originally from conglomerate and/or chalk and mainly found on gently sloping plateaux as well as dissected plateaux with locally hilly topography. The major vegetation type found in this region is Achillea santolina, and the main current land use consists of various field crops and some horticultural crops planted as irrigated crops. Wheat, barely, and sorghum are also grown under rainfed conditions.

3.2.3. Reg Soils and Coarse Desert Alluvium

This type of soil association is located in the southern part of the Jericho district. It is found in plains and dissected low plateaux and characterize large valleys and alluvial fans. The soil covers an area of approximately 800 hectares and it's parent materials are mainly of unconsolidated mixed stone and deposits. The vegetation on this soil is restricted in a few areas to rivulets. In most areas dwarf shrubs such as Anabasis articulata and Reaumuria are dominant. This soil is almost of no agricultural value and its native vegetation poor pastures for camels, goats and sheep.

3.2.4. Brown Lithosols and Loessial Serozems

This type of soil association is found on steep to moderate mountain slopes, in the areas southwest of Aqbat Jaber Camp and northwest of Nuwe'ma, covering an area of about 4,670 hectares. The soil is originally formed from limestone, chalk, dolomite and flint.

The major vegetation types found on this soil are Anabasis articulata and Zygophyllum.

The current land use is restricted to winter crops grown by Bedouins in some wadis.

3.2.5. Calcareous Serozems

This type of soil association is found southeast of Jericho city, northeast of Nuwe'ma and east of Al-Auja villages. It is formed mainly as a result of the flooding of the Jordan River. This soil covers an area of about 2,400 hectares and is originally formed from limestone, chalk and marl. The vegetation it hosts is restricted to Salsola vermiculata var vilosa and its current land use is limited to winter grazing.

3.2.6. Solonchalks

This type of soil association is found in the south eastern part of the district. It covers an area of approximately 3,460 hectares. The soil occupies the drainage valleys and closed basins in the district, where the groundwater table is near the soil surface. The soil parent rocks are recent alluvial deposits ranging in texture form sand to clay. Its major vegetation cover is halophytic with species of Tamarix, Suaeda, and Nitraria being dominant. Without proper drainage this soil is of almost no agricultural value. In the Jericho district some dates are grown on the periphery of the depressions, where the ground water is still relatively fresh.

3.2.7. Loessial Serozems

This type of soil association dominates the areas of Nuwe'ma, north of Al-Auja and south of Aqbat Jaber camp covering an area of approximately 4,920 hectares. This soil is typical of plateaux and moderate slopes. The soil parent materials are loessial sediments, gravel and highly calcareous loamy sediments. Its major vegetation cover is an association of the Hammada scoparia. Most of the area covered by this soil is used for grazing and only part of it is dry-farmed. There are also some irrigated orchards.

3.2.8. Regosols

This type of soil association characterize the eastern border of the Jericho district. It is found as badlands along terrace escarpments in the Jordan Valley, covering an area of approximately 8,880 hectares. The soil parent materials are sand, clay and

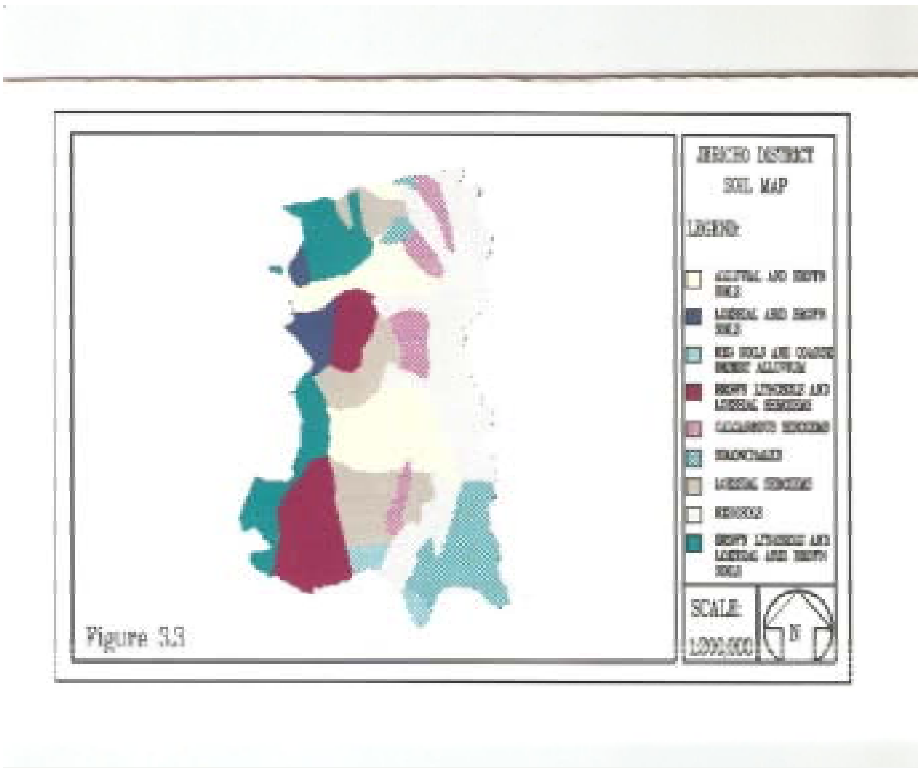
loess. The soil dominant vegetation cover are Anabasis articulata, Salsola vermiculata and Salsola tetrandra, and are used primarily for grazing.

3.2.9. Brown Lithosols and Loessial Arid Brown Soils

This type of soil association characterizes the western part and covers an area of approximately 2,410 hectares of the Jericho district. These type of soils are mainly found on steep rocky and eroded slopes. Brown lithosols are found in the pockets among the rocks, while Loessial arid brown soils are found on flat hilltops, plateaux and foot-slopes.

The parent rocks of this soil association are chalk, marl, limestone and conglomerates. Its major vegetation cover is Artemisia herba-alba.

The given below Jericho District Soil Map illustrates the described soil groups (taken from Reference No. 1 – Environmental Profile for the West Bank – Jericho District Profile – ARIJ Institute, 1995 – Fig.3.3).



3.3 SITE GENERAL GEOLOGY

Considering the collected samples from the drilled boreholes within the borders of the proposed site, and reviewing the visual analysis and description given in the borehole logs, it can be concluded that the whole studied area (within the explored depth of 20m from the existing ground) consists of alluvium, loose to medium dense, fine grained silts to sandy silts with occasional cemented particles in a form of gravels.

The encountered materials in the drilled boreholes, as described above, can be referred to the soil description given in §3.2.1 above (Alluvial Arid Brown Soils).

Geological cross sections illustrating the subsurface conditions encountered in the drilled boreholes are given in the Appendix to this report.

4. LABORATORY TESTING

Representative soil samples were collected from the drilled boreholes, tightly sealed and transported to **HCL**'s Laboratories in Nablus.

4.1 TESTS CARRIED OUT

The following tests were performed to evaluate the engineering properties of the soils and rocks influencing the performance of the proposed structure:

- **Natural moisture contents** were determined in accordance with **ASTM D-2216**.

- **Grain size distribution (sieve analysis)** in accordance with **ASTM D-422**.

- **Atterberg limits (Liquid and Plastic)** in accordance with **ASTM D-4318**. Liquid and plastic limit tests were conducted on the powder of the obtained samples and the plasticity index (PI) was determined.

- **Direct shear test** in accordance with ASTM D-3080, where three identical specimens were sheared under three vertical load conditions and the maximum shear stress in each case was measured. The strength parameters, namely cohesion (c) and angle of internal friction (Ø) were determined from the maximum shear-vs- normal stress plot.

- **Empirical Permeability Evaluation.** The main permeability parameter (coefficient of permeability K) of the encountered soils was estimated empirically using the grain size distribution information.

4.2 SUMMARY OF TEST RESULTS

The results of the mentioned above tests are summarized in the attached tables for treatment plant site and for the trunk lines.

Hijjawi

SUMMARY OF LABORATORY TEST RESULTS

Ref. : SI/625 **Project :** Jericho Wastewater Treatment Plant

Site : Jericho

BH No.	Sample Depth (m)	Moisture Content (%)	Gradation = % Finer Sieve No.					Atterberg Limits		Direct Shear Parameters		USCS Classification	Coefficient of Permeability (K) (m/s)
			3/8" 9.5 mm	#4 4.75 mm	#40 0.425m m	#100 0.150 mm	#200 0.075 mm	LL (%)	PI	C (KN/m²)	Ø (°)		
S1	-311.26-307.263	20.5	100	100	84	76	67	38.1	10.2	39	15	ML	$5X10^{-7}$
	-307.263-291.263	33.2	100	94	88	79	70	40.1	9.7	38	15	ML	$4X10^{-7}$
S2	-313.602-312.102	12.5	100	100	92	82	74	40.2	13.9	40	12	ML	$2X10^{-8}$
	-312.102-301.602	32.3	100	100	94	88	80	45.6	14.3	39	15	ML	$8X10^{-7}$
S3	-315.577-310.577	12.9	100	98	91	80	71	38.2	11.0	37	16	ML	$3X10^{-7}$
	-310.577-295.577	29.9	100	100	98	89	83	41.5	14.3	38	15	ML	$6X10^{-7}$
S4	-316.187-314.187	11.8	100	99	92	86	79	40.1	15.5	39	14	ML	$8X10^{-7}$
	-314.187-296.187	31.0	100	100	94	89	81	40.9	15.9	40	15	ML	$4X10^{-8}$
S5	-317.336-314.336	12.2	100	100	98	90	84	41.1	14.9	40	15	ML	$2X10^{-7}$
	-314.336-302.336	38.5	100	100	99	93	90	45.9	13.5	41	15	ML	$2X10^{-8}$
	-302.336-297.336	32.0	92	89	84	79	68	44.1	14.0	35	17	ML	$9X10^{-6}$

Hijjawi

SUMMARY OF LABORATORY TEST RESULTS

Ref. : SI/625 **Project :** Jericho Sewage Trunk Lines

Site : Jericho

BH No.	Sample Depth (m)	Moisture Content (%)	Gradation = % Finer Sieve No.					Atterberg Limits		Direct Shear Parameters		USCS Classifi-cation	Coefficient of Permeability (K) (m/s)
			3/8" 9.5 mm	#4 4.75 mm	#40 0.425m m	#100 0.150 mm	#200 0.075 mm	LL (%)	PI	C (KN/m²)	Ø (°)		
1	-301.682-296.682	9.9	100	90	84	79	68	36.1	9.1	35	16	ML	$6X10^{-6}$
2	-309.245-307.745	10.2	96	88	77	69	62	35.2	8.5	33	17	ML	$8X10^{-6}$
	-307.745-304.245	17.7	100	96	85	76	58	37.3	7.4	32	18	ML	$8X10^{-5}$
	-304.245-299.245	18.4	100	98	84	79	64	36.8	8.8	34	16	ML	$7X10^{-6}$
3	-293.057-291.557	8.8	100	96	90	87	77	34.4	11.5	37	15	ML	$2X10^{-7}$
	-291.557-290.057	18.1	100	100	94	88	82	36.9	14.0	39	16	ML	$7X10^{-7}$
	-290.057-288.057	19.3	100	100	96	85	80	37.0	13.9	38	16	ML	$7X10^{-7}$
4	-268.461-263.461	4.3	83	77	69	59	47	33.5	13.3	32	18	GP	$7x10^{-4}$
5	-264.650-259.650	9.0	84	71	64	58	45	34.5	14.9	33	16	GP	$4X10^{-4}$
6	-239.252-234.252	8.1	77	68	61	59	49	33.9	14.7	32	19	GP	$2X10^{-4}$
7	-263.504-262.004	7.5	89	81	77	64	54	33.3	14.0	35	16	ML	$6X10^{-5}$
	-262.004-258.504	8.4	82	71	60	48	14	35	14.0	29	20	ML	$7X10^{-4}$

Hijjawi

SUMMARY OF LABORATORY TEST RESULTS

Ref. : SI/625 **Project :** Jericho Sewage Trunk Lines

Site : Jericho

BH No.	Sample Depth (m)	Moisture Content (%)	Gradation = % Finer Sieve No.					Atterberg Limits		Direct Shear Parameters		USCS Classi fi-catio n	Coefficient of Permeability (K) (m/s)
			3/8" 9.5 mm	#4 4.75 mm	#40 0.425m m	#100 0.150 mm	#200 0.075 mm	LL (%)	PI	C (KN/m²)	Ø (°)		
8	-246.504-244.504	9.0	80	70	59	49	28	31.8	18.1	30	16	ML	$2X10^{-5}$
	-244.504-241.504	16.9	100	100	89	80	76	29.9	15.0	34	15	ML	$5X10^{-7}$
9	-282.959-281.459	11.0	100	94	90	84	74	41.1	15.6	34	16	ML	$6X10^{-7}$
	-281.459-277.959	13.8	100	100	99	96	93	47.9	24.8	39	13	ML	$8X10^{-8}$
10	279.643-279.143	6.0	90	80	72	54	33	34	14.1	32	17	ML	$4X10^{-5}$
	-279.143-274.643	7.9	100	100	99	94	90	42.9	17.2	40	13	ML	$2X10^{-8}$

5. REFERENCES

- Environmental Profile for the West Bank – Jericho District Profile – ARIJ Institute, 1995.
- Earth Manual, Part 1 (3rd ed.). US Department of the Interior Bureau of Reclamation, 1998.
- **Code of practice for Site Investigations**. BS 5930: 1981. British Standards Institution.
- **Methods of Test for Soils for Civil Engineering Purposes**. BS 1377: 1975. British Standards Institution.
- K.H. Head. **Manual of Soil Laboratory Testing.** Vol. 1 & 2. ELE International Ltd. London, 1984.
- J.E. Bowles. **Foundation Analysis and Design**. Third edition. McGraw - Hill International, 1982.
- M.J. Tomlinson. **Foundation Design and Construction**. Fourth edition, ELBS, London, 1983.
- R.Peck, W.Hanson, T.Thornburn. **Foundation Engineering**. 2nd edition, Willey, 1980.
- N. Tsytovich. **Soil Mechanics**. Mir Publishers. Moscow, 1987.

6. APPENDICES

APPENDIX-A

BOREHOLE LOGS FOR WASTEWATER TREATMENT PLANT SITE

BOREHOLE LOG

Project	Jericho Wastewater Treatment Plant			**Location**	Jericho
Borehole No.	S1	**Page No.**	1/2	**Date**	16-2-2011
Ground level	-311.263			**Weather**	Sunny
Drill Rig	Mobile B-31			**Operator**	Sharif

Scale (m)		**Sam-pler Type**	**Sample recovery**	**Description of soil strata**	**USCS**	**SPT (No. of blows)**			
						15	**15**	**15**	**N**
-311.263	0		100%	Grayish, soft formation of marl with lenses of white color	ML	5	5	7	12
-310.263	1								
-309.263	2					5	7	11	18
-308.263	3								
-307.263	4		100%	Grayish, soft formation of marl	ML	3	4	6	10
-306.263	5					11	14	19	33
-305.263	6					12	13	15	28
-304.263	7					18	17	18	35
-303.263	8					16	18	19	37
-302.263	9					7	9	10	19
301.263	10			End of boring @ -301.263		8	9	10	19

Water Record			
Level, at which water was encountered	-	**Color of water**	**-**

Remarks :

USCS – Unified Soil Classification System
R – Refusal (more than 50 blows)

SPT (Split spoon sampler)

Core Sampling (Shelby)

Approved :	**Dr. Sami A. Hijjawi**	

BOREHOLE LOG

Project	Jericho Wastewater Treatment Plant			**Location**	Jericho
Borehole No.	S1	**Page No.**	2/2	**Date**	16-2-2011
Ground level	-301.263			**Weather**	Sunny
Drill Rig	Mobile B-31			**Operator**	Sharif

Scale (m)		**Sam-pler Type**	**Sample recovery**	**Description of soil strata**	**USCS**	**SPT (No. of blows)**			
						15	**15**	**15**	**N**
-301.263	10		100%	Grayish, soft formation of marl	ML	8	9	10	19
-300.263	11					5	10	11	21
-299.263	12					15	15	20	35
-298.263	13					15	20	20	40
-297.263	14					13	17	23	40
-296.263	15					13	16	17	33
-295.263	16					12	15	18	33
-294.263	17					11	12	17	29
-293.263	18					8	10	12	22
-292.263	19					20	24	26	46
-291.263	20			End of boring @ -291.263					

Water Record

Level, at which water was encountered	-298.263	**Color of water**	**-**

Remarks :

USCS – Unified Soil Classification System
R – Refusal (more than 50 blows)

SPT (Split spoon sampler)

Core sampling (Shelby)

Approved :	**Dr. Sami A. Hijjawi**	

BOREHOLE LOG

Project	Jericho Wastewater Treatment Plant				Location	Jericho
Borehole No.	S2	**Page No.**	1/2	**Date**	17-2-2011	
Ground level	-313.602			**Weather**	Sunny	
Drill Rig	Mobile B-31			**Operator**	Sharif	

Scale (m)		Sam-pler Type	Sample recovery	Description of soil strata	USCS	SPT (No. of blows) 15	15	15	N
-313.602	0		100%	Whitish soft and dry silty marl	ML	5	6	8	13
-312.602	1					7	9	10	19
-311.602	2		100%	Grayish, soft formation of marl	ML	5	8	9	17
-310.602	3								
-309.602	4					9	12	13	25
-308.602	5								
-307.602	6					10	20	17	37
-306.602	7					7	11	13	24
-305.602	8					10	12	13	25
-304.602	9					9	13	15	28
-303.602	10			End of boring @ -303.602		5	4	5	9

Water Record			
Level, at which water was encountered	-	**Color of water**	**-**

Remarks :

USCS – Unified Soil Classification System
R – Refusal (more than 50 blows)

SPT (Split spoon sampler)

Core sampling (Shelby)

Approved :	**Dr. Sami A. Hijjawi**	

BOREHOLE LOG

Project	Jericho Wastewater Treatment Plant			Location	Jericho
Borehole No.	S2	**Page No.**	2/2	**Date**	17-2-2011
Ground level	-303.602			**Weather**	Sunny
Drill Rig	Mobile B-31			**Operator**	Sharif

Scale (m)		Sam-pler Type	Sample recovery	Description of soil strata	USCS	SPT (No. of blows) 15	15	15	N
-303.602	10					5	4	5	9
-302.602	11					5	9	11	20
-301.602	12					4	7	12	19
-300.602	13					7	10	15	25
-299.602	14					5	9	12	21
-298.602	15		100%	Grayish, soft formation of marl	ML	9	10	13	23
-297.602	16					7	9	14	23
-296.602	17					5	10	13	23
-295.602	18					10	11	12	23
-294.602	19					17	17	19	36
-293.602	20			End of boring @ -301.602					

Water Record

Level, at which water was encountered	-300.602	**Color of water**	-

Remarks :

USCS – Unified Soil Classification System
R – Refusal (more than 50 blows)

SPT (Split spoon sampler)

Core sampling (Shelby)

Approved :	**Dr. Sami A. Hijjawi**	

BOREHOLE LOG

Project	Jericho Wastewater Treatment Plant			**Location**	Jericho
Borehole No.	S3	**Page No.**	1/2	**Date**	17-2-2011
Ground level	-315.577			**Weather**	Sunny
Drill Rig	Mobile B-31			**Operator**	Sharif

Scale (m)		**Sam-pler Type**	**Sample recovery**	**Description of soil strata**	**USCS**	**SPT (No. of blows)**			
						15	**15**	**15**	**N**
-315.577	0					7	5	9	14
-314.577	1					11	12	7	19
-313.577	2					4	5	4	9
-312.577	3					5	4	5	9
-311.577	4		100%	Soft and grayish formation of mal with white lenses (slices)	ML	4	3	3	6
-310.577	5					3	14	12	26
-309.577	6					8	7	12	19
-308.577	7					8	7	12	19
-307.577	8					8	8	12	20
-306.577	9								
-305.577	10			End of boring @ -305.577		7	10	12	22

Water Record			
Level, at which water was encountered		**Color of water**	-

Remarks :

USCS – Unified Soil Classification System
R – Refusal (more than 50 blows)

SPT (Split spoon sampler)

Core sampling (Shelby)

Approved :	**Dr. Sami A. Hijjawi**	

BOREHOLE LOG

Project	Jericho Wastewater Treatment Plant			Location	Jericho
Borehole No.	S3	**Page No.**	2/2	**Date**	17-2-2011
Ground level	-305.577			**Weather**	Sunny
Drill Rig	Mobile B-31			**Operator**	Sharif

Scale (m)		Sam-pler Type	Sample recovery	Description of soil strata	USCS	SPT (No. of blows) 15	15	15	N
-305.577	10		100%	Soft and grayish formation of marl	ML	70	10	12	22
-304.577	11					5	9	13	22
-303.577	12					8	12	15	27
-302.577	13					7	12	14	26
-301.577	14					9	11	16	27
-300.577	15					8	9	12	21
-299.577	16					9	10	16	26
-298.577	17					5	9	13	22
-297.577	18					7	10	13	23
-296.577	19					10	15	17	32
-295.577	20			End of boring @ -295.577					

Water Record

Level, at which water was encountered	-300.577	**Color of water**	-

Remarks :

USCS – Unified Soil Classification System
R – Refusal (more than 50 blows)

SPT (Split spoon sampler)

Core sampling (Shelby)

Approved :	**Dr. Sami A. Hijjawi**	

BOREHOLE LOG

Project	Jericho Wastewater Treatment Plant			**Location**	Jericho
Borehole No.	S4	**Page No.**	1/2	**Date**	18-2-2011
Ground level	-316.187			**Weather**	Sunny
Drill Rig	Mobile B-31			**Operator**	Sharif

Scale (m)		**Sam-pler Type**	**Sample recovery**	**Description of soil strata**	**USCS**	**SPT (No. of blows)**			
						15	**15**	**15**	**N**
-316.187	0		100%	Soft and dry formation of silty marl with white slices	ML	8	13	13	26
-315.187	1					5	7	8	15
-314.187	2		100%	Soft and gray formation of soft marl	ML	7	10	11	21
-313.187	3					5	6	10	16
-312.187	4					5	9	13	22
-311.187	5								
-310.187	6					6	10	12	22
-309.187	7					7	11	14	25
-308.187	8					8	12	14	26
-307.187	9					6	11	15	26
-306.187	10			End of boring @ -306.187					

Water Record

Level, at which water was encountered	-	**Color of water**	**-**

Remarks :

USCS – Unified Soil Classification System
R – Refusal (more than 50 blows)

SPT (Split spoon sampler)

Core sampling (Shelby)

Approved :	**Dr. Sami A. Hijjawi**	

BOREHOLE LOG

Project	Jericho Wastewater Treatment Plant			Location	Jericho
Borehole No.	S4	**Page No.**	2/2	**Date**	18-2-2011
Ground level	-306.187			**Weather**	Sunny
Drill Rig	Mobile B-31			**Operator**	Sharif

Scale (m)		Sam-pler Type	Sample recovery	Description of soil strata	USCS	SPT (No. of blows) 15	15	15	N
-306.187	10		100%	Soft and gray formation of soft marl	ML	6	11	15	26
-305.187	11					9	12	14	26
-304.187	12					5	9	14	23
-303.187	13					5	9	14	23
-302.187	14					7	11	13	24
-301.187	15					7	12	14	26
-300.187	16					9	14	17	31
-299.187	17					8	10	16	26
-298.187	18					14	22	27	49
-297.187	19					12	23	27	50
-296.187	20			End of boring @ -296.187					

Water Record

Level, at which water was encountered	-301.187	**Color of water**	-

Remarks :

USCS – Unified Soil Classification System
R – Refusal (more than 50 blows)

SPT (Split spoon sampler)

Core sampling (Shelby)

Approved :	**Dr. Sami A. Hijjawi**	

BOREHOLE LOG

Project	Jericho Wastewater Treatment Plant			Location	Jericho
Borehole No.	S5	**Page No.**	1/2	**Date**	18-2-2011
Ground level	-317.336			**Weather**	Sunny
Drill Rig	Mobile B-31			**Operator**	Sharif

Scale (m)		Sam-pler Type	Sample recovery	Description of soil strata	USCS	SPT (No. of blows)			
						15	15	15	N
-317.336	0		100%	Soft gray and dry formation of mar with lenses (slices) of white marl	ML	5	7	8	15
-316.336	1					3	8	10	18
-315.336	2					5	7	8	15
-314.336	3		100%	Soft and gray formation of saturated marl	ML	6	10	11	21
-313.336	4					6	10	11	21
-312.336	5					9	12	13	25
-311.336	6					7	10	11	21
-310.336	7					6	9	11	20
-309.336	8					6	10	12	22
-308.336	9								
-307.336	10			End of boring @ -307.336					

Water Record			
Level, at which water was encountered	-	**Color of water**	-

Remarks :

USCS – Unified Soil Classification System
R – Refusal (more than 50 blows)

SPT (Split spoon sampler)

Core sampling (Shelby)

Approved :	**Dr. Sami A. Hijjawi**	

BOREHOLE LOG

Project	Jericho Wastewater Treatment Plant			Location	Jericho
Borehole No.	S5	**Page No.**	2/2	**Date**	18-2-2011
Ground level	-307.336			**Weather**	Sunny
Drill Rig	Mobile B-31			**Operator**	Sharif

Scale (m)		Sam-pler Type	Sample recovery	Description of soil strata	USCS	SPT (No. of blows) 15	15	15	N
-307.336	10		100%	Soft and gray formation of saturated marl	ML	6	10	12	22
-306.336	11					8	12	15	27
-305.336	12					5	9	14	23
-304.336	13					8	12	15	27
-303.336	14					5	8	15	23
-302.336	15		100%	Soft and gray formation of marl with little gravels	ML	22	12	19	31
-301.336	16					9	25	30	55
-300.336	17					23	27	19	46
-299.336	18					22	25	18	43
-298.336	19					20	20	22	42
-297.336	20			End of boring @ -297.336					

Water Record

Level, at which water was encountered	-301.336	**Color of water**	-

Remarks :

USCS – Unified Soil Classification System
R – Refusal (more than 50 blows)

SPT (Split spoon sampler)

Core sampling (Shelby)

Approved :	**Dr. Sami A. Hijjawi**	

APPENDIX-B

BOREHOLE LOGS FOR TRUNK LINES

BOREHOLE LOG

Project	Jericho Sewerage Trunk			**Location**	Jericho
Borehole No.	1	**Page No.**	1/1	**Date**	19-2-2011
Ground level	-301.682			**Weather**	Sunny
Drill Rig	Mobile B-31			**Operator**	Sharif

Scale (m)		**Sam-pler Type**	**Sample recovery**	**Description of soil strata**	**USCS**	**SPT (No. of blows)**			
						15	**15**	**15**	**N**
-301.682	0		100%	Soft formation of creamy marlstone with occasional pebbles	ML	5	7	9	16
-300.682	1					4	8	10	18
-299.682	2					5	6	9	15
-298.682	3								
-297.682	4					10	7	6	13
-296.682	5								
				End of boring @-296.682					

Water Record			
Level, at which water was encountered	None	**Color of water**	**-**

Remarks :

USCS – Unified Soil Classification System
R – Refusal (more than 50 blows)

SPT (Split spoon sampler)

Core sampling (Shelby)

Approved :	**Dr. Sami A. Hijjawi**	

BOREHOLE LOG

Project	Jericho Sewerage Trunk			**Location**	Jericho
Borehole No.	2	**Page No.**	1/1	**Date**	19-2-2011
Ground level	-309.245			**Weather**	Sunny
Drill Rig	Mobile B-31			**Operator**	Sharif

Scale (m)		**Sam-pler Type**	**Sample recovery**	**Description of soil strata**	**USCS**	**SPT (No. of blows)**			
						15	**15**	**15**	**N**
-309.245	0		100%	Soft and dry formation of grayish brown marl with little gravels	ML	7	10	12	22
-308.245	1					9	14	15	29
-307.245	2		100%	Soft and whitish formation of marl with little gravel	ML	8	15	16	31
-306.245	3					15	19	24	43
-305.245	4					11	13	14	27
-304.245	5		100%	Soft and dry formation of grayish marl with little gravels	ML	12	14	17	31
-303.245	6					11	15	20	35
-302.245	7					8	10	11	21
-301.245	8					8	12	13	25
-300.245	9					10	12	15	27
-299.245	10			End of boring @ -299.245					

Water Record			
Level, at which water was encountered	None	**Color of water**	**-**

Remarks :

USCS – Unified Soil Classification System
R – Refusal (more than 50 blows)

SPT (Split spoon sampler)

Core sampling (Shelby)

Approved :	**Dr. Sami A. Hijjawi**	

BOREHOLE LOG

Project	Jericho Sewerage Trunk				Location	Jericho
Borehole No.	3	**Page No.**	1/1	**Date**	19-2-2011	
Ground level	-293.057			**Weather**	Sunny	
Drill Rig	Mobile B-31			**Operator**	Sharif	

Scale (m)		Sam-pler Type	Sample recovery	Description of soil strata	USCS	SPT (No. of blows)			
						15	15	15	N
-293.057	0			Dry soft formation of brown sandy silt	ML	7	21	21	42
-292.057	1								
				Soft grayish formation of marl	ML	6	15	18	33
-291.057	2								
						6	6	6	12
-290.057	3			Soft grayish formation of marl with occasional slices of white marl	ML				
						7	8	10	18
-289.057	4								
						8	8	11	19
-288.057	5								
				End of boring @ -288.057					

Water Record			
Level, at which water was encountered	None	**Color of water**	-

Remarks :
USCS – Unified Soil Classification System
R – Refusal (more than 50 blows)

SPT (Split spoon sampler)

Core sampling (Shelby)

Approved :	**Dr. Sami A. Hijjawi**	

BOREHOLE LOG

Project	Jericho Sewerage Trunk			**Location**	Jericho
Borehole No.	4	**Page No.**	1/1	**Date**	19-2-2011
Ground level	-268.461			**Weather**	Sunny
Drill Rig	Mobile B-31			**Operator**	Sharif

Scale (m)		**Sam-pler Type**	**Sample recovery**	**Description of soil strata**	**USCS**	**SPT (No. of blows)**			
						15	**15**	**15**	**N**
-268.461	0		100	Mix of silty sandy clay and boulders	GP				
						16	32	R	R
-267.461	1								
						R			R
-266.461	2								
						R			R
-265.461	3								
						R			R
-264.461	4								
						R			R
-263.461	5								
				End of boring @ -263.461					

Water Record			
Level, at which water was encountered		**Color of water**	-

Remarks :

USCS – Unified Soil Classification System
R – Refusal (more than 50 blows)

SPT (Split spoon sampler)

Core SAMPLING (Shelby)

DTH Sampling

Approved :	**Dr. Sami A. Hijjawi**	

BOREHOLE LOG

Project	Jericho Sewerage Trunk			**Location**	Jericho
Borehole No.	5	**Page No.**	1/1	**Date**	20-2-2011
Ground level	-264.650			**Weather**	Sunny
Drill Rig	Mobile B-31			**Operator**	Sharif

Scale (m)		**Sam-pler Type**	**Sample recovery**	**Description of soil strata**	**USCS**	**SPT (No. of blows)**			
						15	**15**	**15**	**N**
-264.650	0		100%	Light to medium dark brown silty gravelly sand with occasional boulders	GP	21	32	45	R
-263.650	1					25	40	R	R
-262.650	2					30	R		R
-261.650	3					21	15	18	33
-260.650	4								
						20	42	R	R
-259.650	5								
	6								
				End of boring @ -259.650					

Water Record			
Level, at which water was encountered	None	**Color of water**	**-**

Remarks :

USCS – Unified Soil Classification System
R – Refusal (more than 50 blows)

SPT (Split spoon sampler)

Core sampling (Shelby)

DTH Sampling

Approved :	**Dr. Sami A. Hijjawi**	

BOREHOLE LOG

Project	Jericho Sewerage Trunk			**Location**	Jericho
Borehole No.	6	**Page No.**	1/1	**Date**	20-2-2011
Ground level	-239.252			**Weather**	Sunny
Drill Rig	Mobile B-31			**Operator**	Sharif

Scale (m)		**Sam-pler Type**	**Sample recovery**	**Description of soil strata**	**USCS**	**SPT (No. of blows)**			
						15	**15**	**15**	**N**
-239.252	0		100%	Light brown formation of sandy silt with gravels and boulders	GP	7	14	19	33
-238.252	1					R			R
-237.252	2					R			R
-236.252	3					R			R
-235.252	4					R			R
-234.252	5								
				End of boring @ -234.252					

Water Record			
Level, at which water was encountered	None	**Color of water**	**-**

Remarks :

USCS – Unified Soil Classification System
R – Refusal (more than 50 blows)

SPT (Split spoon sampler)

Core sampling (Shelby)

DTH Sampling

Approved :	**Dr. Sami A. Hijjawi**	

BOREHOLE LOG

Project	Jericho Sewerage Trunk				Location	Jericho
Borehole No.	7	**Page No.**	1/1	**Date**	20-2-2011	
Ground level	-263.504			**Weather**	Sunny	
Drill Rig	Mobile B-31			**Operator**	Sharif	

Scale (m)		Sam-pler Type	Sample recovery	Description of soil strata	USCS	SPT (No. of blows) 15	15	15	N
-263.504	0			Reddish brown soft formation of sandy silt with little gravels	ML				
			100%			5	11	15	26
-262.504	1								
				Light brown sandy silt with occasional boulders	ML	5	14	15	29
-261.504	2								
			100%			29	33	R	R
-260.504	3								
						19	17	17	34
-259.504	4								
						19	17	18	35
-258.504	5								
				End of boring @ -258.504					

Water Record			
Level, at which water was encountered	None	**Color of water**	**-**

Remarks :

USCS – Unified Soil Classification System
R – Refusal (more than 50 blows)

SPT (Split spoon sampler)

Core barrel sampling

DTH Sampling

Approved :	**Dr. Sami A. Hijjawi**	

BOREHOLE LOG

Project	Jericho Sewerage Trunk				Location	Jericho
Borehole No.	8	**Page No.**	1/1	**Date**	20-2-2011	
Ground level	-246.504			**Weather**	Sunny	
Drill Rig	Mobile B-31			**Operator**	Sharif	

Scale (m)		Sam-pler Type	Sample recovery	Description of soil strata	USCS	SPT (No. of blows)			
						15	15	15	N
-246.504	0		100%	Light brown sandy gravelly silt	ML				
						24	22	25	47
-245.504	1								
						14	12	14	26
-244.504	2		100%	Soft formation grayish brown clayey silt	ML				
						14	14	16	30
-243.504	3								
						15	15	18	33
-242.504	4								
						12	15	16	31
-241.504	5								
				End of boring @ -241.504					

Water Record

Level, at which water was encountered	None	**Color of water**	-

Remarks :

USCS – Unified Soil Classification System
R – Refusal (more than 50 blows)

SPT (Split spoon sampler)

Core sampling (Shelby)

DTH Sampling

Approved :	**Dr. Sami A. Hijjawi**	

BOREHOLE LOG

Project	Jericho Sewerage Trunk			**Location**	Jericho
Borehole No.	9	**Page No.**	1/1	**Date**	20-2-2011
Ground level	-282.959			**Weather**	Sunny
Drill Rig	Mobile B-31			**Operator**	Sharif

Scale (m)		**Sam-pler Type**	**Sample recovery**	**Description of soil strata**	**USCS**	**SPT (No. of blows)**			
						15	**15**	**15**	**N**
-282.959	0		100%	Reddish brown sandy silt with gravels	ML	28	42	R	R
-281.959	1					15	25	19	44
-280.959	2		100%	Dark brown sandy silty clay with very little pebbles	CL	15	24	17	41
-279.959	3					10	15	18	33
-278.959	4								
-277.959	5								
				End of boring @ -277.959					

Water Record			
Level, at which water was encountered	None	**Color of water**	**-**

Remarks :

USCS – Unified Soil Classification System
R – Refusal (more than 50 blows)

SPT (Split spoon sampler)

Core sampling (Shelby)

DTH Sampling

Approved :	**Dr. Sami A. Hijjawi**	

BOREHOLE LOG

Project	Jericho Sewerage Trunk			**Location**	Jericho
Borehole No.	10	**Page No.**	1/1	**Date**	20-2-2011
Ground level	-279.643			**Weather**	Sunny
Drill Rig	Mobile B-31			**Operator**	Sharif

Scale (m)		**Sam-pler Type**	**Sample recovery**	**Description of soil strata**	**USCS**	**SPT (No. of blows)**			
						15	**15**	**15**	**N**
-279.643	0		100%	Light brown Sandy silt with boulders	ML	7	17	19	36
-278.643	1					7	6	7	13
-277.643	2		100%	Soft and dry white formation of marl	ML	9	7	6	13
-276.643	3					12	15	11	26
-275.643	4					14	15	18	33
-274.643	5								
				End of boring @ -274.643					

Water Record			
Level, at which water was encountered	None	**Color of water**	**-**

Remarks :

USCS – Unified Soil Classification System
R – Refusal (more than 50 blows)

SPT (Split spoon sampler)

Core sampling (Shelby)

DTH Sampling

Approved :	**Dr. Sami A. Hijjawi**	

5-2　社会意識調査結果

１．報告書本文

A-107～A-161

２．結果概要

社会意識調査を現地再委託調査により 2011 年１月に行った。調査は一般家屋（170 戸)、ホテル（４軒)、商店（25 店)、及び工場（11 社）に対して市内全域で偏りができないように行った。それぞれのカテゴリーの諸条件について、個人住宅の主な収入源、病気の回数や医療費等を添付表 5-2-1、ホテルの客数等について添付表 5-2-2、商店と工場の業種について添付表 5-2-3 に示す。

サンプル数 210 全体の集計結果は添付表 5-2-4 に示すとおりである。

添付表 5-2-1　対象個人住宅の調査結果

項目		平均値
平均収入(NIS/月)		2,512
平均支出（NIS/月)		2,532
病気になる延べ回数	家毎（回/家/年)	48.2
	一人当たり（回/人/年)	8.6
病気の原因	水(%)	11.2
	食物(%)	5.3
	衛生施設(%)	4.7
	その他(%)	78.8
年間医薬費（NIS/年)		1093
主要収入源（%）	農業	7.1
	商取引	14.7
	サービス(公務員含）	32.9
	観光	1.4
	建設	43.5
	その他	0.6

添付表 5-2-2　対象ホテルの調査結果

項目		平均値
客室数（室)		85.5
客　数（人）	年間	7,975
	日間	29

添付表 5-2-3　対象商店・工場の業種

商店		工場	
業種	割合(%)	業種	割合(%)
全般	40	食品	36.4
衣料	20	プラスティック	9.1
建設資機材	4	金属	9.1
家庭水回り商品	16	木製品	9.1
その他	20	その他	36.4

添付表 5-2-4　社会意識調査の結果集計表

項目			個人住宅	ホテル	商店	工場
サンプル数			170	4	25	11
平均住民（従業員)数（人）			5.61	50	2.24	20.3
平均面積(m²)			125	8,314	53	3,081
平均水道料（NIS/月）			101	12,643	46	1,472
トイレ	位置	屋内(%)	97.6	100	68	100
		屋外(%)	2.4		28	
		無し			4	
	形式	水洗(%)	81.8	100	56	81.8
		溜めます(%)	18.2		12	18.2
給水	給水栓位置	屋内(%)	78.2	100	68	63.6
		屋外(%)	21.8		28	36.4
		無し			4	
	夏期給水量	月(m³)	43.34	584	26.7	272.5
		Lpcd	258			
	冬給水量	月(m³)	21.32	351	17.4	183.1
		Lpcd	127			
セスピット	雑排水流入	全量(%)	87.6	100	68	100
		部分的(%)	11.8			
		無し(%)	0.6		32	
	使用形態	専用(%)	31.8	100	4	63.6
		共有(%)	68.2		64	36.4
		無し(%)			32	
	汚水引抜き（回/年）		6.42	0.75	2.72	23.4
	引抜き費用(NIS/回)		76.3	525	69.4	136.4
感染の原因(%)	経口		8.2		8	9
	接触		4.1		4	
	衛生環境		84.1	100	88	91
	その他		3.5			
衛生環境が心配(%)			98.2	100	100	100
周辺の水環境も同様に心配(%)			98.2	100	100	100
衛生環境の改善には下水の接続が必要(%)			98.8	100	100	100
下水処理水再利用,汚泥肥料使用に賛成(%)			70	100	92	90
下水処理水を農業灌漑に使うことに賛成(%)			64.7	100	88	90
下水料金を負担する(%)			85.9	50	96	100
下水料金の負担限界（月/NIS)			63	300	66	129
下水道施設の建設に賛成(%)			97.1	100	100	100
下水に接続後もセスピットを使う(%)			31.2	50	4	9.1
政府事業の優先順位(0-10 のスケール)	給水		8.8	7	8	8.8
	下水		8.6	8	9.1	8.6
	道路		7.3	7.5	4.5	5
	教育		8.3	5	4.4	5.3
	通信		6.7	6.25	3	3.8
	電力		7.8	7	5.3	6.7
	医療		9	6	6.8	6.7
	灌漑		7.9	6.25	5.5	5
	ゴミ収集		8.4	9.25	7.2	7.5

The Methodology of the Social Survey on the City of Jericho
February 18-20, 2011

The JICA Study Team (the Team) composed by the staff of NJS consultant Co., Ltd contracted out a survey study on the social conditions in Jericho Municipality to the Center for Opinion Polls and Survey Studies at An-Najah National University.
The survey addressed the consumption of water in houses, stores, factories and hotels. It also addressed sewage water drainage from the same places and the hygienic awareness of the inhabitants of the area. As requested by the Team the size of the sample was, 170 families, 11 factories, 4 hotels, and 25 stores.
The preparation of the survey questionnaire was made after consultations with the Team; the Team provided the Center for Opinion Polls and Survey Studies with the main points that the survey had undertaken. The questionnaire then was prepared accordingly. Four questionnaires were prepared and each questionnaire was designed to fit the requirements of the surveyed item it represents according to its functions. There are some questions that are shared by all surveyed items.
The survey was pretested by a sample that consisted of 20 questionnaires distributed as follows: 10 families, 4 factories, two hotels and 4 stores. The purpose of the pretest was to examine the validity of the questionnaire and its reception among respondents.

Training the field workers (researchers) of the survey:
The field coordinators were called to lay down the needed arrangements of the survey so that suitable field workers (researchers) are chosen. After that the field workers (researchers) were invited to be trained on the methodology of conducting interviews and on the proper way of dealing with the target groups whether they were individuals or institutions. During the time of the survey there were field supervisors whose task was to verify the accuracy of the adopted methodology through close supervision by accompanying the field workers (researchers) and through moving among them. The supervisors conducted a random testing on the questionnaires to verify the place in which the questionnaire was filed out and the interviewed person. Supervisors also made sure that the questionnaire was properly completed without mistakes or unanswered questions.

The survey sample was distributed as follows:
The houses' sample: a random stratified sample was adopted. Four neighborhoods were selected randomly from the City. The components of the sample then were chosen; one house was chosen from every three houses. The sample of houses was distributed as follows:

- Kitf Al- Wad neighborhood: the starting point of collecting questionnaires was from near the previous location of Al-Quds Open University, near Al-Rawda Park. 84 questionnaires were collected from this neighborhood.
- Sabeha Al-Khedawi neighborhood: the starting point of collecting questionnaires was from behind the Tarra Santa School near Al-Itihad Youth Club; 39 questionnaires were collected from this neighborhood.
- Al-Magatas neighborhood: 35 questionnaires were collected
- Al-Jaza'ir neighborhood: 12 questionnaires were collected

The reason for the diversity in the number of collected questionnaires is related to the existing numbers of houses in each neighborhood.

The stores sample: it was collected from the following neighborhoods: Al-Magatas, Al-Bayader – the Electric Company; Amman Street, Falastine Street, the City Center, and Amman Main Street.

The factories sample: The following factories were interviewed: Al-Tumoor (Dates) Factory, Palestine Street; Tumoor Al-Madina Factory, Hisham's Palace Street; Abu Zainah Plastic Factory, near Al Hesba (the fruits and vegetables market); Al-Fityani Brick Factory, Al Hesba Street; Ghosheh Food Factory, A brick factory near Popeye Park street; Jericho Iron Factory, Popeye Street; a food and dates factory, Popeye street in front of the new vegetables and fruits market, and Al-Shawwa Clothes Factory on Palestine Street.

The hotels sample: Four hotels were interviewed in the city of Jericho. They are: The Intercontinental, Al-Quds, Madinat Al_Qamar, and the Jericho Tourist Village.

After collection, the data it was processed by the SPSS program and the results were drawn by the same program.

Residential Houses

The Results

Residential Houses

The size of the survey sample collected from residential houses were 170 household.

- The average family size is 5.61 persons
- 97.6% of respondents said that they have sanitary facilities inside their houses; 2.4% said that they have sanitary facilities outside their houses.
- The location of the water source (tap water) for houses is distributed as follows: 78.2 % inside the building, 21.8% outside the building.
- The average water consumption in houses during summer (the dry season) is about 43.34 m^3 per month.
- The average water consumption in houses during winter (the rain season) is about 21.32 m^3 per month.
- The average distance between houses and the source of water is about 7.67 meter.
- 85.3% of respondents said that the source of water in houses is individual, 14.1% said it is an outdoors faucet, 0.6% said it is an individual and private well of water.
- 31.2% of respondents said that they would continue to use the sanitary pit even after connection to the sewage system network.
- 81.8% of respondents said that the sanitary facilities available at the house are provided with flushing toilet; 18.2% said that they are provided with a pit latrine
- 87.6% of houses drain the sewage water into a cesspit made especially for the house, 0.6% drain it in the open and 11.8% drain it into a cesspit and in the open.
- 31.8% of houses are connected to a cesspit made especially for the house; 68.2% share a cesspit with other houses.
- The average number of times the cesspit is emptied is 6.42 times every year.
- The average cost of emptying the sanitary pit is 76.29 NIS per time.
- The average monthly income of the household is 2512.06 NIS.
- The household's source of income; 7.1% from the agriculture, 14.7% from the trade, 32.9% from services, 1.8% from tourism and 43.5% from construction.
- The average monthly expenditures of the household is 2531.81 NIS.
- The average monthly water bill for houses is 100.67 NIS per month.
- The average annual number of sickness per household is 48.18 times.
- The causes of sickness according to respondents are: 11.2% water, 5.3% food, 4.7% sanitary system, 78.8% others.
- The average annual expenditure on healthcare per household is 1093.18 NIS.

Ecological and Hygienic Awareness

- According to respondents, the infectious routes are 8.2% through the mouth (oral), 4.1% through touch, 84.1% through the ecological surroundings and 3.5% others.

- 98.2% of respondents said that the sanitary conditions at home are one of their concerns
- 98.2% of respondents said that the sanitary conditions of water ecology and their neighborhoods are one of their concerns
- 98.8% of respondents said that their concern with sanitary conditions is meant to improve connection to the sewage system network.
- 70% of respondents supported reusing treated sewage water and using the remains as fertilizers.
- 64.7% of respondents supported reusing treated sewage water for agricultural purposes.
- 85.9% of respondents expressed willingness to pay accrued fees for water and sanitary services.
- From among respondents who expressed willingness to pay accrued fees for water and sanitary services said that the monthly amount that they can pay is 62.81 NIS
- 97.1% of respondents supported the construction of a sewerage system.
- Priorities of respondents for what they would like the government to improve are as follows: (on a 0–10 scale)
  Water supply 8.79
  Sewerage system 8.64
  Road 7.34
  Education 8.33
  Telecommunication 6.68
  Electricity 7.84
  Medication 8.99
  Irrigation 7.86
  Garbage collection 8.39

Residential Houses
Tables

Where are the sanitation facilities located?

(%)

Area/Category	Inside the house	Outside the House
Ktef Al-Wade	98.8	1.2
Sabeaha Al-khedaway	97.1	2.9
Al-Maghtas	94.9	5.1
Algeria	100.0	
Total	97.6	2.4

Source of water; location of the faucet

(%)

Area/Category	Inside the building	Outside the building
Ktef Al-Wade	78.6	21.4
Sabeaha Al-khedaway	71.4	28.6
Al-Maghtas	79.5	20.5
Algeria	91.7	8.3
Total	78.2	21.8

Source of water in the house

(%)

Area/Category	Individual	Outside faucet	Private (individual) well
Ktef Al-Wade	90.5	9.5	
Sabeaha Al-khedaway	80.0	17.1	2.9
Al-Maghtas	84.6	15.4	
Algeria	66.7	33.3	
Total	85.3	14.1	0.6

Will you still use the sanitation pit even after connecting to the sewage network?

(%)

Area/Category	Yes	No
Ktef Al-Wade	26.2	73.8
Sabeaha Al-khedaway	40.0	60.0
Al-Maghtas	35.9	64.1
Algeria	25.0	75.0
Total	31.2	68.8

Type of sanitary facility available in the house

(%)

Area/Category	Flushing Toilet	Pit latrine
Ktef Al-Wade	81.0	19.0
Sabeaha Al-khedaway	82.9	17.1
Al-Maghtas	76.9	23.1
Algeria	100.0	
Total	81.8	18.2

Method of getting rid of sewage water

(%)

Area/Category	Sanitary pit	In the open	In a pit and in the open
Ktef Al-Wade	90.5		9.5
Sabeaha Al-khedaway	82.9		17.1
Al-Maghtas	84.6	2.6	12.8
Algeria	91.7		8.3
Total	87.6	0.6	11.8

Is the house connected to a sanitary pit?

(%)

Area/Category	There is a private sanitary pit for the house	There is a sanitary pit shared with others
Ktef Al-Wade	39.3	60.7
Sabeaha Al-khedaway	37.1	62.9
Al-Maghtas	17.9	82.1
Algeria	8.3	91.7
Total	31.8	68.2

What is the source of the family's income?

(%)

Area/Category	Agriculture	Commerce (business)	Services	Tourism	Construction
Ktef Al-Wade	7.1	13.1	29.8		50.0
Sabeaha Al-khedaway		20.0	31.4	5.7	42.9
Al-Maghtas	10.3	15.4	38.5	2.6	33.3
Algeria	16.7	8.3	41.7		33.3
Total	7.1	14.7	32.9	1.8	43.5

What is cause for getting sickness?

(%)

Area/Category	Water	Food	Sewerage	Unknown
Ktef Al-Wade	10.7	10.7	4.8	73.8
Sabeaha Al-khedaway	14.3			85.7
Al-Maghtas	7.7		7.7	84.6
Algeria	16.7		8.3	75.0
Total	.11	5.3	4.7	78.8

What are the infectious routes in your opinion?

(%)

Area/Category	Oral	Contagion	Environment	Others
Ktef Al-Wade	8.3	2.4	85.7	3.6
Sabeaha Al-khedaway	5.7	2.9	91.4	
Al-Maghtas	12.8	5.1	74.4	7.7
Algeria		16.7	83.3	
Total	8.2	4.1	84.1	3.5

Is the sanitary condition one of your concerns at home?

(%)

Area/Category	Yes	No
Ktef Al-Wade	97.6	2.4
Sabeaha Al-khedaway	100.0	
Al-Maghtas	97.4	2.6
Algeria	100.0	
Total	98.2	1.8

Is the sanitary condition one of your concerns at your neighborhood?

(%)

Area/Category	Yes	No
Ktef Al-Wade	97.6	2.4
Sabeaha Al-khedaway	100.0	
Al-Maghtas	97.4	2.6
Algeria	100.0	
Total	98.2	1.8

Is the sanitary condition one of your concerns that would lead to the improvement in sewage system ?

(%)

Area/Category	Yes	No
Ktef Al-Wade	100.0	
Sabeaha Al-khedaway	100.0	
Al-Maghtas	94.9	5.1
Algeria	100.0	
Total	98.8	1.2

Do you support or reject reusing treated sewage water and using the remains as manure?

(%)

Area/Category	Yes, I support	No, I reject
Ktef Al-Wade	77.4	22.6
Sabeaha Al-khedaway	62.9	37.1
Al-Maghtas	64.1	35.9
Algeria	58.3	41.7
Total	70.0	30.0

Do you support using treated sewage water for irrigation?

(%)

Area/Category	Yes, I support	No, I reject
Ktef Al-Wade	69.0	31.0
Sabeaha Al-khedaway	65.7	34.3
Al-Maghtas	56.4	43.6
Algeria	58.3	41.7
Total	64.7	35.3

Are you willing to pay the water and sewage bill?

(%)

Area/Category	Yes	No	I do not know/ no opinion
Ktef Al-Wade	91.7	2.4	6.0
Sabeaha Al-khedaway	88.6	8.6	2.9
Al-Maghtas	79.5	17.9	2.6
Algeria	58.3	25.0	16.7
Total	85.9	8.8	5.3

Will you support the construction of a sewerage system if it starts?

(%)

Area/Category	Yes	No	I do not know/ no opinion
Ktef Al-Wade	98.8		1.2
Sabeaha Al-khedaway	94.3	2.9	2.9
Al-Maghtas	94.9	2.6	2.6
Algeria	100.0		
Total	97.1	1.2	1.8

Basic information

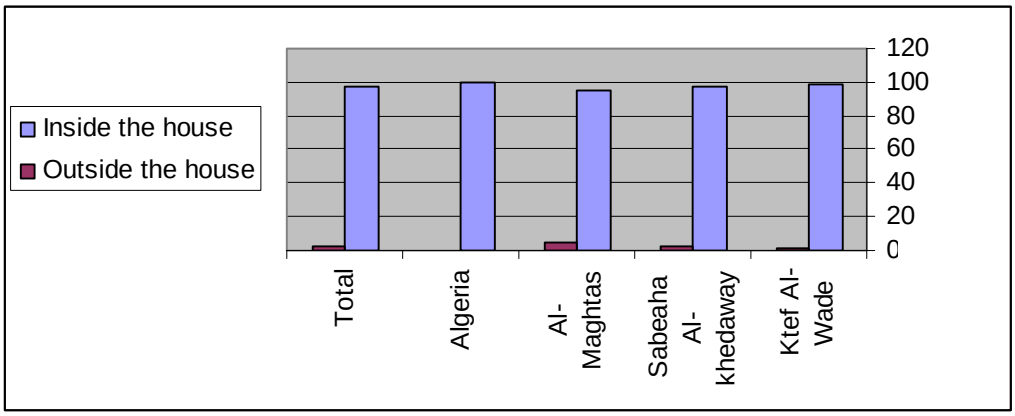
Category/Area	Ktef Al-Wade	Sabeaha Al-khedaway	Al-Maghtas	Algeria	Total
Number of Family members	5.7	4.9	5.7	6.3	5.6
Average of water consumption during dry seasons (Summer) -----m^3 per day	37.5	49.1	50.1	56.4	43.3
Average of water consumption during wet seasons (Winter) ------m^3 per day	17.7	24.1	26.1	31.01	21.31
Q6 Distance from the source of water ------ meter	7.61	7.1	8.31	7.8	7.7
Number of times the sanitary pit is emptied. ------ times every year	6.4	3.5	8.9	7.0	6.4
Cost of emptying the sanitary pit-------NIS per time	89.6	52.0	73.6	62.5	76.3
The average monthly income of the family. ---- NIS	2416	2809	2428	2592	2512
What is the average monthly expenditures of the family? ----- NIS per month	2226	2917	2777	2750	2532
What is the average monthly water bill? ----NIS per month	90.3	156.8	84.1	63.3	100.7
Expense for medical care per year per family: ------ NIS/year/family	1065	1202	1215	575	1093
what is the amount of money that you can pay for the water and sewage bill? --NIS per month	70.9	60.3	49.7	42.9	62.8

Please set priorities on a 0-10 scale for what you would like to get improved by the government

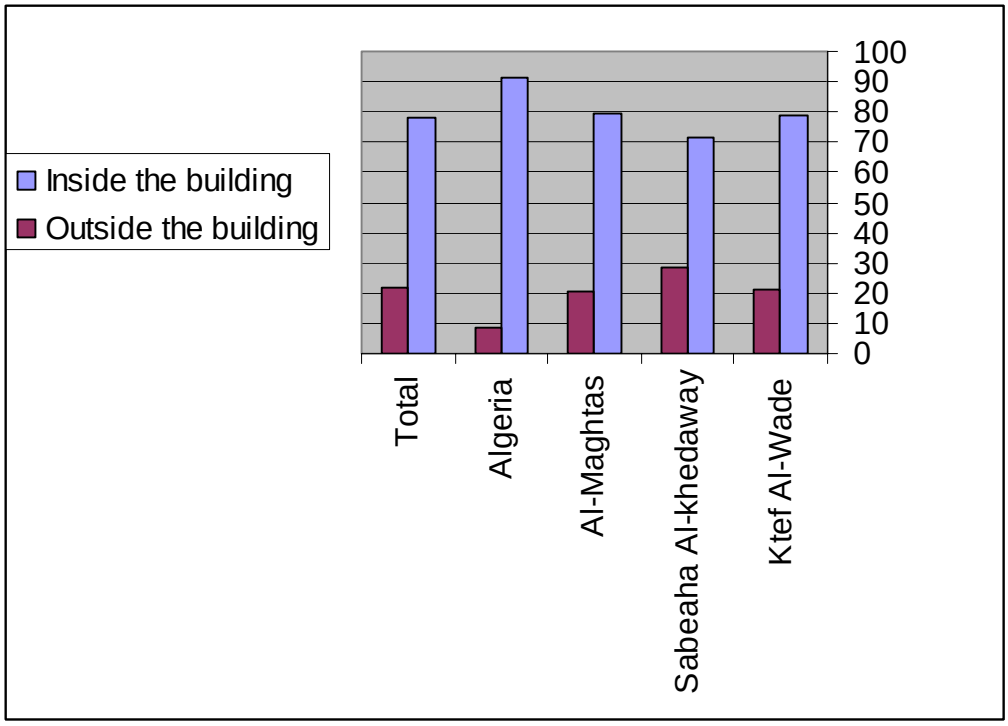
	Ktef Al-Wade	Sabeaha Al-khedaway	Al-Maghtas	Algeria	Total
Water supply	8.3	9.2	9.3	9.0	8.8
Sewerage system	8.5	8.8	9.0	8.3	8.6
Road	5.8	8.8	8.6	8.3	7.2
Education	7.5	9.3	8.9	9.6	8.3
Telecommunication	5.3	8.1	7.9	8.6	6.7
Electricity	6.6	9.0	9.0	9.5	7.8
Medication	8.5	9.3	9.5	9.9	9.0
Irrigation	8.3	9.2	9.3	9.0	8.8
Garbage collection	8.5	8.8	9.0	8.3	8.6

Residential Houses
Graphs

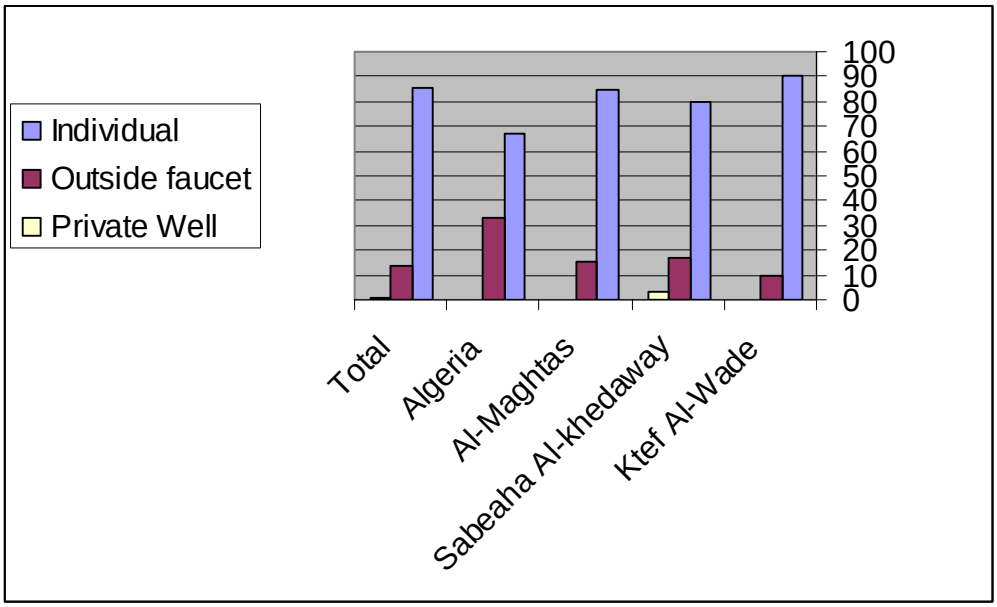
Where are the sanitation facilities located?



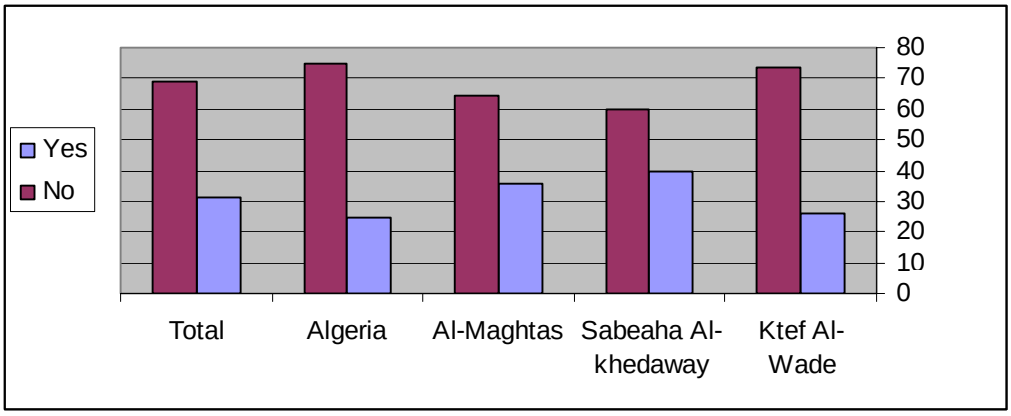
Source of water; location of the faucet



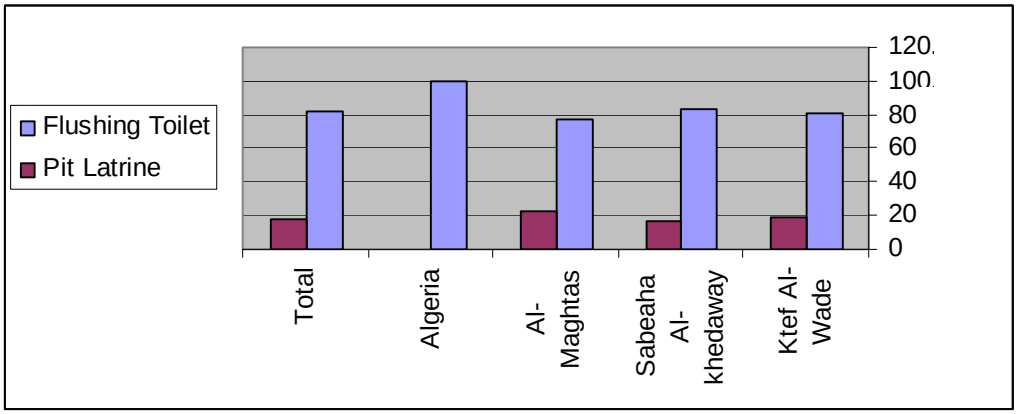
Source of water in the house



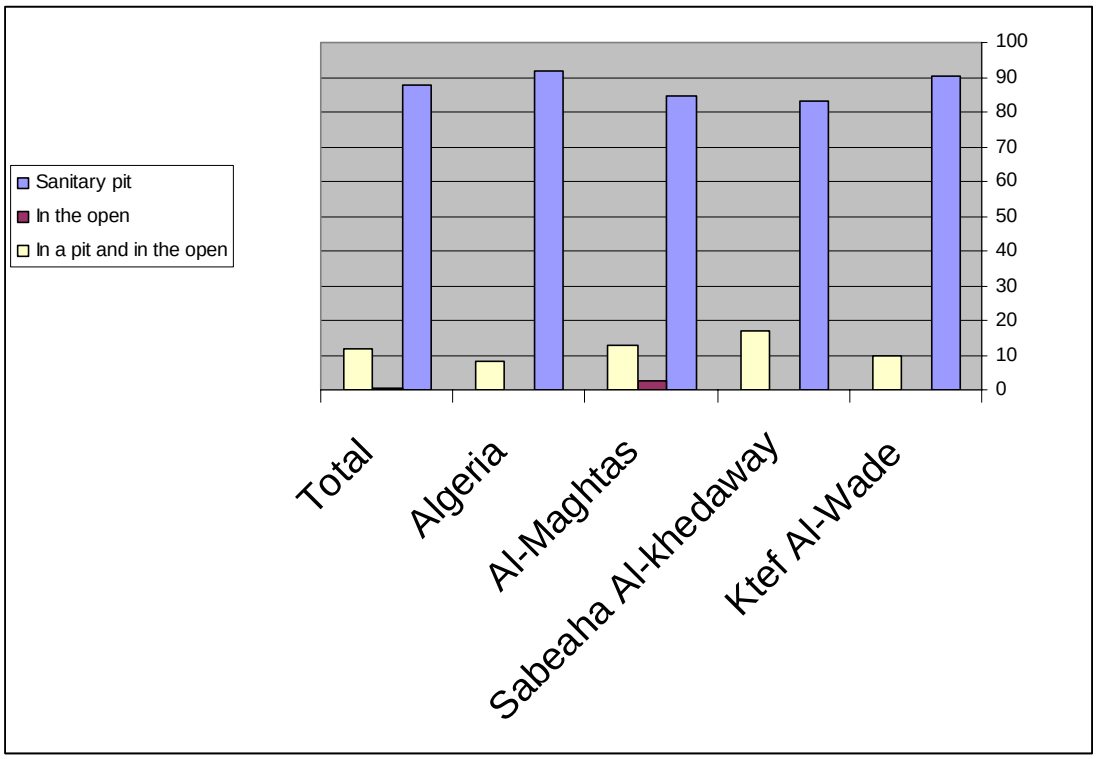
Will you still use the sanitation pit even after connecting to the sewage network?



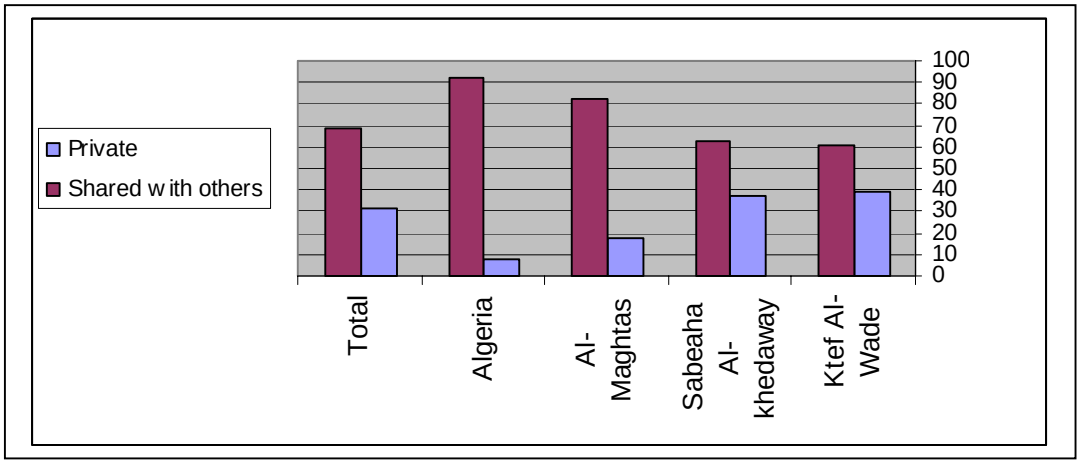
Type of sanitary facility available in the house



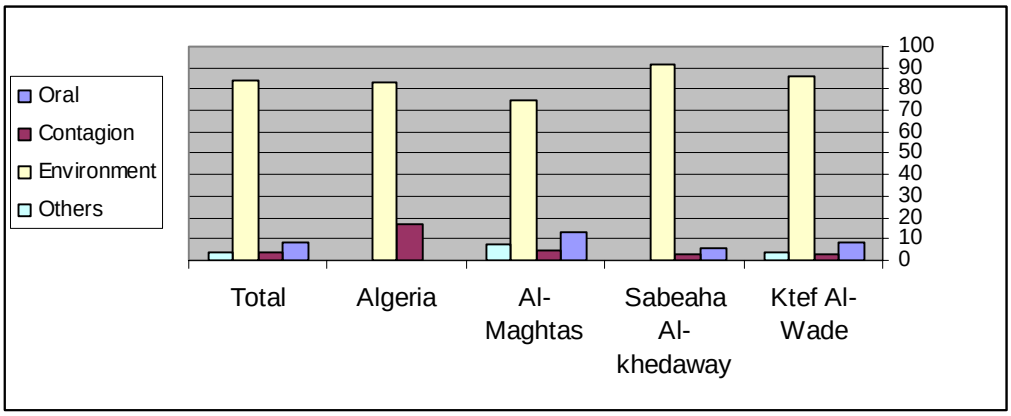
Method of getting rid of sewage water



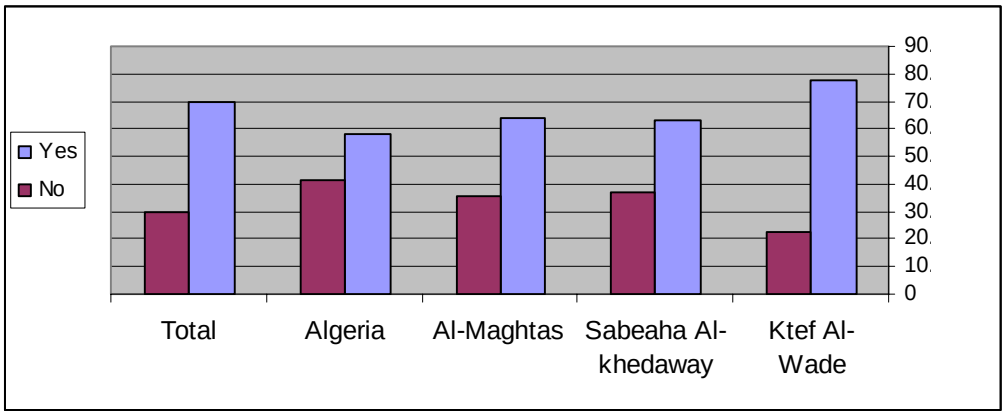
Is the house connected to a sanitary pit?



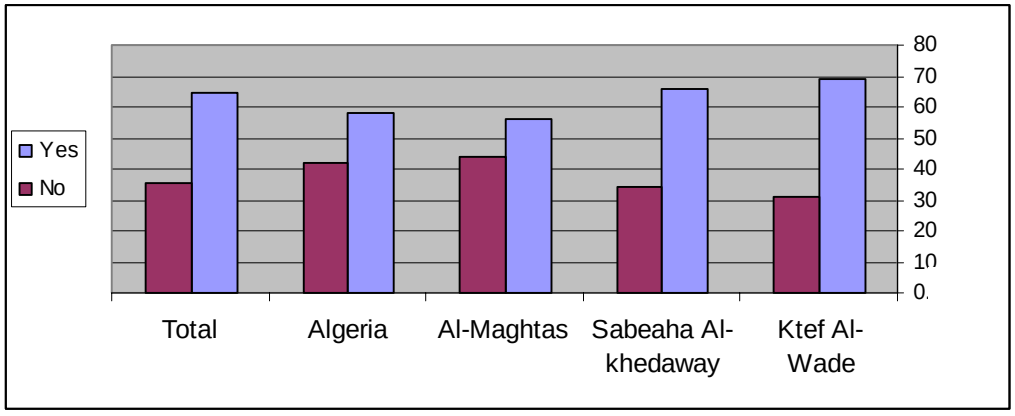
What are the infectious routes in your opinion?



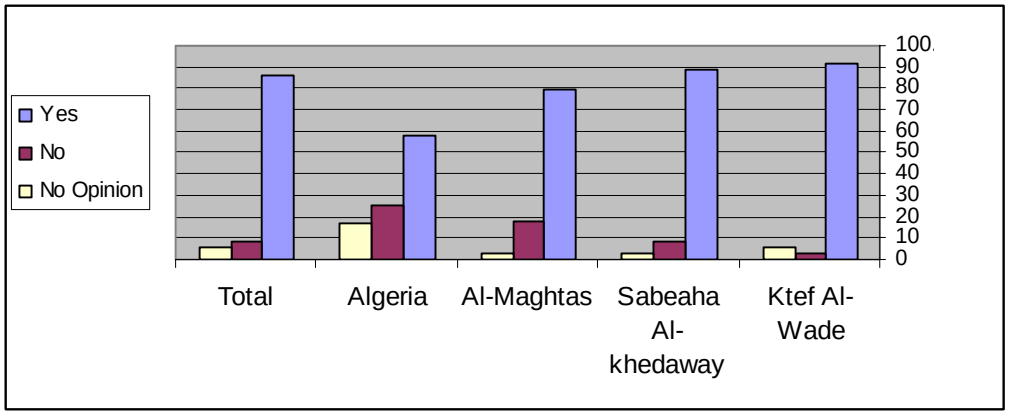
Do you support or reject reusing treated sewage water and using the remains as manure?



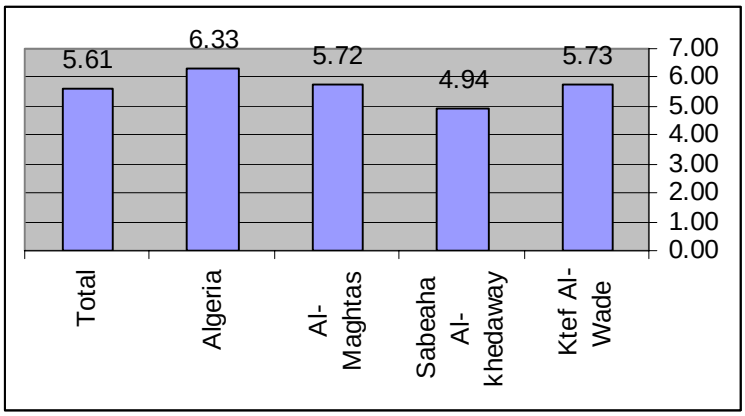
Do you support using treated sewage water for irrigation?



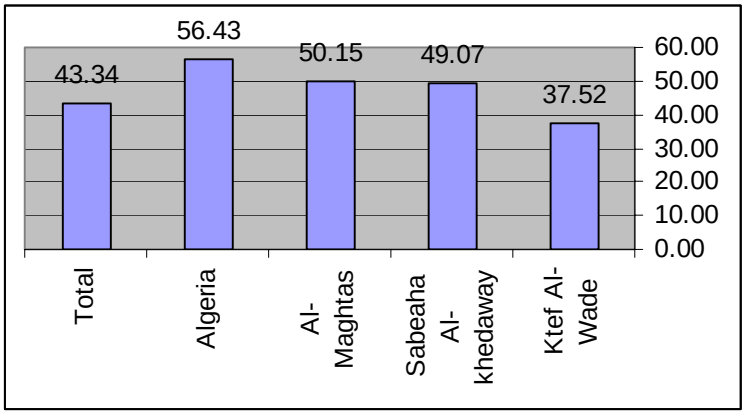
Are you willing to pay the water and sewage bill?



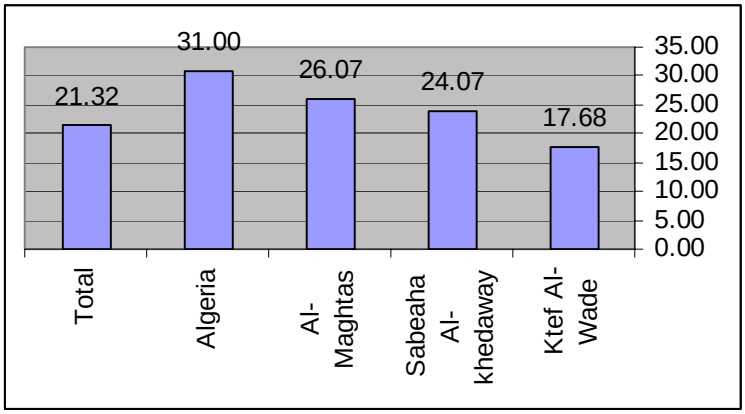
Number of Family members



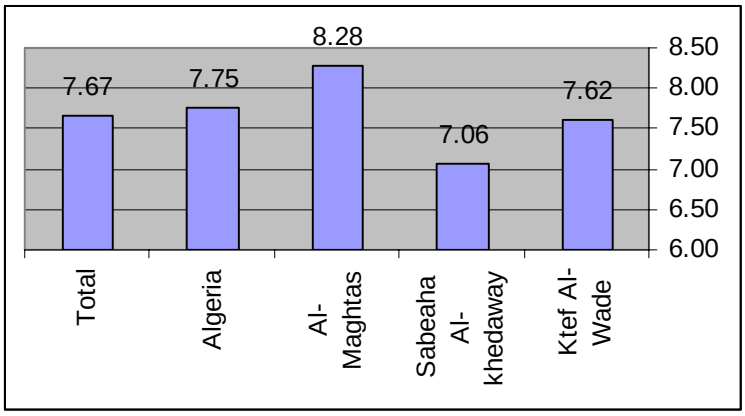
Average of water consumption during dry seasons (Summer) -----m³ per day



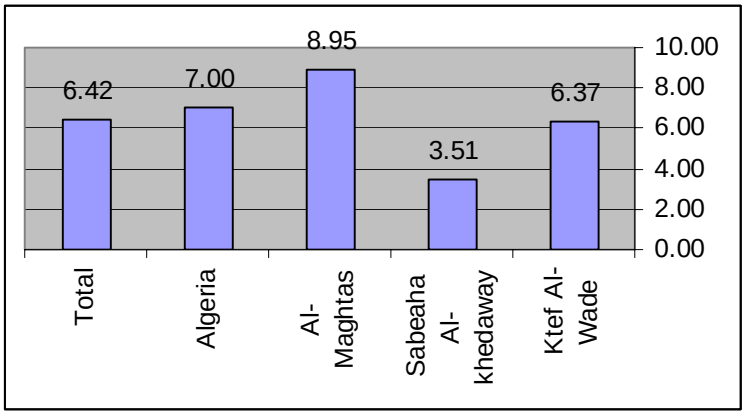
Average of water consumption during wet seasons (Winter) ------m³ per day



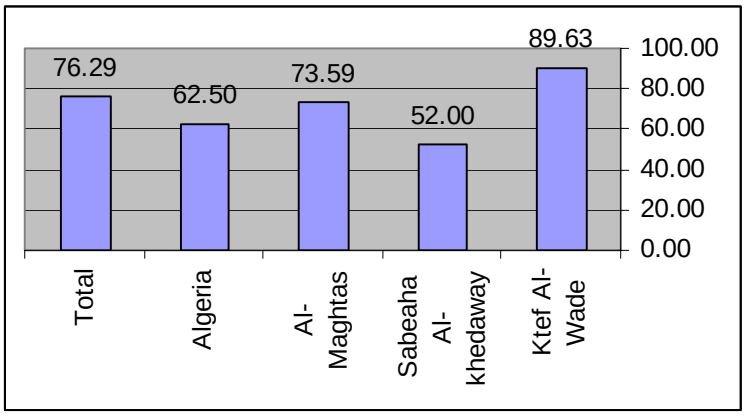
Distance from the source of water ------ meter



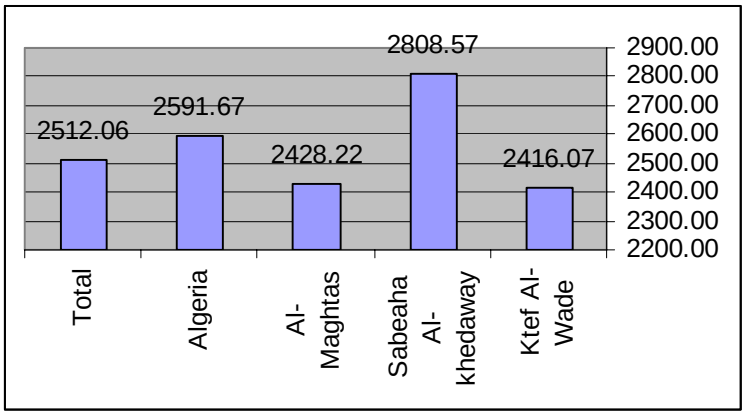
Number of times the sanitary pit is emptied. ------ times every year



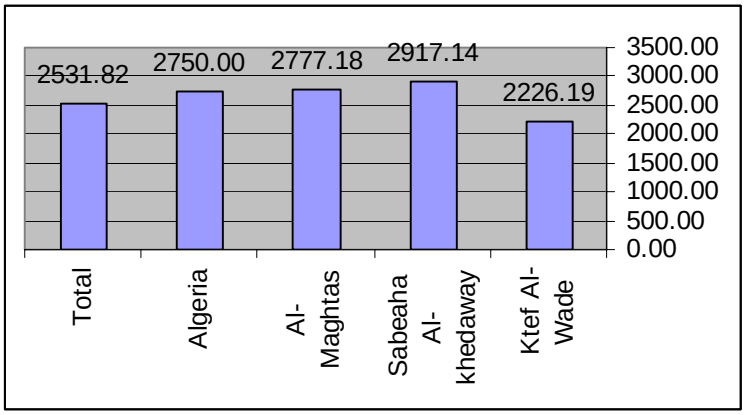
Cost of emptying the sanitary pit-------NIS per time



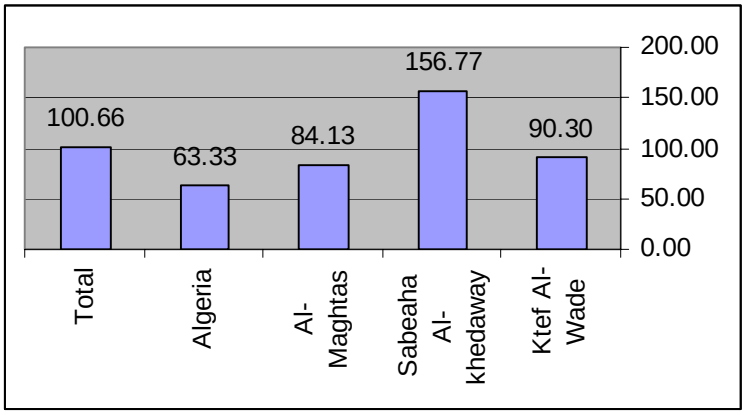
The average monthly income of the family. ---- NIS



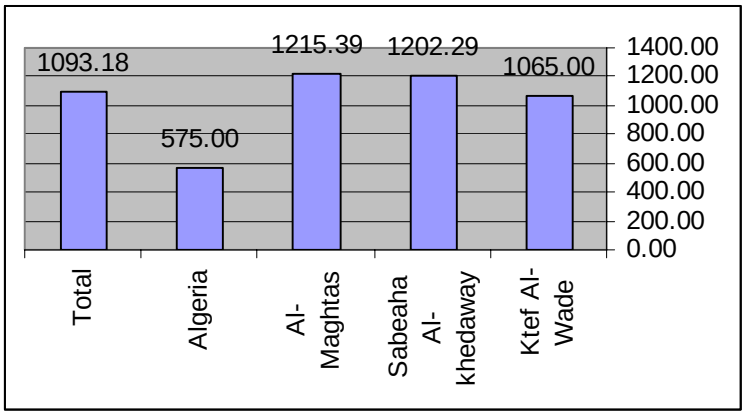
What is the average monthly expenditures of the family? -----NIS per month



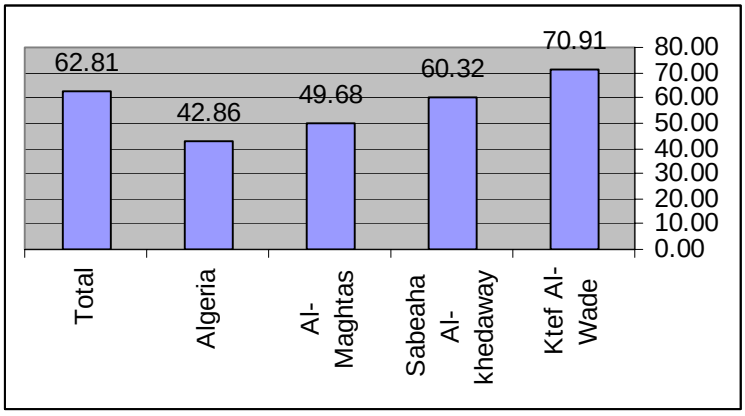
What is the average monthly water bill? ----NIS per month



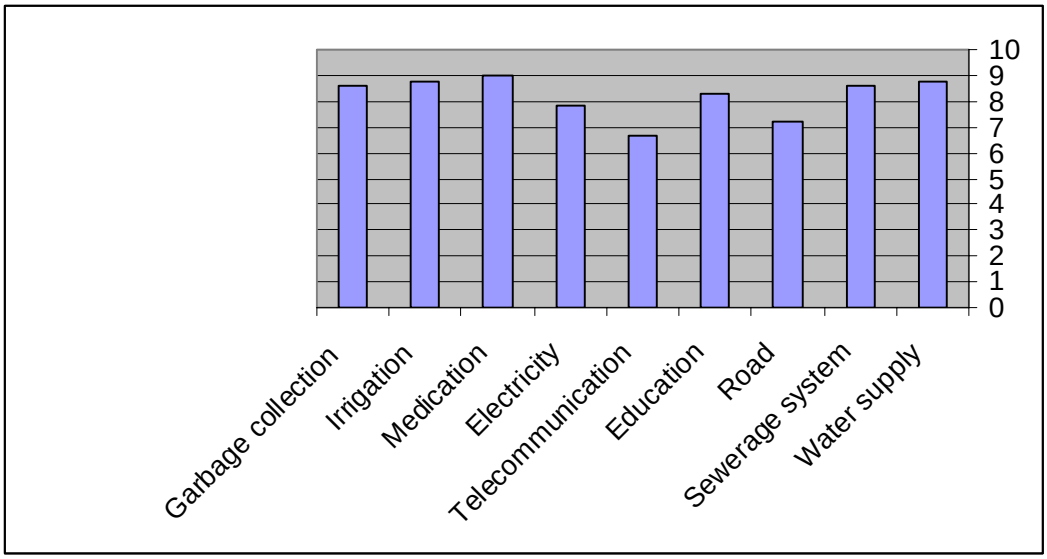
Expense for medical care per year per family: ------NIS/year/family



What is the amount of money that you can pay for the water and sewage bill?
---------- NIS per month



Please set priorities on a 0-10 scale for what you would like to get improved by the government



Factories

Factories

The size of the survey sample collected from factories were 11 factory.

- The factories of the sample are distributed as follows:
  - 36.4% food product factories
  - 9.1% plastic product factories
  - 9.1% metal product factories
  - 9.1% wood product factories
  - 36.4% other product factories
- The average number of employees in the factories of the survey is 20.27 employees
- The average square area of the factories of the survey is 3080.91 m^2
- All of respondents said that the factories in the sample contain in-door sanitary facilities.
- The location of the water source (tap water) for factories is distributed as follows: 63.6% inside the building, 36.4% outside the building.
- The average water consumption in factories during summer (the dry season) is about 272.46 m^3 per month.
- The average water consumption in factories during winter (the rain season) is about 183.09 m^3 per month.
- The average distance between factories and the source of water is about 645.09 meter.
- 81.8% of respondents said that the source of water in factories is individual, 9.1% said it is an outdoors faucet, 9.1% said it is an individual and private well of water.
- 9.1% of respondents said that they would continue to use the sanitary pit even after connection to the sewage system network.
- 81.8% of respondents said that the sanitary facilities available at the factory are provided with flushing toilet; 18.2% said that they are provided with a pit latrine
- All of factories in the sample drain the sewage water into a cesspit made especially for the factory.
- 63.6% of factories are connected to a cesspit made especially for the factory; 36.4% share a cesspit with other factories.
- The average number of times the cesspit is emptied is 23.36 times every year.
- The average cost of emptying the sanitary pit is 136.36 NIS per time.
- The average monthly water bill for factories is 1471.82 NIS per month.

Ecological and Hygienic Awareness

- According to respondents, the infectious routes are 9.1% through the mouth (oral), 90.9% through the ecological surroundings.
- All of the respondents in the sample said that the sanitary conditions at home are one of their concerns
- All of respondents in the sample said that the sanitary conditions of water ecology and their neighborhoods are one of their concerns
- All of respondents in the sample said that their concern with sanitary conditions is meant to improve connection to the sewage system network.
- 90.9% of respondents supported reusing treated sewage water and using the remains as fertilizers.
- 90.9% of respondents supported reusing treated sewage water for agricultural purposes.
- All of respondents in the sample expressed willingness to pay accrued fees for water and sanitary services.
- From among respondents who expressed willingness to pay accrued fees for water and sanitary services said that the monthly amount that they can pay is 129.09 NIS
- All of respondents in the supported the construction of a sewerage system.
- Priorities of respondents for what they would like the government to improve are as follows: (on a 0–10 scale)
  Water supply 8.82
  Sewerage system 8.64
  Road 5.00
  Education 5.27
  Telecommunication 3.82
  Electricity 6.73
  Medication 6.73
  Irrigation 5.00
  Garbage collection 7.46

Factories
Tables

Type of factory business

(%)

Food products	36.4
Plastic products	9.1
Metal products	9.1
Wood products	9.1
Others	36.4

Where are the_sanitation facilities located?

(%)

Inside the factory	100.0

Source of water; location of the faucet

(%)

Inside the building	63.6
Outside the building	36.4

F9 Source of water in the factory

(%)

Individual	81.8
Outside faucet	9.1
Private (individual) well	9.1

Will you still use the sanitation pit even after connecting to the sewage network?

(%)

Yes	9.1
No	90.9

Type of sanitary facility available in the factory

(%)

Flushing Toilet	81.8
Pit latrine	18.2

Method of getting rid of sewage water

(%)

Sanitary pit	100.0

Is the factory connected to a sanitary pit?

(%)

There is a private sanitary pit for the factory	63.6
There is a sanitary pit shared with others	36.4

What are the infectious routes in your opinion?

(%)

Oral	9.1
Environment	90.9

Is the sanitary condition one of your concerns at home?

(%)

Yes	100.0

Is the sanitary condition one of your concerns at your neighborhood?

(%)

Yes	100.0

Is the sanitary condition one of your concerns that would lead to the improvement in sewage system?

(%)

Yes	100.0

Do you support or reject reusing treated sewage water and using the remains as manure?

(%)

Yes, I support	90.9
No, I reject	9.1

Do you support using treated sewage water for irrigation?

(%)

Yes, I support	90.9
No, I reject	9.1

Are you willing to pay the water and sewage bill?

(%)

Yes, I support	100.0

Will you support the construction of a sewerage system if it starts?

(%)

Yes, I support	100.0

Basic information

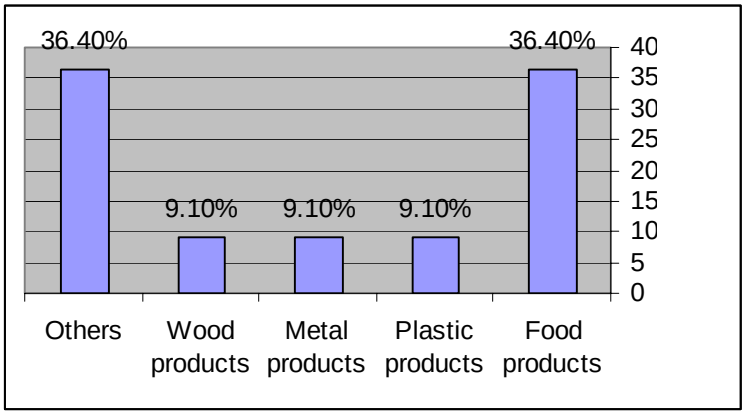
Number of employees in the factory	20.3
Factory square area:……. m^2	3081
Average of water consumption during dry seasons (Summer) ---- m^3 per month	272.5
Average of water consumption during wet seasons (Winter) ----- m^3 per month	183.1
Distance from the source of water ------ meter	645.1
Number of times the sanitary pit is emptied. ------ times every year	23.4
Cost of emptying the sanitary pit------- NIS per time	136.4
What is the average monthly water bill? ----NIS per month	1472
what is the amount of many that you can pay? ---------- NIS per month	129

Please set priorities on a 0-10 scale for what you would like to get improved by the government

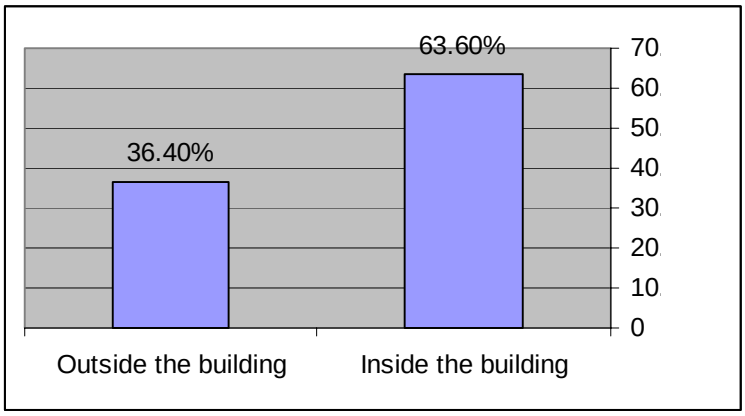
Water supply	8.8
Sewerage system	8.6
Road	5.0
Education	5.3
Telecommunication	3.8
Electricity	6.7
Medication	6.7
Irrigation	5.0
Garbage collection	7.5

Graphs
Tables

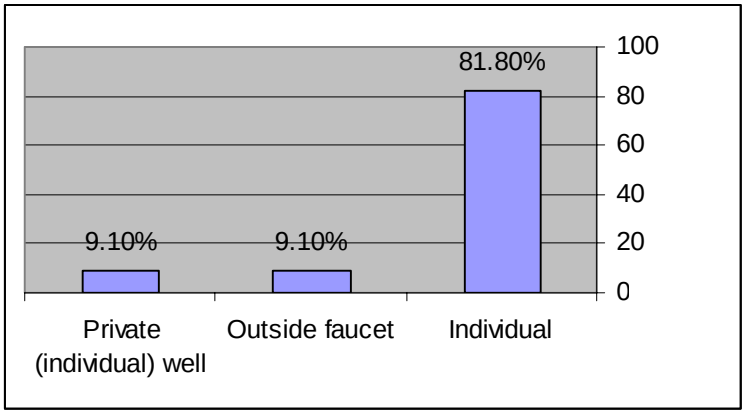
Type of factory business



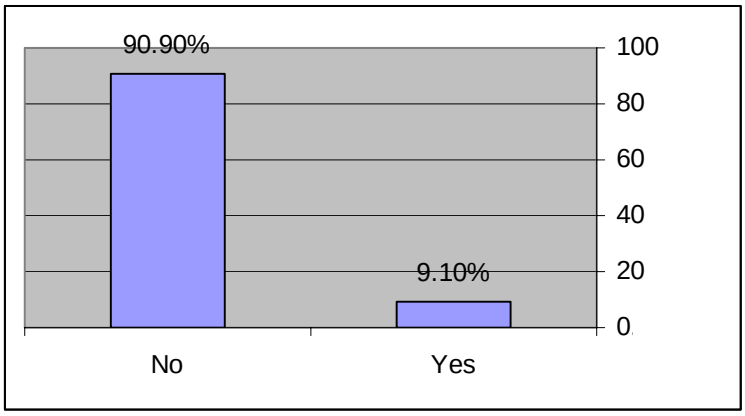
Source of water; location of the faucet



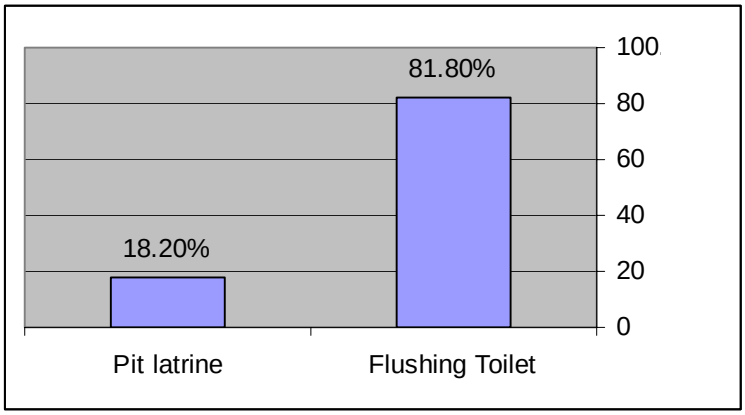
Source of water in the factory



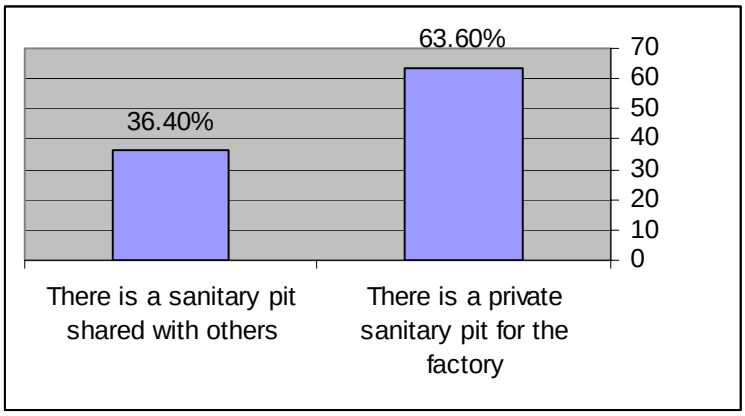
Will you still use the sanitation pit even after connecting to the sewage network?



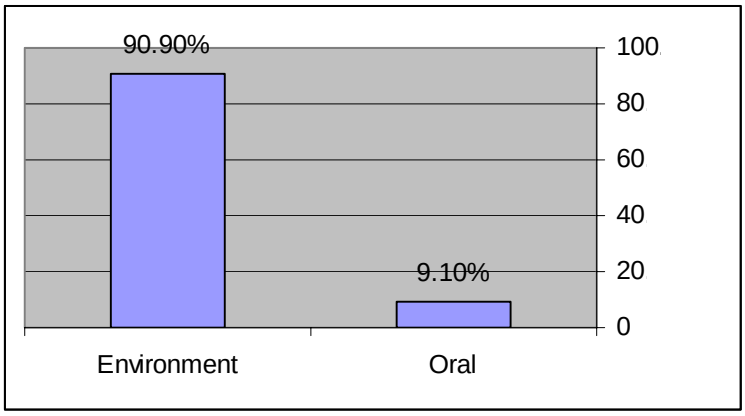
Type of sanitary facility available in the factory



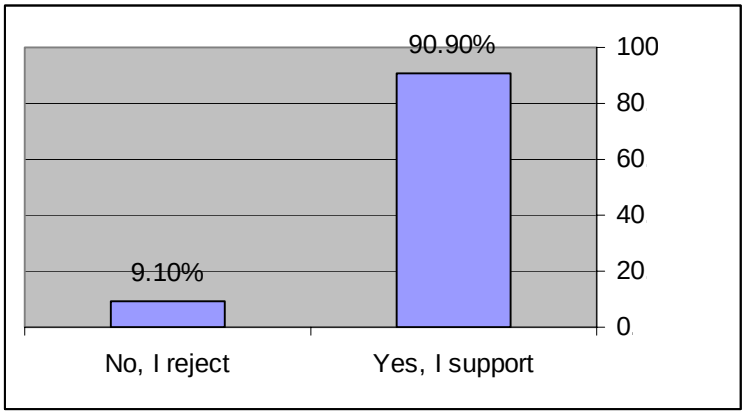
Is the factory connected to a sanitary pit?



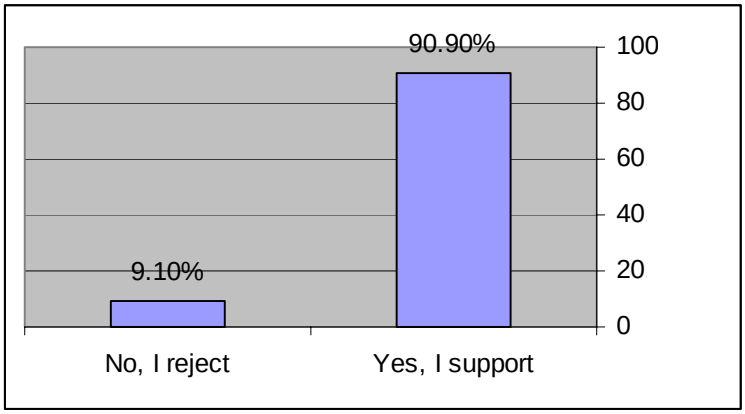
What are the infectious routes in your opinion?



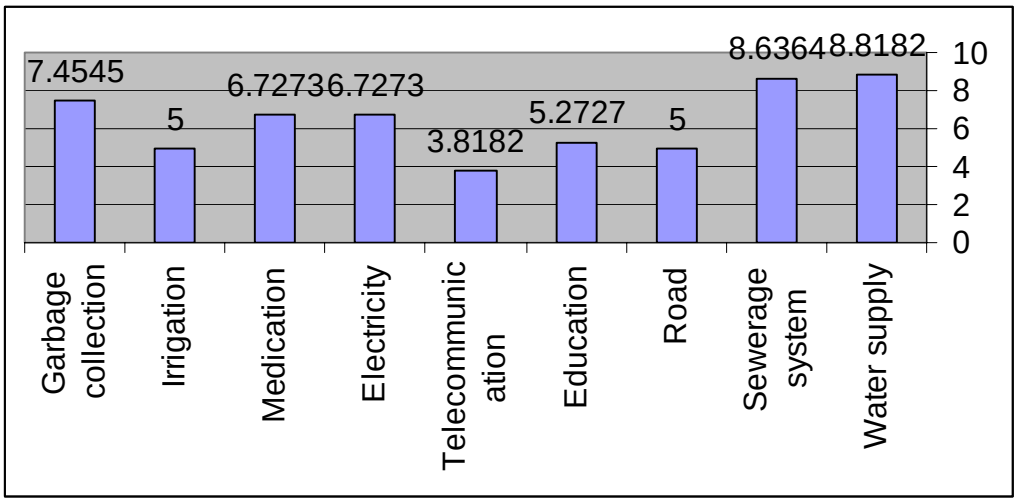
Do you support or reject reusing treated sewage water and using the remains as manure?



Do you support using treated sewage water for irrigation?



Please set priorities on a 0-10 scale for what you would like to get improved by the government



Business Stores

Business Stores

The size of the survey sample collected from business stores were 25 stores.

- Business stores contained in the survey sample are distributed as follows:
  General trade 40%
  Clothing (nouvotte) 20%
  Construction material 4%
  House ware appliances and sanitary equipment 16%
  Others (specify) 20%
- The average number of employees in the stores of the survey was 2.24 employees
- The average square area of the stores of the survey was 52.72 m^2
- 68% of respondents said that the stores contain in-door sanitary facilities, and 32% said that the stores contain no sanitary facilities at all.
- The location of the water source (tap water) for stores is distributed as follows: 68% inside the building, 28% outside the building, and 4% in a public place.
- The average water consumption in stores during summer (the dry season) is about 26.66 m^3 per month.
- The average water consumption in stores during winter (the rain season) is about 17.40 m^3 per month.
- The average distance between stores and the source of water is about 13 meter.
- 68% of respondents said that the source of water in stores is individual, and 32% said it is an outdoors faucet.
- 4% of respondents said that they would continue to use the sanitary pit even after connection to the sewage system network.
- 56% of respondents said that the sanitary facilities available at the store are provided with flushing toilet; 12% said that they are provided with a pit latrine
- 68% of stores drain the sewage water into a cesspit made especially for the store, and 32% drain it in the open.
- 4% of stores are connected to a cesspit made especially for the store; 64% share a cesspit with others and 32% do not have any cesspit at all.
- The average number of times the cesspit is emptied is 2.72 times every year.
- The average cost of emptying the sanitary pit is 69.4 NIS per time
- The average monthly water bill for stores is 46.28 NIS per month

Ecological and Hygienic Awareness

- According to respondents, the infectious routes are 8% through the mouth (oral), 4% through touch, 88% through the ecological surroundings.
- All of respondents of the stores said that the sanitary conditions at home are one of their concerns
- All of respondents of the stores said that the sanitary conditions of water ecology and their neighborhoods are one of their concerns
- All of respondents of the stores said that their concern with sanitary conditions is meant to improve connection to the sewage system network.
- 92% of respondents supported reusing treated sewage water and using the remains as fertilizers.

- 88% of respondents supported reusing treated sewage water for agricultural purposes.
- 96% of respondents expressed willingness to pay accrued fees for water and sanitary services.
- From among respondents who expressed willingness to pay accrued fees for water and sanitary services said that the monthly amount that they can pay is 66.25 NIS
- All of respondents of the stores supported the construction of a sewerage system.
- Priorities of respondents for what they would like the government to improve are as follows: (on a 0–10 scale)
  Water supply 7.96
  Sewerage system 9.12
  Road 4.52
  Education 4.44
  Telecommunication 3.04
  Electricity 5.32
  Medication 6.80
  Irrigation 5.48
  Garbage collection 7.24

Business Stores
Tables

Type of business store

(%)

Dry goods store (retail store)	40.0
Clothing	20.0
Construction material	4.0
House ware appliances	16.0
Others	20.0

Where are the sanitation facilities located?

(%)

Inside the store	68.0
Outside the store	32.0

Source of water; location of the faucet

(%)

Inside the building	68.0
Outside the building	38.0
In a public place	4.0

Source of water in the store

(%)

Individual	68.0
Outside faucet	32.0

Will you still use the sanitation pit even after connecting to the sewage network?

(%)

Yes	4.0
No	64.0
The water network not available	32.0

Type of sanitary facility available in the store

(%)

Flushing Toilet	56.0
Pit latrine	12.0
The water network not available	32.0

Method of getting rid of sewage water

(%)

Sanitary pit	68.0
In the open	32.0

Is the store connected to a sanitary pit?

(%)

There is a private sanitary pit for the store	4.0
There is a sanitary pit shared with others	64.0
There is no sanitary pit for the store	32.0

What are the infectious routes in your opinion?

(%)

Oral	8.0
Contagion	4.0
Environment	88.0

Is the sanitary condition one of your concerns at home?

(%)

Yes	100.0

Is the sanitary condition one of your concerns at your neighborhood?

(%)

Yes	100.0

Is the sanitary condition one of your concerns that would lead to the improvement in sewage system?

(%)

Yes	100.0

Do you support or reject reusing treated sewage water and using the remains as manure?

(%)

Yes, I support	92.0
No, I reject	8.0

Do you support using treated sewage water for irrigation?

(%)

Yes, I support	88.0
No, I reject	12.0

Are you willing to pay the water and sewage bill?

(%)

Yes, I support	96.0
I do not know	4.0

Will you support the construction of a sewerage system if it starts?

(%)

Yes, I support	100.0

Basic information

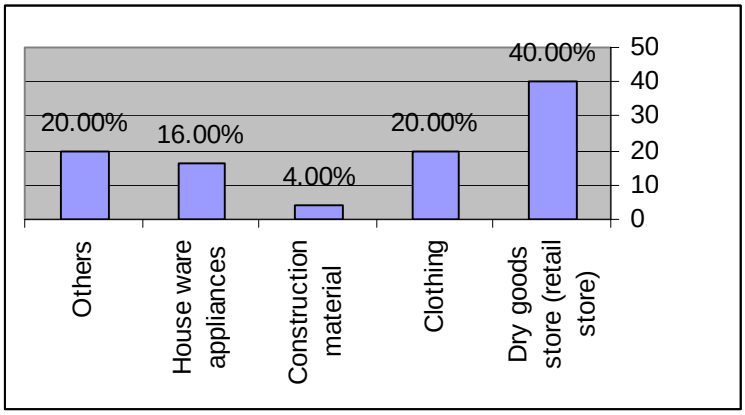
Number of employees in the store	2.24
Store square area:…. m^2	52.72
Average of water consumption during dry seasons (Summer) ----- m^3 per month	26.66
Average of water consumption during wet seasons (Winter) ----- m^3 per month	17.40
Distance from the source of water ------ meter	13.00
T14 Number of times the sanitary pit is emptied. ------ times every year	2.72
Cost of emptying the sanitary pit------- NIS per time	69.4
What is the average monthly water bill? ----NIS per month	46.28
what is the amount of many that you can pay? ---------- NIS per month	66.25

Please set priorities on a 0-10 scale for what you would like to get improved by the government

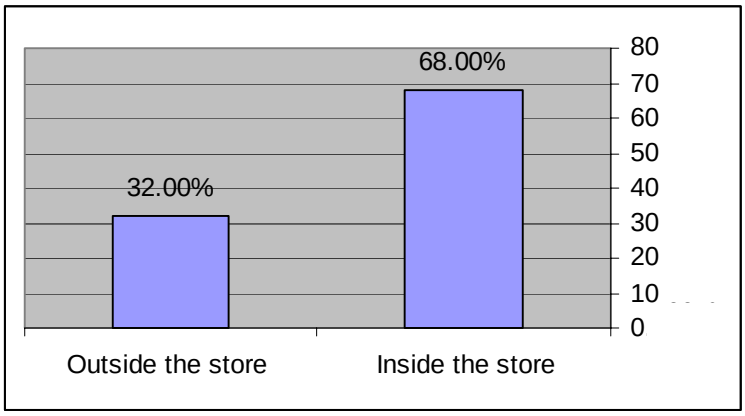
Water supply	7.96
Sewerage system	9.12
Road	4.52
Education	4.44
Telecommunication	3.04
Electricity	5.32
Medication	6.80
Irrigation	5.48
Garbage collection	7.24

Business Stores
Graphs

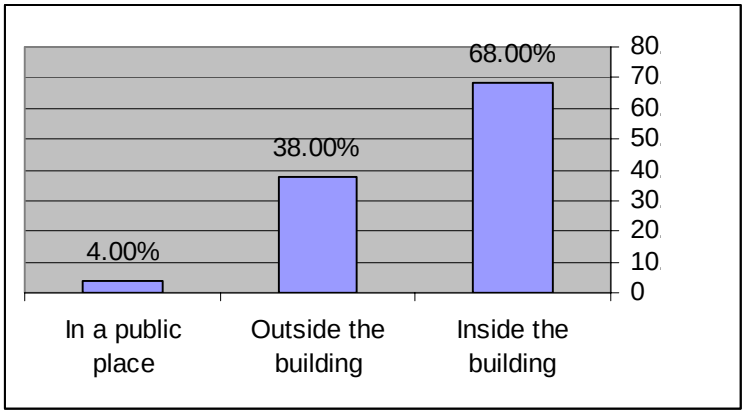
Type of business store



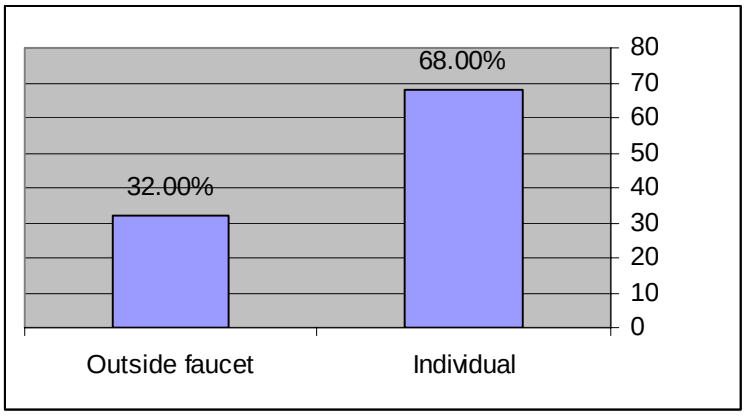
Where are the sanitation facilities located?



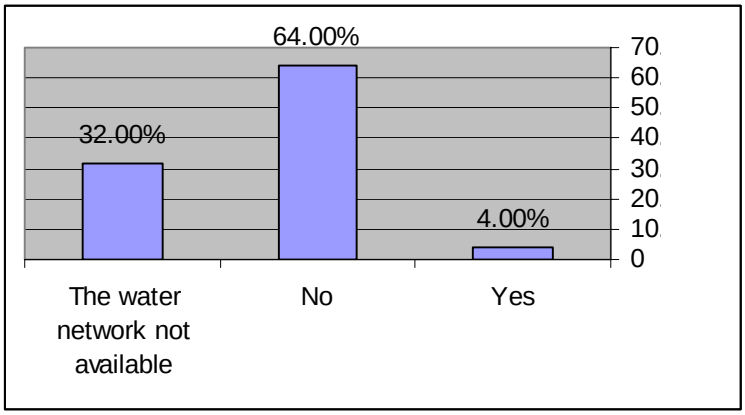
Source of water; location of the faucet



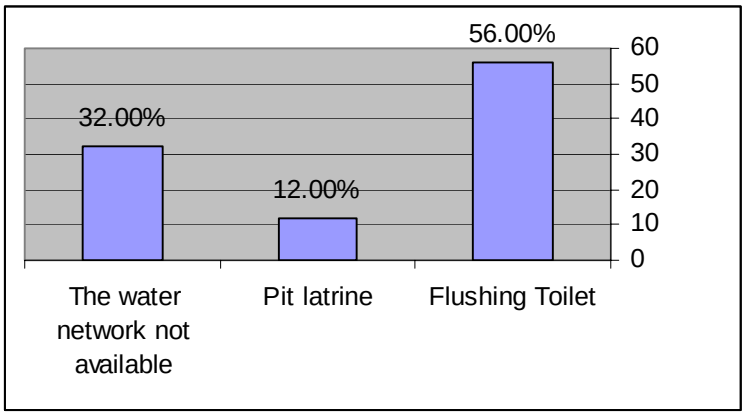
Source of water in the store



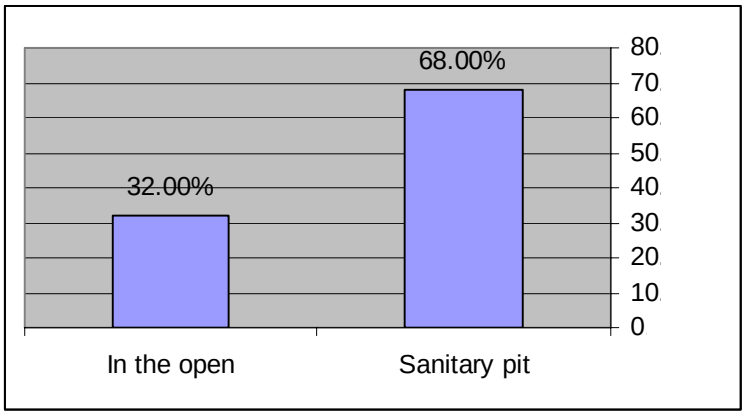
Will you still use the sanitation pit even after connecting to the sewage network?



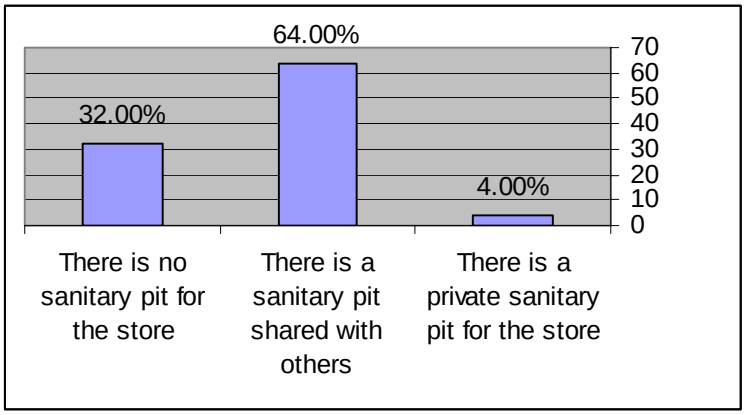
Type of sanitary facility available in the store



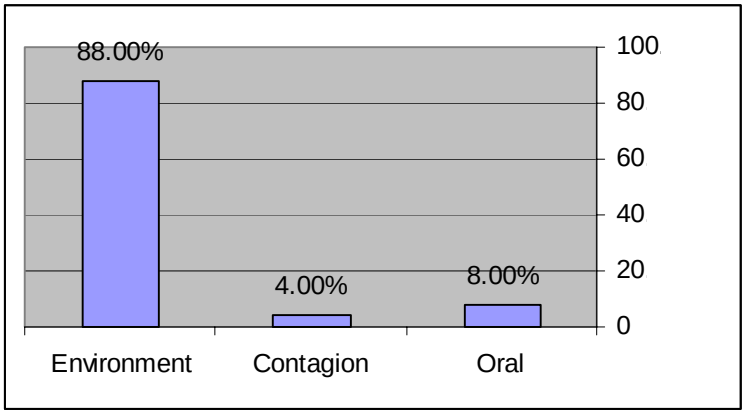
Method of getting rid of sewage water



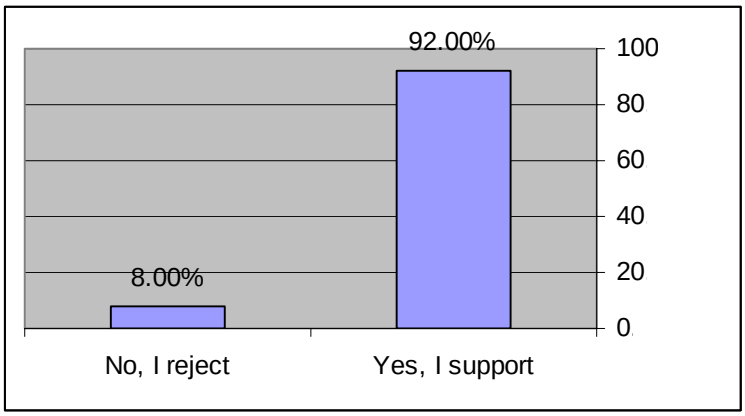
Is the store connected to a sanitary pit?



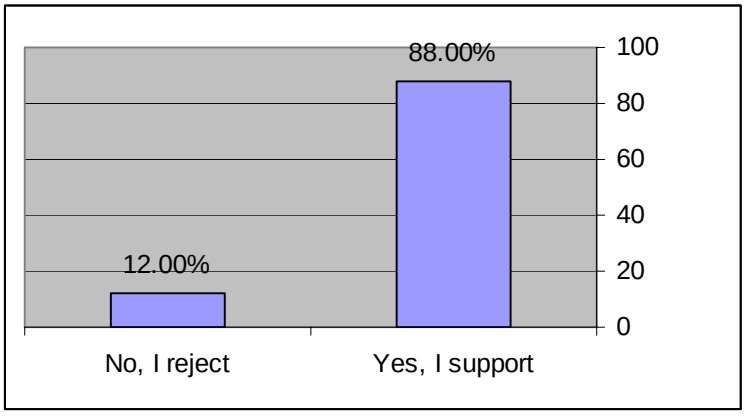
What are the infectious routes in your opinion?



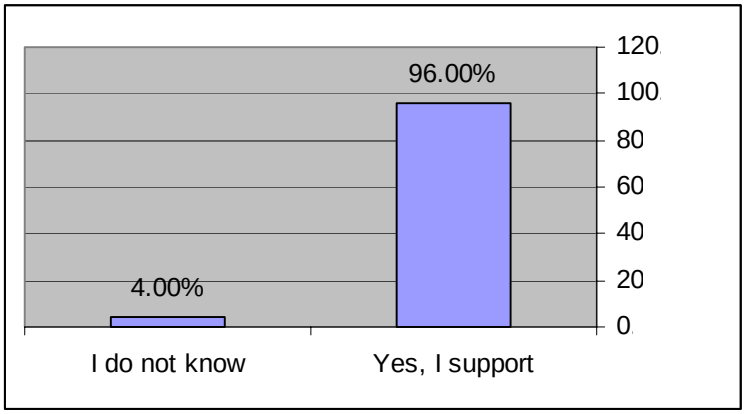
Do you support or reject reusing treated sewage water and using the remains as manure?



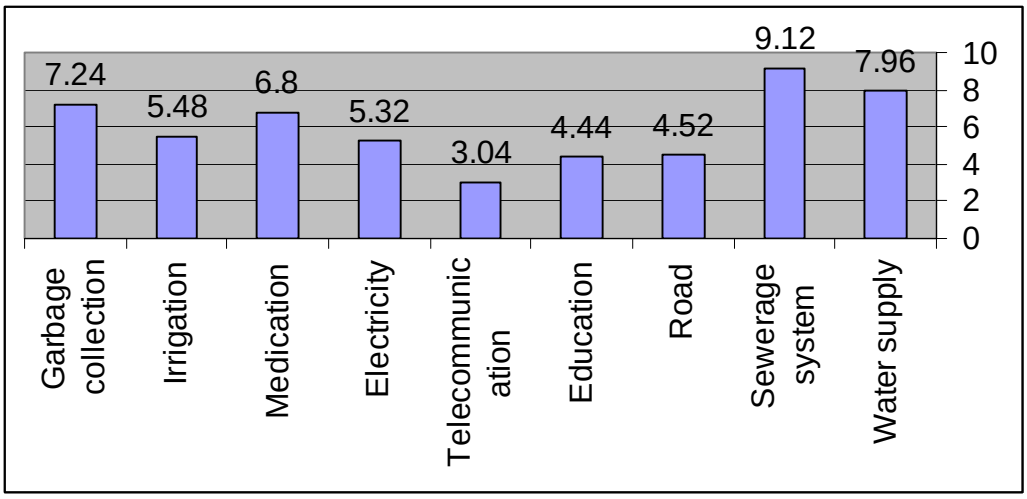
Do you support using treated sewage water for irrigation?



Are you willing to pay the water and sewage bill?



Please set priorities on a 0-10 scale for what you would like to get improved by the government



Hotels

Hotels

The size of the survey sample collected from hotels were 4 hotels.

- The average number of rooms in the hotels contained in the survey sample is 85.5 rooms
- The average number of accommodated guests in a hotel is 7975 guests per year.
- The average number of hotel visitors is 28.75 visitors per day
- The average number of employees in the hotels contained in the survey is 49.75 employees.
- The average square area of a hotel is 8314 m^2
- The location of the water source (tap water) for hotels is distributed as follows: 50% inside the building, 50% outside the building.
- The average water consumption in hotels during summer (the dry season) is about 583.5 m^3 per month.
- The average water consumption in hotels during winter (the rain season) is about 350.5 m^3 per month.
- The average distance between hotels and the source of water is about 46.25 meter.
- 75% of respondents said that the source of water in hotels is individual, 25% said it is an individual and private well of water.
- 50% of respondents said that they would continue to use the sanitary pit even after connection to the sewage system network.
- All of the hotels in the sample said that the sanitary facilities available at the factory are provided with flushing toilet.
- All of hotels drain the sewage water into a cesspit made especially for the hotel.
- All of hotels are connected to a cesspit made especially for the hotel.
- The average number of times the cesspit is emptied is 0.75 times every year.
- The average cost of emptying the sanitary pit is 525 NIS per time.
- The average monthly water bill for hotels is 12642.5 NIS per month.

Ecological and Hygienic Awareness

- According to respondents of the hotels, the infectious routes are through the ecological surroundings only.
- All of respondents of the hotels said that the sanitary conditions at home are one of their concerns
- All of respondents of the hotels said that the sanitary conditions of water ecology and their neighborhoods are one of their concerns
- All of respondents of the hotels said that their concern with sanitary conditions is meant to improve connection to the sewage system network.
- All of respondents of the hotels supported reusing treated sewage water and using the remains as fertilizers.
- All of respondents of the hotels supported reusing treated sewage water for agricultural purposes.
- 50% of respondents expressed willingness to pay accrued fees for water and sanitary services.

- From among respondents who expressed willingness to pay accrued fees for water and sanitary services said that the monthly amount that they can pay is 300 NIS
- All of respondents of the hotels supported the construction of a sewerage system.
- Priorities of respondents for what they would like the government to improve are as follows: (on a 0–10 scale)
  Water supply 7.00
  Sewerage system 8.00
  Road 7.50
  Education 5.00
  Telecommunication 6.25
  Electricity 7.00
  Medication 6.00
  Irrigation 6.25
  Garbage collection 9.25

Hotels
Tables

Source of water; location of the faucet

(%)

Name/Division	Inside the building	Outside the building
Al-Quds	100.0	
Inter Continental	100.0	
Jericho Resort Village		100.0
City of Moon		100.0
Total	50.0	50.0

Source of water in the hotel

(%)

Name/Division	Individual	Private (individual) well
Al-Quds	100.0	
Inter Continental	100.0	
Jericho Resort Village		100.0
City of Moon	100.0	
Total	75.0	25.0

Will you still use the sanitation pit even after connecting to the sewage network?

(%)

	Yes	No
Al-Quds		100.0
Inter Continental	100.0	
Jericho Resort Village	100.0	
City of Moon		100.0
Total	50.0	50.0

Type of sanitary facility available in the hotel

(%)

Name	Flushing Toilet
Al-Quds	100.0
Inter Continental	100.0
Jericho Resort Village	100.0
City of Moon	100.0
Total	100.0

Method of getting rid of sewage water

(%)

Name	Sanitary pit
Al-Quds	100.0
Inter Continental	100.0
Jericho Resort Village	100.0
City of Moon	100.0
Total	100.0

Is the hotel connected to a sanitary pit?

(%)

Name	There is a private sanitary pit for the hotel
Al-Quds	100.0
Inter Continental	100.0
Jericho Resort Village	100.0
City of Moon	100.0
Total	100.0

What are the infectious routes in your opinion?

(%)

Name	Environment
Al-Quds	100.0
Inter Continental	100.0
Jericho Resort Village	100.0
City of Moon	100.0
Total	100.0

Is the sanitary condition one of your concerns at home?

(%)

Name	Yes
Al-Quds	100.0
Inter Continental	100.0
Jericho Resort Village	100.0
City of Moon	100.0
Total	100.0

Is the sanitary condition one of your concerns at your neighborhood?

(%)

Name	Yes
Al-Quds	100.0
Inter Continental	100.0
Jericho Resort Village	100.0
City of Moon	100.0
Total	100.0

Is the sanitary condition one of your concerns that would lead to the improvement in sewage system?

(%)

Name	Yes
Al-Quds	100.0
Inter Continental	100.0
Jericho Resort Village	100.0
City of Moon	100.0
Total	100.0

Do you support or reject reusing treated sewage water and using the remains as manure?

(%)

Name	Yes, I support
Al-Quds	100.0
Inter Continental	100.0
Jericho Resort Village	100.0
City of Moon	100.0
Total	100.0

Do you support using treated sewage water for irrigation?

(%)

Name	Yes, I support
Al-Quds	100.0
Inter Continental	100.0
Jericho Resort Village	100.0
City of Moon	100.0
Total	100.0

Are you willing to pay the water and sewage bill?

(%)

Name	Yes	I do not know/ no opinion
Al-Quds		100.0
Inter Continental		100.0
Jericho Resort Village	100.0	
City of Moon	100.0	
Total	50.0	50.0

Will you support the construction of a sewerage system if it starts?

(%)

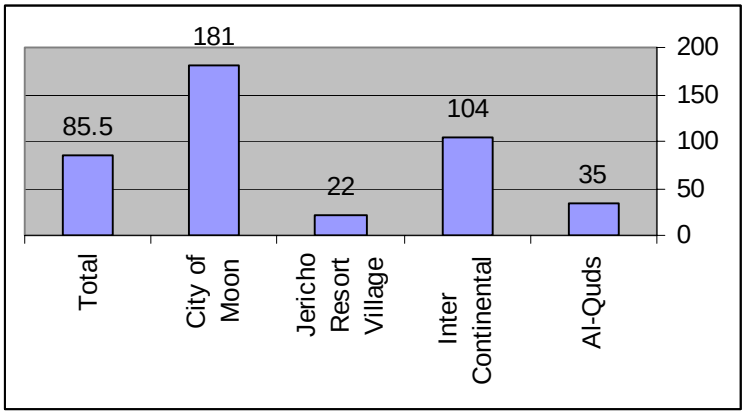
Name	Yes, I support
Al-Quds	100.0
Inter Continental	100.0
Jericho Resort Village	100.0
City of Moon	100.0
Total	100.0

Basic information

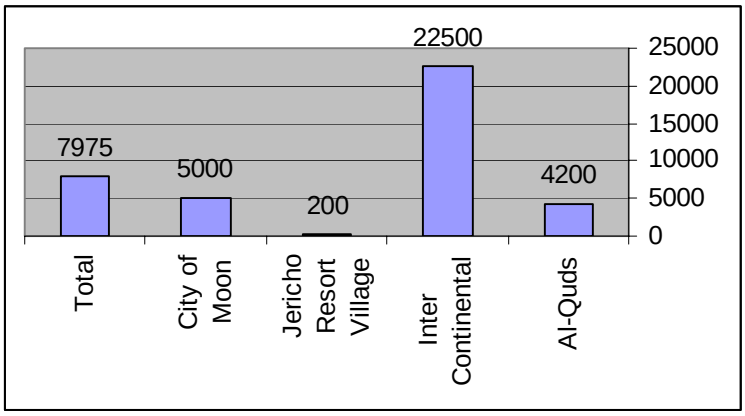
Category/Name	Al-Quds	Inter Continental	Jericho Resort Village	City of Moon	Total
Number of rooms	35	104	22	181	**85.50**
Number of guest accommodation: ---------- Persons/year	4200	22500	200	5000	**7975.0**
Number of visitors: ----------Persons/day	10	60	5	40	**28.75**
Number of employees	12	45	2	140	**49.75**
Hotel square area: ---------- m^2	1500	12000	580	19176	**8314.00**
Average of water consumption during dry seasons (Summer) ----- m^3 per month	600	1700	4	30	**583.50**
Average of water consumption during wet seasons (Winter) ----- m^3 per month	300	1000	2	100	**350.50**
Distance from the source of water ------ meter	50	100	15	20	**46.25**
Number of times the sanitary pit is emptied. ------ times every year	1	2	0	0	**0.75**
Cost of emptying the sanitary pit-------NIS per time	100	2000	0	0	**525.00**
What is the average monthly water bill? ----NIS per month	500	20000	70	30000	**12642.50**
what is the amount of many that you can pay? ---------- NIS per month	200	400	-	-	**300.00**

Hotels
Graphs

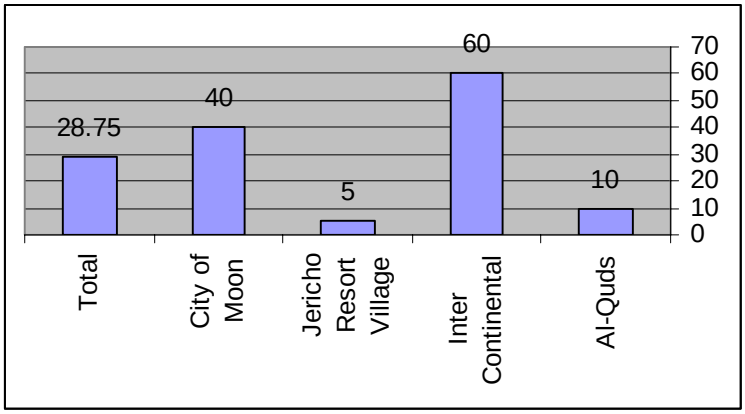
Number of rooms



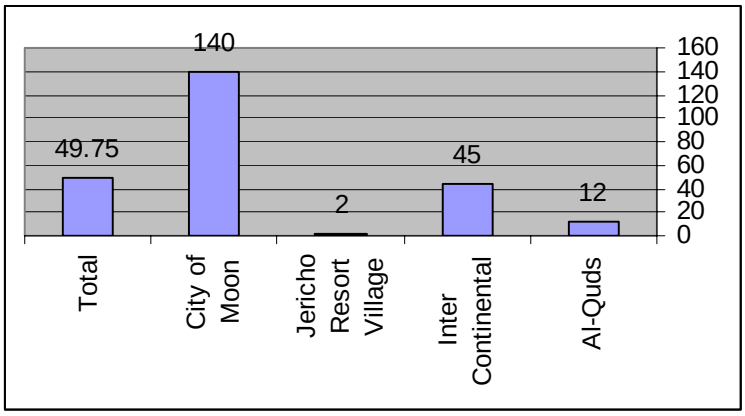
Number of guest accommodation: -------- Persons/year



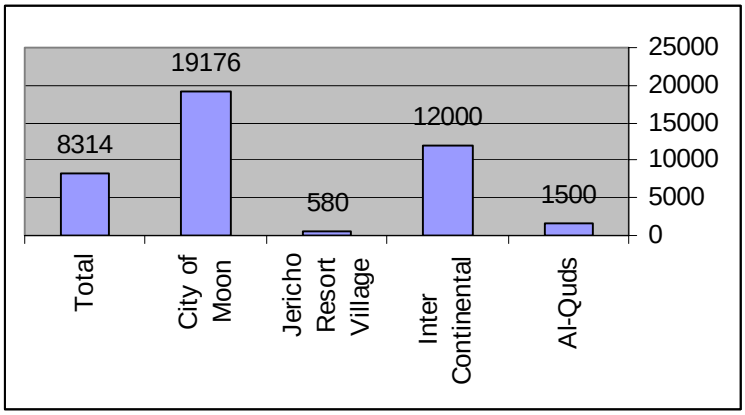
Number of visitors: ----------Persons/day



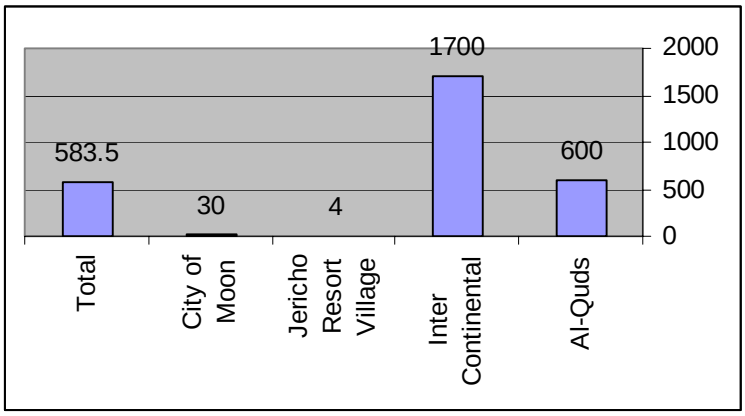
Number of employees



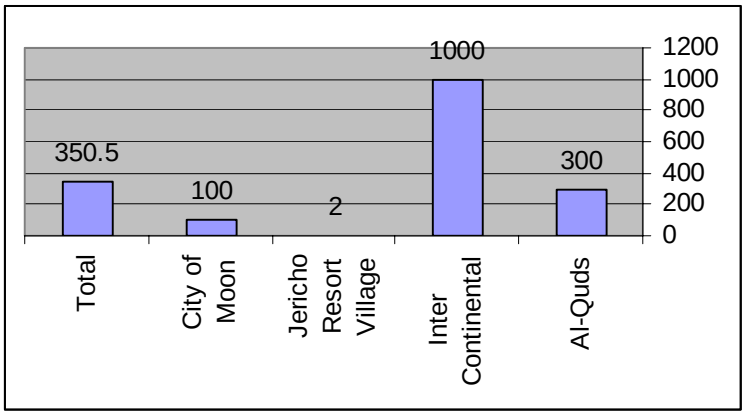
Hotel square area: --------- m^2



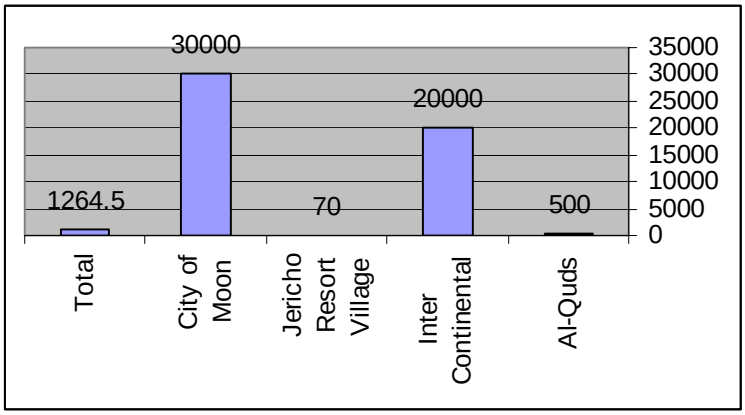
Average of water consumption during dry seasons (Summer) ----- m^3 per month



Average of water consumption during wet seasons (Winter) ----- m³ per month



What is the average monthly water bill? ----NIS per month



5-3　水質調査結果

１．報告書本文

A-164～A-175

２．結果概要

アルビーレ、ナルブス等の都市の下水データは入手できていたが、ジェリコについてはデータが無かったので、ジェリコで汚水処理施設を持つ、インターコンチネンタルホテル（以下 ICH）と大統領警護隊基地の 2 箇所の流入、流出水全４試料及び、家庭やビルのセスピットのくみ取り汚水をバキューム車が排出時の水質を６試料について分析した。採取は、前者の試料については 2011 年 2 月 16 日、後者の試料については 2011 年 2 月 21 日に採取した。

結果は添付表 5-3-1 及び 5-3-2 に示すとおりであり、ICH の処理施設流入水質は今回計画で想定している水質より相当低いが、大統領警護隊基地の流入水質はほぼ同等で、いずれも処理水質は良好とは言えない。一方でセスピットのくみ取り排水は、BOD は比較的低い一方で、TSS は想定の 10 倍近いものが多いことから、水分は浸透して固形分が濃縮されて残っていることを示すものと考えられる。

BOD の濃度が高くなっていないのは、水と共に地下浸透されているものと考えられる。なお、通常流入汚水の BOD と T-N の割合は 5:1 程度（今計画では、汚濁原単位は BOD：T-N＝60:12＝5:1）であるが、今回の測定値は T-N の値は大きめに測定されている。

T-N については、このように疑わしい結果になったが、誤りではないかと確認した結果であるため、結果をそのまま掲げる。窒素の値は重要なので、詳細設計で再度試験機関を変えて測定する必要があると考える。

添付表 5-3-1　汚水処理場の流入出水質

採取場所	ICH		大統領護衛隊基地	
分類	流入水	処理水	流入水	処理水
採取日時	11/2/16	11/2/16	11/2/21	11/2/21
pH(--)	7	7.5	6.1	7.6
EC(μs/cm)	2,050	2,430	1,800	2,040
BOD(mg/L)	167	26	540	64
COD(mg/L)	320	224	960	320
TSS(mg/L)	120	48	286	18
PO_4(mg/L)	6.2	2.0	11.8	11.0
T-N(mg/L)	134	46	152	33

添付表 5-3-2　セスピットの排出汚水水質

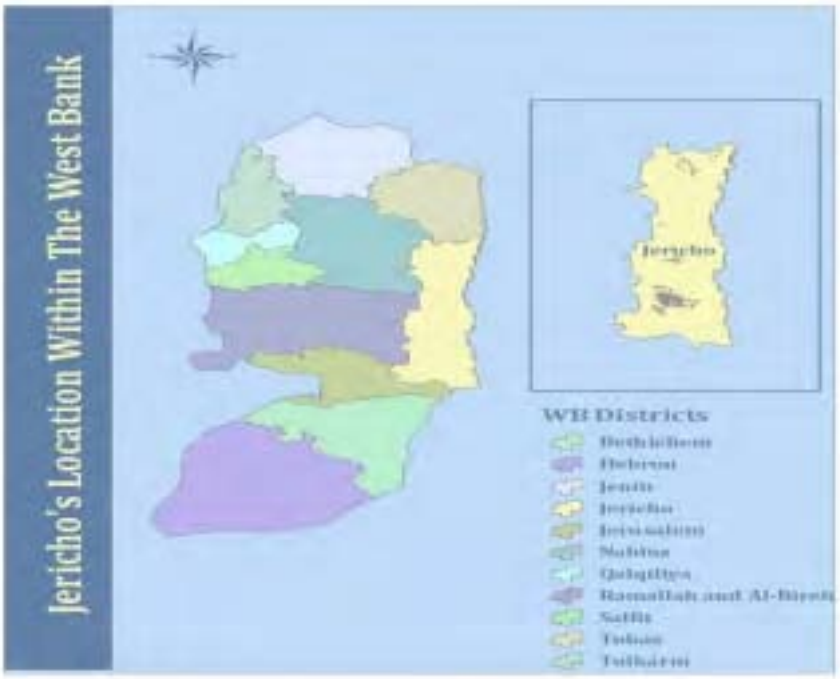
採取場所	家庭１	家庭２	家庭３	家庭４	ビル１	家庭５
採取日時	11/2/21	11/2/21	11/2/21	11/2/21	11/2/21	11/2/21
pH(--)	6.3	7	6.5	6.7	6.1	6.8
EC(μs/cm)	1,640	1,697	1,920	2,440	2,390	1,650
BOD(mg/L)	312	182	400	248	616	208
COD(mg/L)	800	720	640	480	1,500	960
TSS(mg/L)	4,240	1,090	4,310	3,680	8,390	3,010
PO_4(mg/L)	2.1	1.9	3.2	4.1	10.1	6.5
T-N(mg/L)	140	123	176	162	184	128

Japan International
Cooperation Agency (JICA)

An-Najah National University
Water and Environmentand
Studies Institute (WESI)

FINAL REPORT

WATER QUALITY SURVEY
For the Basic Study On
The Jericho Wastewater Collection, Treatment System And Reuse Project



Prepared by

Atef Abu Jaish

Water and Environmental Studies Institute (WESI)
An-Najah National University
Nablus – Palestine

Submitted to

Japan International Cooperation Agency (JICA)

March 2011

TABLE OF CONTENTS

ABBREVIATIONS

JICA: Japan International Cooperation Agency
WESI: Water and Environmental Studies Institute
WW: Wastewater
WWTP: Wastewater Treatment Plant

0. Executive Summary

Within the preliminary study necessary to implement this project, wastewater samples from the targeted communities were planned to be collected and analyzed. Therefore, JICA Study Team had contracted Water and Environmental Studies Institute (WESI) at An-Najah National University-Nablus to collect and analyze these samples.

For the purpose of this study, wastewater samples from the influent and effluent of the wastewater treatment plants WWTPs at the Intercontinental Hotel and the Presidential Guard, were collected and chemically analyzed. Another set of wastewater samples, from cesspits in different areas of Jericho district, were also collected and analyzed.

Results indicated that removal percentage of BOD5, COD, TSS, and Total nitrogen in the WWTP of the Intercontinental Hotel was 84.4%, 30%, 60%, and 65.7%, respectively. Whereas values of the same parameters in the WWTP of the Presidential Guard were 88%, 66.6%, 93.7%, and 78.3%, respectively. These results indicate that the efficiency of the WWTP of the Presidential Guard is higher than that of the WWTP at the Intercontinental Hotel.

Results of the chemical analysis of the samples collected from the cesspits showed that the average of the BOD5, COD, TSS, PO4, and Total-N was 328, 850, 4120, 4.7, and 152 mg/l, respectively.

Studying of more wastewater samples is recommended in order to form a comprehensive picture about wastewater characteristics in WWTPs at the governmental and non-governmental institutions and at cesspits in houses as well.

1. Introduction

Jericho is one of the smallest cities in the Palestinian Territories. It is located in the far east of the West Bank with the lowest altitude (250 meters below sea level) of any city. The population is about 20,000, with a large part of the population engaged in agriculture as Jericho is considered a green oasis located in the Jordan Valley. Figure-1 depicts Jericho City and the surrounding communities.

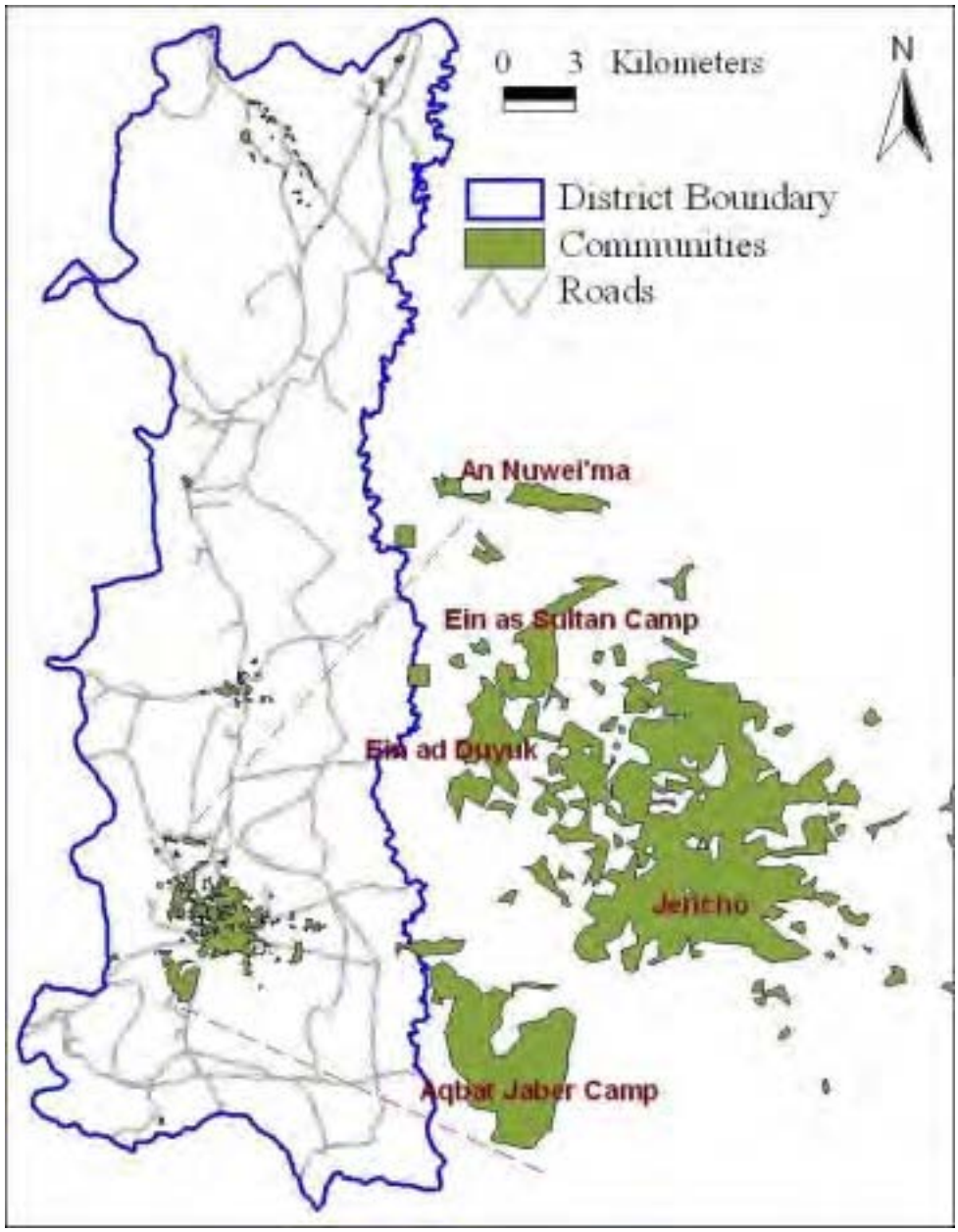


Figure-1 Jericho City and the surrounding communities

Jericho is located on the crossroads of the east–west tourist corridor from Jerusalem to Amman and the north-south tourist corridor from Tiberias to Eliat, having an immense potential to attract tourists who have diversified

tourism objectives, such as pilgrimage tourism, cultural tourism, resort tourism and nature tourism including eco-tourism.

Jericho is suffering from many problems related to poor infrastructure. It is, as a touristy city, still lacking to basic services in the field of sufficient drinking water of acceptable quality, sewerage systems and wastewater treatment plant systems, suitable roads, solid waste collection and disposal systems, affordable hotels and resorts, etc…

2. Background

Wastewater collection in the Palestinian Territory is mostly limited to major cities and refugee camps. Jericho is one of the cities which have no wastewater collection system, and wastewater is discharged into septic tanks and/or emptied into Wadis. In most cities including Jericho, rainwater is allowed to runoff on the surface and eventually reaches the Wadis.

Overall, it was recently estimated that sewage networks serve only about 30% of the West Bank populations. The remaining population uses cesspits and open channels for wastewater collection. Most of the cesspits are left without a cement basement of liner so that sewage infiltrates into the earth layers and the owners avoid using the expensive services of the vacuum tankers to empty the cesspits. These non-lined cesspits exacerbate the pollution of groundwater aquifers.

Currently, wastewater treatment and reuse in the Palestinian Territory is limited because of high cost and limited financial resources, Israeli authority approval of such projects, people's acceptance and involvement, and technological and experience needs.

Wastewater management is a very important issue to consider, from environmental protection of public health, soil, and groundwater and from conserving the treated effluent and its potential reuse as a supplementary source of water in various purposes including agriculture.

3. Objectives

The specific objective of this study, carried out by Water and Environmental Studies Institute (WESI) at An-Najah National University, is to give an updated picture and a comprehensive understanding about wastewater characteristics currently treated or disposed of in cesspits. Data obtained from this study will be used during planning and constructing the wastewater networks and treatment plants in Jericho City and the surrounding communities such as Aqbat Jabr refugee camp, Ain Al Sultan, Al Doyouk, and Al Nuwai'meh. This important project is funded by Japan government.

It is anticipated that this study will also help innovating or at least applying appropriate methods to improve wastewater treatment technologies maintaining acceptable levels of wastewater standards and enabling Jericho Municipality to utilize some of the treated wastewater for irrigation or/and industrial purposes.

4. Wastewater in Jericho City

Jericho is one of the Palestinian cities lacking to sewerage networks and central wastewater treatment plants (WWTP). Wastewater in Jericho and the surrounding communities is almost being disposed of in cesspits. Some governmental and non-governmental institutions are exceptional examples where wastewater is treated and reused in their vicinities.
The Intercontinental Hotel, as an example of the non-governmental institutions, has a WWTP using activated carbon as the appropriate technology for treating wastewater. Meanwhile, the Presidential Guard as an example of the governmental institutions has a WWTP using trickling filter method.

5. Sample Collection

Ten wastewater Samples were collected from Jericho City. Four of them were collected from WWTPs and six from infiltration cesspits. Sample collection was carried out as follows:

a) Two wastewater samples were collected from the influent and effluent of the WWTP of the Intercontinental Hotel and another two from the influent and effluent of the Presidential Guard WWTP. Collection of these samples was conducted on 16th February, 2011. The four samples were transported in a cooling box to WESI laboratories at the university campus in Nablus.

b) Six samples were collected, on 21st February, 2011, from house cesspits in different areas of Jericho City. These samples were also transported in a cooling box to WESI laboratories.

Using the cooling box is of great importance to minimize any changes or reactions in the sample bottles during transportation.

6. Laboratory Analysis

As soon as the samples were received in the laboratory, the following chemical tests were carried out:

1- BOD_5
2- COD
3- TSS
4- Total-N
5- pH
6- EC
7- PO_4

Methods used in the laboratory to test these samples were according to "*Standard Methods for the Examination of Water and Wastewater, APHA, 21st ed., 2005*".

Carrying out these tests aimed at highlighting the chemical characteristics of wastewater which decide the appropriate technology to be applied when planning and constructing the WWTPs in Jericho.

7. Results and Discussion

All the obtained results of the chemical analysis of the wastewater samples are shown in the table in the ANNEX.

Results of wastewater samples are classified into two groups:

7.1 Samples collected from the WWTPs

Results of samples collected from the WWTPs of the Intercontinental Hotel and the Presidential Guard are shown in Table-1.

From Table-1 and Figure-2, it is evident that in the WWTP of the Intercontinental Hotel:

(i) BOD5 dropped from 167 to 26 mg/l after treatment
(ii) COD dropped from 320 to 224 mg/l after treatment
(iii) TSS dropped from 1,120 to 48 mg/l after treatment
(iv) BOD5 to COD ratio is 0.52 which means that the WW is considered to be highly biodegradable;

Whereas in the WWTP of the Presidential Guard:

(i) BOD5 dropped from 540 to 64 mg/l after
(ii) COD dropped from 960 to 320 mg/l after treatment
(iii) TSS dropped from 286 to 18 mg/l after treatment
(iv) BOD5 to COD ratio is 0.56 which means that the WW is considered to be highly biodegradable, too.

Table-1 Results of WW Samples Collected from the Intercontinental Hotel And the Presidential Guard At Jericho on 16th February, 2011

Location	Date	pH unit	EC µs/cm	BOD_5 mg/l	COD mg/l	TSS mg/l	PO_4 mg/l	Total-N mg/l
Intercontinental (Influent)	16/2/2011	6.97	2,050	167	320	120	6.2	**134**
Intercontin-ental (Effluent)	16/2/2011	7.51	2,430	26	224	48	2.0	**46**
Presidential Guard (Influent)	16/2/2011	6.61	1,800	540	960	286	11.8	**152**
Presidential Guard (Effluent)	16/2/2011	7.63	2,040	64	320	18	11.0	**33**

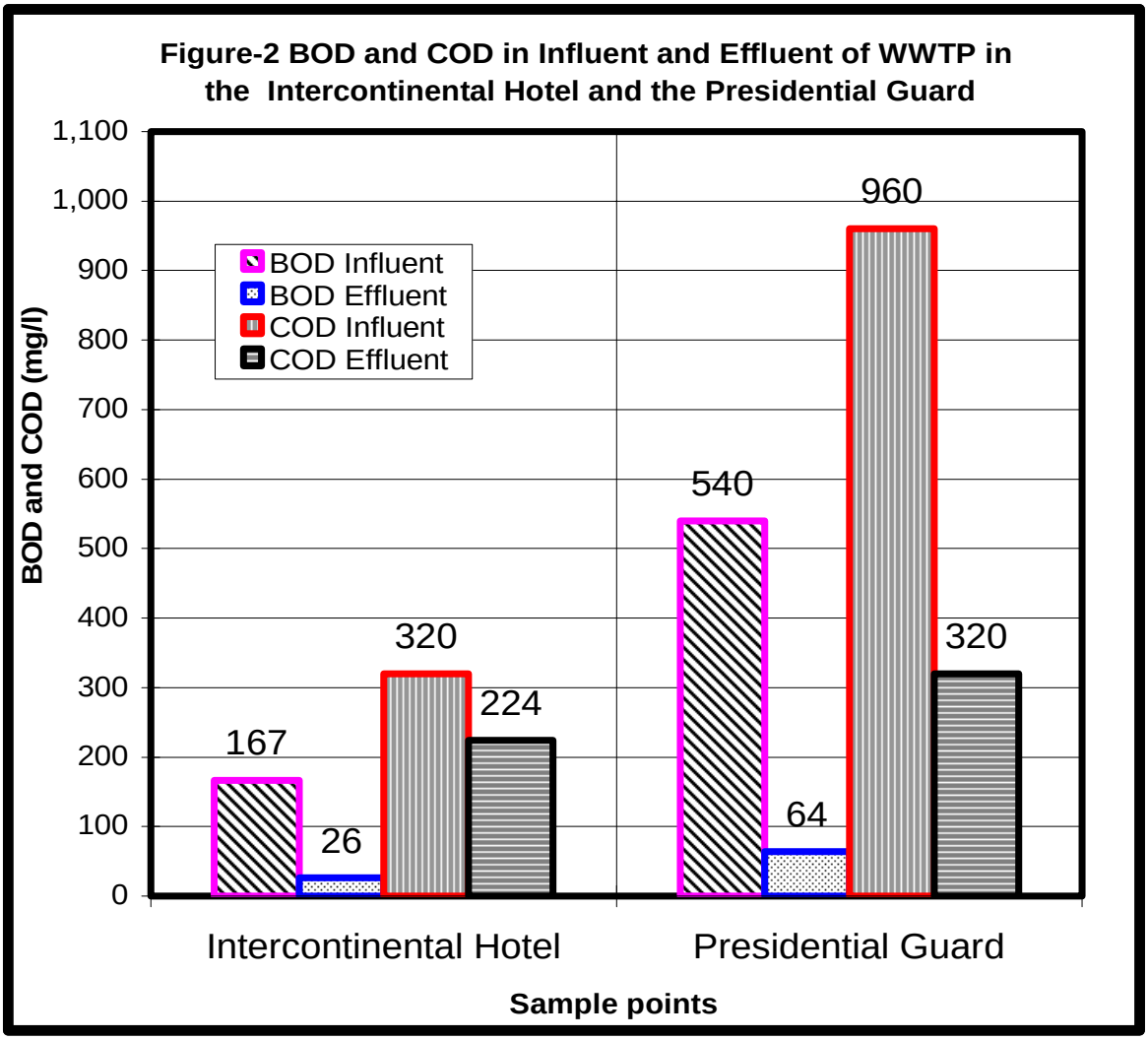
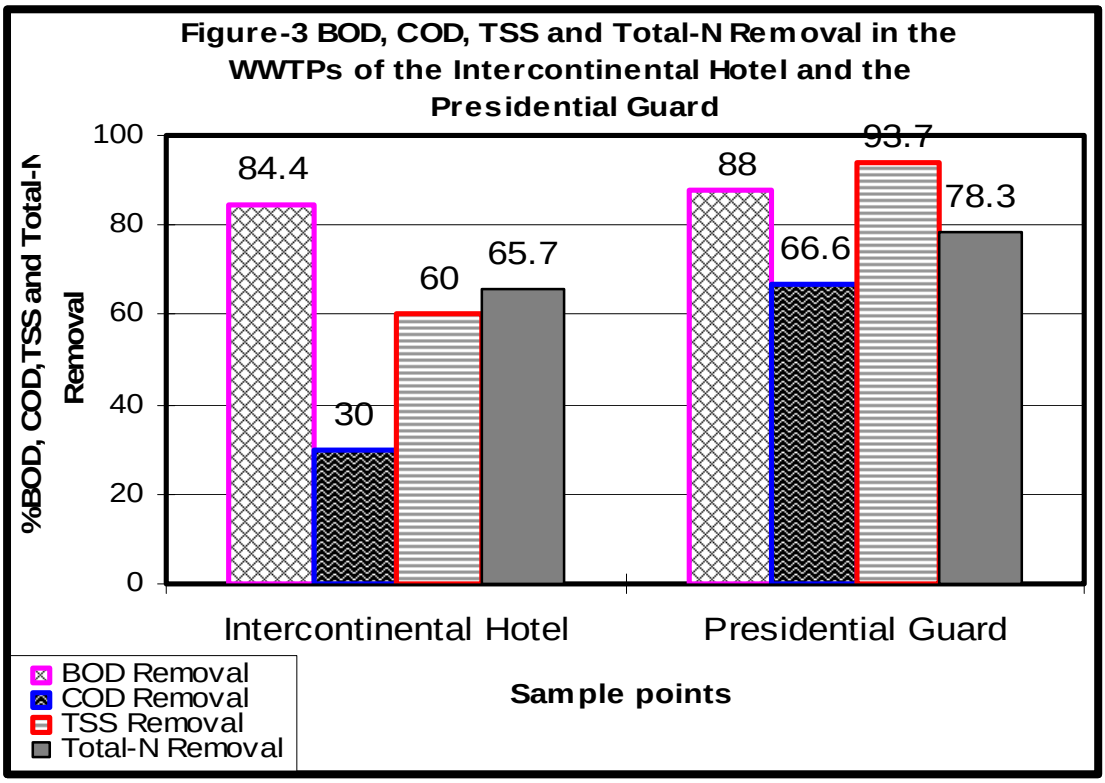


Table-2 Removal Percentage of BOD5, COD, and TSS in the WWTP in the Intercontinental Hotel and the Presidential Guard

Location	%BOD5 removal	%COD removal	%TSS removal	%Total-N removal
Intercontinental Hotel	**84.4**	**30.0**	**60.0**	**65.7**
Presidential Guard	**88.0**	**66.6**	**93.7**	**78.3**

From Table-2 and Figure-3 it is clear that the removal percentage of BOD5, COD, TSS and Total-N are higher in the WWTP of the Presidential Guard in comparison to that of the Intercontinental Hotel. Consequently, the WWTP of the Presidential Guard is more efficient than that of the Intercontinental Hotel.

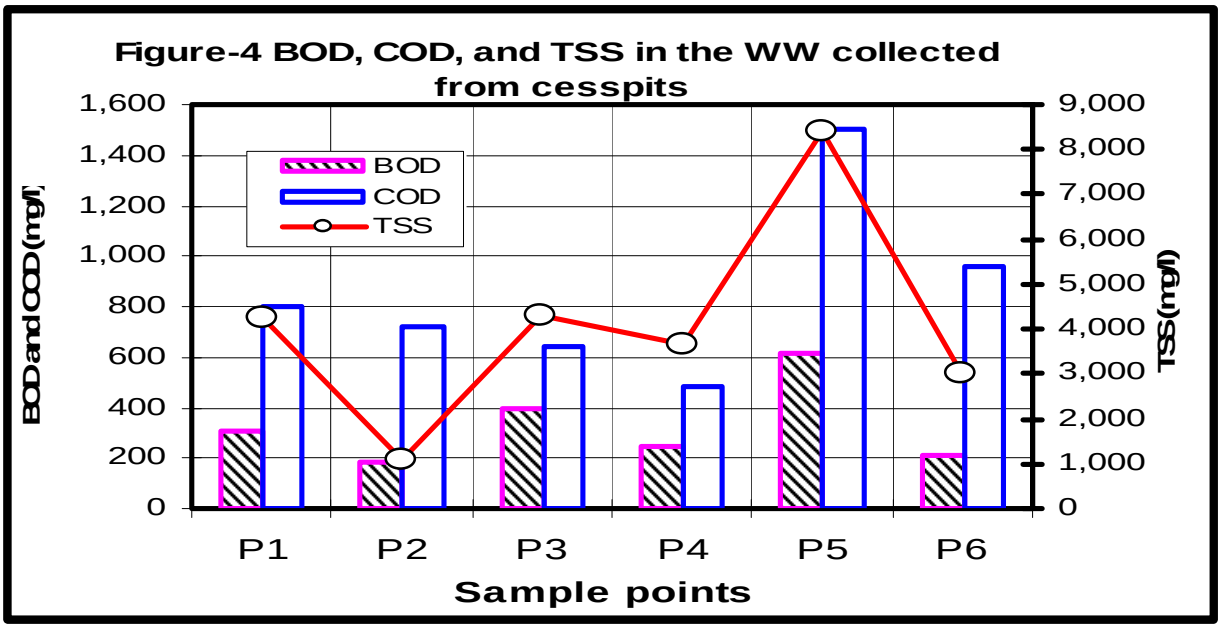


7.2 Samples collected from cesspits

Results of samples collected from the infiltration cesspits distributed in different areas of Jericho City are shown in Table-3.

Table-3 Results of WW Samples Collected from the Infiltration Cesspits Distributed in Different Areas of Jericho City on 21st February, 2011

No.	Location	Date	pH unit	EC µs/cm	BOD_5 mg/l	COD mg/l	TSS mg/l	PO_4 mg/l	Total-N mg/l
1	Palestine St. (house)	21/2/2011	6.27	1640	312	800	4240	2.1	140
2	Sabiha area (house)	21/2/2011	6.97	1697	182	720	1090	1.9	123
3	El Sultan St. (house)	21/2/2011	6.54	1920	400	640	4310	3.2	176
4	El Sultan St. (house)	21/2/2011	6.71	2440	248	480	3680	4.1	162
5	Al Maghtas St. (Building)	21/2/2011	6.13	2390	616	1500	8390	10.1	184
6	Hisham Palace St. (house)	21/2/2011	6.76	1650	208	960	3010	6.5	128



P1: *Palestine street (house)*
P2: *Sabiha area (house)*
P3: *El Sultan street (house)*
P4: *El Sultan street (house)*
P5: *Al Maghtas street (building)*
P6: *Hisham Palace street (house)*

From Table-3 and Figure-4, the BOD5, COD, TSS and Total-N of the various cesspits showed values in the range of 208-616, 480-1,500, and 3,010-8,390, 123-184 mg/l, respectively.

Table-4 shows the range and average of BOD5, COD, TSS, EC, PO4, and Total-N in the abovementioned cesspits.

Table-4 Range and Average of the Concentration of BOD5, COD, TSS, PO4 and Total-N in the Cesspits

Parameter	Range (mg/l)	Average (mg/l)
BOD5	208-616	328
COD	480-1,500	850
TSS	3,010-8,390	4,120
EC (µs/cm)	1,640-2440	1956
PO4	1.9-6.5	4.7
Total-N	123-184	152

8. Conclusions

From the chemical analysis of the wastewater samples collected from the WWTPs in the Intercontinental Hotel and the Presidential Guard and from the house cesspits used to dispose of wastewater, it can be concluded that:

1- As BOD5 to COD ratio was > 0.5 in both influent of the Intercontinental Hotel and the Presidential Guard, then wastewater there is considered to be highly biodegradable.
2- As BOD5 to COD ratio in the samples collected from cesspits in Sabiha area and Hisham Palace was <0.3, then wastewater is deemed to undergo a chemical treatment before the routine biological treatment..
3- Removal percentage of BOD5, COD, TSS and Total-N in the WWTP of the Presidential Guard was higher than that in the Intercontinental Hotel which indicates that the WWTP in the Presidential Guard is more efficient.

9. Recommendations

1- The technology used to treat wastewater in the Presidential Guard WWTP should be studied carefully in order to make use of its application in designing and constructing the anticipated central WWTP for the whole city of Jericho and its surrounding communities.
2- WW characteristics in cesspits should be studied in more cesspits (i.e. more than 30 cesspits in different areas of the city).

ANNEX

Results of the WW samples collected from Jericho City During February 2011

No	Location	Date	pH unit	EC µs/cm	BOD_5 mg/l	COD mg/l	TSS mg/l	PO_4 mg/l	Total-N mg/l
1	**Intercontinental Hotel (influent)**	16/2/2011	6.97	2050	167	320	120	6.2	134
2	**Intercontinental Hotel (Effluent)**	16/2/2011	7.51	2430	26	224	48	2	46
3	**Presidential Guard (influent)**	16/2/2011	6.61	1800	540	960	286	11.8	152
4	**Presidential Guard (Effluent)**	16/2/2011	7.63	2040	64	320	18	11	33
5	**Palestine St. (house)**	21/2/2011	6.27	1640	312	800	4240	2.1	140
6	**Sabiha area (house)**	21/2/2011	6.97	1697	182	720	1090	1.9	123
7	**El Sultan St. (house)**	21/2/2011	6.54	1920	400	640	4310	3.2	176
8	**El Sultan St. (house)**	21/2/2011	6.71	2440	248	480	3680	4.1	162
9	**Al Maghtas St. (Building)**	21/2/2011	6.13	2390	616	1500	8390	10.1	184
10	**Hisham Palace St. (house)**	21/2/2011	6.76	1650	208	960	3010	6.5	128