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### Appendix 1-1 MM for Beginning of the Preparatory Survey

## 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 8<sup>th</sup> 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 13<sup>th</sup> December 2010 to 16<sup>th</sup> 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

No1 IN

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



Nation Pulestinian Water Authority

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

### ATTACHMENT

### 1. Outline of the Project

4.4

- 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

- 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 7<sup>th</sup> 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 8<sup>th</sup> 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

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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



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

4.1

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### 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.

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### 2. Japan's Grant Aid

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#### 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.

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- Estimation of costs of the Project.

14.4

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

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"

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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.

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(9) Authorization to Pay (A/P)

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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

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Table 2.1 Major	Undertakings	to be Taken	by Each	Government
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- A	 16	X.	-	ş.,

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NO.	Burros.	To be covered by Grant Aid	To be covered by Recipient Side
1	to secure [a lot] /[but] of land necessary for the implementation of the Project and to clear the [site]/[sites];		
2	To constrait the following facilities		
	1) The building		
	2) The gates and fences in and around the site		
	3) The parking lot	•	
	<ol> <li>The road within the site</li> </ol>		
	<ol> <li>The road outside the site</li> </ol>		
1	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		
	4. The distributing power line to the site		
	h. 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		
	h. The supply system within the site (receiving and elevated tanks)		
	3) Orainage		
	a. The city drainage main (for storm sewer and others to the site)		
	<ul> <li>The drainage system (for toilet sewer, common waste, storm drainage and others) within the site</li> </ul>	•	
	41 Gas Supply		
	The cas sucoly system within the site		
	5) Telenhone Swarm	-	
	<ul> <li>The telephone truck line to the main distribution frame/nanel (MDF) of the building</li> </ul>		
	h. The MEXE and the extension other the frame/nand		
	5) Furniture and Environment	-	
	<ul> <li>General familiare</li> </ul>		
	h. Project estimate		
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.		
	13 Marine (Air) transportation of the Products from Janua to the recipient country		
	2) Tax exemption and custom clearance of the Products at the port of disembediation		
	3) Internal transportation from the port of disemberitation to the environment		
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		•
ů.	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 energy into the recipient country and data therein Control and facilities as may be necessary for their energy into the recipient country and star. therein Control and Facilities as may be necessary for their energy into the recipient country and star.		•
7	To ensure that the Facilities be maintained and used properly and effectively for the implamentation of the Project		•
8	To bear all the expenses, other than these 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		•
iò	To give due environmental and social consideration in the implementation of the Project.		ð

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

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2. Jupan's Grant Aid



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

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### 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

	1. 2	010				20			_	
Description	November	December	Jamany	February	Manh	Apdt	May	Jac	July	Asput
(1) Preparation Work in Japan	E	== (								
R4D 1 (2) Field Servicy I		annighter a	-							
13) Hame Work I			1							
(4) Field Survey I.				-	-				-	1.1
news a 151 Hanne Work I					And and a second			-		
161 Explanation of DF-III.									1000	
(7) Propagation & Submission of Fill.										



#### 3.3 Member of the Team

Table 3.1 Member of the Ica	m	
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Name	Position	Organization
Mr. N. Mori	Team Leader of the Study Team	IICA
Mr. I. Aoki	Planning Management	лел
Mr. K. Matsuoka	Leader of the Consultant Team/Sewerage System Planning/ Environmental and Social Consideration	
Mr. T. Watanabe	Sewage Treatment Facility Planning/Design	NJS Consultants
Mr. Y. Konda	Sewer Pipeline Planning/Design	Co., Ltd
Mr. K. Nakamura	Cost Estimation/Procurement Planning/Construction Planning	
Mr. A. Natsui	Electric Equipment Planning	

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## 3.4 Proposed Itinerary of the Team

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-	1000	100			Contra Pro-		lembe	t	10 11	
No.	Date		Activities	N. Mori	L. Aoki	K. Matsuoka	Ľ. Watamabo	V. Konda	K. Vakamum	A. Natsui
1	11-Dec	Sat	Move	1		0	0	0	0	0
2	12-Dec	Sun	Preparation in Ramallah			0	0	0	0	0
3	13-Dec	Mon	Cortesy call to IBCA/related Agencies, Explantion of IC/R	Ő	0	0	0	0	0	0
4	14 Dec	Tue	Meeting for MM, Field Survey	0	0	0	Ó	0	0	0
5	15-Dec	Wed	Motting, Signing on MM	0	0	0	0	0	0	0
6	16-Dec	Thu	Data Collection, Field Survey, etc., Move (Mr. Mori, Mr. Anki)	0	0	0	Ó	0	0	0
7	17-Dec	Fri	Data Collection, Field Survey, etc.	0	0	0	0	0	0	0
8	18-Dec	Sat	Internal Moeting, etc.	-		0	0	0	0	0
9	19-Dec	Sun	Internal Meeting, etc., Move (Mr. Natsul)			0	0	0	Ó	0
10	20-Dec	Mon	Data Collection, Field Survey, etc.	-		D	0	0	0	0
11	21-Dec	Tue	Data Collection, Field Survey, etc.	-	-	0	0	0	0	0
12	22-Dec	Wed	Data Collection, Field Survey, etc.	-		0	0	0	0	-
13	23-Dec	Thu	Data Collection, Field Survey, etc.			0	0	Ő.	0	
14	24-Dec	Fri	Data Collection, Field Survey, etc.			0	0	0	0	
15	25-Dec	Sat	Internal Meeting, etc.			Ö.	0	0	O	
16	26-Dec	Sun	Internal Moeting, etc.	1		0	0	0	0	
17	27-Dec	Mon	Data Collection, Field Survey, etc.	-	-	O.	0	0	O	
18	28-Dec	Tue	Data Collection, Field Survey, etc.		-	0	0	0	0	
19	29-Dec	Wed	Data Collection, Field Survey		-	0	0	0	0	
20	30-Dec	Thu	Data Collection, Field Survey, Move(Mr. Watanabe, Mr. Nahamura)			0	0	0	0	
21	31-Dec	Fri	Data Collection, Basue Design Report, etc.		-	0	0	0	0	
22	I-Jan	Sat	Data Collection, Basue Design Report, etc.			0		0		
23	2-Jan	Sun	Internal Meeting, etc.		-	0		0		
24	3-Jan	Mon	Data Collection, Brasac Design Report, etc.			0.		0		
25	4-Jan	Tue	Data Collection, Hasac Design Report, etc.			0		C)		-
26	5-Jan	Wed	Data Collection, Busine Design Report, etc.			0		0		
27	6-Jan	Thu	Data Collection, Bassac Design Report, etc.			0		0		
38	7-Jan	Fri	Move (Jericho - Tel Aviv) Explanation to JICA office/Explanation to Embassy of Japan			0		0		
29	8-Jan	Sat	Move (Tel Aviv-listanbul)			0		Ũ		
30	9-Jan	Sun	Move (-Japan)			D	1.00	0		

Table 3.2 Proposed Itinerary of the Team

IC/R: Inception Report

MM: Minutes of Meeting

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### 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:

- 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.

### 4. Contents of the Survey

#### 4.1 Objectives of the Survey

The Study has the following objectives:

- 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,

4. Contents of the Study

- (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

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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.

## 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)

Design Sewage Rate	Daily Average : 11,000 m <sup>3</sup> /day
	Daily Maximum : 15,400 m <sup>3</sup> /day
	Hourly Maximum : 33,000 m <sup>3</sup> /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.



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### 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

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## 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.

Ch

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

Ramallah, 7th July, 2011 Dr. Shaddad Al Attili mian Nation 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 8<sup>th</sup> 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 4<sup>th</sup>, 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

## PREPARATORY SURVEY

## ON

# THE JERICHO WASTEWATER COLLECTION, TREATMENT

## SYSTEM AND REUSE PROJECT

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# OUTLINE OF THE SURVEY

JULY 2011

## NJS CONSULTANTS CO., LTD

## Contents

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#### 1. Capacity Calculation of the System

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

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

Note) Target Year:2020, Ultimate: Population in 2025 with 100% of connection

WW = Wastewater, C. Population = Connected Population, C. Ratio = Connected Ratio, P = Person

Items		Target Year		Amount	Application to facility design		
		2020	2020 Ultimate Plan				
Wastewater Daily Average		6,600	9,900	1.0	Reactor during winter season and sludge drying bed		
(m <sup>3</sup> /day)	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	BOD	500	500		Mass balance, reactor capacity and air		
Quality	TSS	500	500				
(mg/L)	T-N	75	75		оюжег сарасну		

#### Table 1-2 Design Wastewater Amount and Quality

#### 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 Wa	Effluent		
	Q <sub>DA</sub>	Q <sub>DM</sub>	Q <sub>HM</sub>	Quality
WW Quantity (m <sup>3</sup> /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.

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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 skinnmer 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 $12 \text{ m}^3/\text{m}^2/\text{day}$ . 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 $60 \text{kgDS/m}^2/\text{day}$ 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.





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Figure 2-2 WWTP Flow Sheet

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#### 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.

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Number	Pipe Length		Dia (mm) Served Population		Note	
inumber	(m)	Pipe Dia.(mm)	2010	2025	Note	
I	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 Sev	ver coverage (%)		25.4	21.3		
Ratio covered by s	ewers including b	anch sewer (%)	47.3	43.2		

Table 3-1 Service Ratio by Sewer Network Development

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.

Connecting	Collection	Served	Pipe	Pipe Diameter
Trunk No.	Area (ha)	Population	Length(m)	(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	

 Table 3-2
 Population served by Branch Sewers

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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.

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

#### **Table 4-2 Water Quality Analysis Apparatus**

Item	Contents
Procured	Water quality test equipment(portable pH meter, portable DO meter, portable
Equipment	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.

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	<ul> <li>Sodium Hypochlorite (Average injection rate : 3 ppm counted as effective Cl)</li> <li>1,120 NIS/m<sup>3</sup>×0.2 m<sup>3</sup>/day×365 day=81,000 NIS/year</li> </ul>	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 7-1 Estimated O&M Cost for this Project (NIS/year)

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.

		с	onnection Ratio	) (%)	Wastewater	Annual O&M		Unit O	Unit O&M Cost	
Year	Case	Municipality	Surrounding	Agro-industrial Park <sup>*2</sup>	Quantity (m <sup>3/</sup> d)	Including	Excluding	(NI) Including	S/m <sup>2</sup> ) Excluding	
	1*1	80	50	100	6,540	4,392	2,177	1.8	0.9	
2020	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 <sup>*1</sup>	90	70	100	8,450	4,523	2,308	1.5	0.7	
2025	5	60	30	50	4,650	4,213	1,998	2.5	1.2	

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

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 13haWWTP 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

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							2012 April- 2014	20011 0012			
	Timeline (to be revised) (*)		2010 Ju	Ŋ	Dec-2011 August	2011 Sep - Dec	Mar	C102 4107	Notes	Current situation	
Category	Items	Responsible Entity	Pre F/S	F/S	B/D	D/D	Construction	0&M		Andication has been already submitted to	
		VIII	Basic concept of the	The standard is	The standard is approved by JWC.					WC and agreed in principle. Final report of the survey will be submitted to JWC.	
Approval	Approval of standard for effluent of wastewater by JWG Approval of environmental and social impact assessment by relevant	PWA	Procedure of the ESIA		ECIA is annound					EQA commented on the EIA. PWA is preparing to answer the comment. EIA will be approved by the end of this month.	
status of the Project	national authority	PWA MOF PWA	pe contirmed Procedure of land acquisition be		Land acquisition is L annivored.	Land acquisition is completed.				The new location of the proposed WML <sup>1</sup> is swined by the Religion Ministry (AI Waqef land). Special Committee was established to accelerate the process on 22 June, 2011.	
	Land acquisition for the Fregeu site Legislation which enables mixed treatment of industrial wastewater		Basic concept of the legislation be		Draft legislation be						
Law and regulation	and domestic sewage Legislation of mandatory connection to from each household to sewer	PWA	confirmed Basic concept of the		prepared Draft legislation be	Approved				PWA is waiting for cabinet approval of bylaw. MOLG has already endorsed the bylaw. PWA	
	by beneficiaries of the Project Legislation of payment of service fee by beneficiaries of the Project	PWA	legislation be confirmed		Draft legislation be prepared	Approved				is still pushing to obtain the cabinet approval: since it is required for other projects. DWA already has Projects Management Unit	
	Responsible organizational and institutional structure (including Responsible organizational and institutional structure (including seconsistance such as planning, designing, operation, maintenance	AWA	Basic concept of the structure be confirmed	Responsible units De decided	i.	The units established	Training for capacity development		The timeline can be	rent an early near 1 9900 memory near 1 9000 memory near 1 9000 memory near 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
Organizational and Institutional building	Responsibility of the Project (including sharing expense) when the	MQ	Basic concept of the responsibility be	The responsibility is confirmed by written agreement with the park.					changed in accordance with an organizational structure of agro- industrial park.	The MOU has been already signed with three original copies.	
	Project treat wastewater from Agro-Industrial park Organization and institution (including securing humane resource and Jevoleoment) to imilement Q&M of the Project	Jericho	Basic concept of the organization be confirmed	Responsible units be decided		The units established	Training for capacity development			Jerichio Municipality expands the water department to be water and sanitation department.	
	developments to importance com or unit of the Development of the Decision making with regard to expense sharing between Jericho city and the Project baneficiaries through service fee	PWA Jericho	Basic concept of the expense sharing be confirmed		Decided					Jencino Municopancy has an easy services we Prick in this issue. PAA in this issue. PA through MOF allocates 2 millions US\$ to	<u> </u>
Securing a source of revenue			Basic concept of the budget allocation be	Budget allocation procedure be	Budget allocation		Budget be allocated			Accore the obligation expenses by the receipient. Further necessary budgest (1.5 million US\$) will be allocated by PA through MOF.	1
	Budget allocation for construction of branch sewer	Jericho	contirmed Basic concept of the budget allocation be	contirmed Budget allocation procedure be	procedure started 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.	
	Budget allocation for UKM of the Project Organization and institution for guality inspection of inflow of industrial	FDA	Basic concept of the organization be confirmed			Responsible organization and procedure be set up					
Organization for inspection	Wastewater to severage prant. Organization and institution for enforcement of regulation on inflow of industrial wastewater to severage plant.	EQA	Basic concept of the organization be confirmed			Responsible organization and procedure be set up		Enforcement		PWA will monitor the WWTP and EQA will monitor whole environmental matters.	
	Organization and institution for quality inspection of treated wastewater from the sewerage plant	PWA EQA	Basic concept of the organization be confirmed			Responsiole organization and procedure be set up				Necessary instruments and capacity for the monitoring is lacking.	
The Project	Service fee collection system (including consideration of possibility of simultaneous collection with water supply, electricity bill, penalty rule	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.	
implementatio n	for non-payment enture monocomments Promotion of connection to sever from each floursehold (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.	-
	Target volume, target crops, identification of users, system for collection of user fee, securing of safety of traated vasteviater	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.	
Reuse of treated wastewater	Water quality standard of reuse of treated water and the system of		Basic concept of the	Standard be		-		110011		The standard is based on the MOU signed in the	c .
	inspection	PWA	standard be confirmed Basic concept of the utility system be	contirmed	Design of electricity supply be	oystelli de estadilation				Basic design of the electricity supply will be confirmed during Basic Distan	0
Others	Utility (Electricity) system for the Project (*) subinet to change due to administrative procedure, budget availabil	PWA ity and so fort	confirmed the concerned author	Confirmed ities of both Palest	confirmed. inian and Japanese sid	ə				CONTINUEU OUTING LABOR PROVIDER	1

ANNEX-3

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Environmental Check Lists : Sewerage (1)

Yes or No	<ul> <li>(a) Y (a) It was already made and submitted to EQA.</li> <li>(b) N (b) The limit duration which EQA shall answer to proponent was expired, then now PWA is inquiring the result to EQA.</li> <li>mposed on (c) - (c) Currently no official reply from EQA</li> <li>(d) N (d) Not necessary.</li> </ul>	<ul> <li>explained (a) Y (a) The contents and influences of the Project had been already explained in the stakeholder meetings mation</li> <li>(b) Y in Jericho Municipality, and the approval of acquisition for WWTP site was already obtained from Ministry of Religious Affairs.</li> <li>an reflected</li> <li>(b) Proper response was already done.</li> </ul>	(a) Y (a) Several options for the location of WWTP site and the wastewater treatment process were examined.	ant from a (a) Y (a) The T-N value of effluent is exceeded the standard of agreement with Israel, but Israel authority (b) N agreed the value. (b) No factories which discharzes heavy metal exist in and around the Protect site.	ly treated (a) - (a) Dried solid will be stored at the WWTP site and then it will be used for farmlands.	lequate (a) Y (a) Heavy metal will not be contained in sewage. hates from	reatment (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.	treatment (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.	's laws or (a) N (a) There is no protected area, and the site is currently a farmland. et will
Main Check Items	<ul> <li>(a) Have EIA reports been already prepared in offici.</li> <li>(b) Have EIA reports been approved by authorities o government?</li> <li>(c) Have EIA reports been unconditionally approved the approval of EIA reports, are the conditions satisfied in addition to the above approvals, have other rebeen obtained from the appropriate regulatory author government?</li> </ul>	(a) Are contents of the project and the potential impa to the local stakeholders based on appropriate proceed disclosure? Is understanding obtained from the loca (b) Have the comment from the stakeholders (such to the project design?	(a) Have alternative plans of the project been examir environmental considerations?	<ul> <li>(a) Do pollutants, such as SS, BOD, COD, pH conta sewage treatment plant comply with the country's ef (b) Does untreated water contain heavy metals?</li> </ul>	(a) Are wastes, such as sludge generated by the facili and disposed of in accordance with the country's sta	(a) If wastes, such as sludge are suspected to contain measures taken to prevent contamination of soil and the wastes?	(a) Do noise and vibrations generated from the facili facilities and pumping stations comply with the cour	<ul> <li>(a) Are adequate control measures taken for odor sou facilities?</li> </ul>	(a) Is the project site located in protected areas desig international treaties and conventions? Is there a pos affect the protected areas?
Environmental Item	(1) EIA and Environmental Permits	(2) Explanation to the Public	(3)Study of Alternative plans	(1)Water Quality	(2) Wastes	(3) Soil Contamination	(4) Noise and Vibration	(5) Odor	(1) Protected Areas
Category	1. Permits and					2. Policies for prevention of pollution			

(3)	
Sewerage	
heck List	
Ð	ſ
Environmental	

Confirmation of Environmental Considerations	<ul> <li>(a) There is no such area.</li> <li>(b) There is no such area.</li> <li>(c) No impact is anticipated.</li> <li>(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.</li> </ul>	<ul> <li>(a) No resettlement</li> <li>(b) Not necessary</li> <li>(c) Not necessary</li> <li>(d) Not necessary</li> <li>(f) Not necessary</li> <li>(g) Not necessary</li> <li>(i) Not necessary</li> <li>(j) Not necessary</li> </ul>	(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 construction need to be prepared for housing along the access rord.	(a) When sever 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	(a) There is a farmiand 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 accordingly offered.	<ul><li>(a) There is no ethnic minorities</li><li>(b) Not necessary</li></ul>
Yes or No	(F) N	88999998655	(a) N (b) Y	(a) Y	(a) N	(a) N (b) -
Main Check Items	<ul> <li>(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)?</li> <li>(b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions?</li> <li>(c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem?</li> <li>(d) Is there a possibility that the project will adversely affect aquatic environments, such as aquatic organisms?</li> </ul>	<ul> <li>(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement?</li> <li>(b) Is adequate explanation on conpensation and resettlement given to affected persons prior to resettlement?</li> <li>(c) Is the companion on grading conpensation with full replacement costs, restoration of livilhoods and living standards developed based on socioeconomic studies on resettlement?</li> <li>(c) Is the compansation going to be paid prior to the resettlement?</li> <li>(c) Is the compansation going to be paid prior to the resettlement?</li> <li>(d) Is the compansation provides repared in document?</li> <li>(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?</li> <li>(g) Are agreements with the affected persons obtained prior to resettlement?</li> <li>(h) Is the organizational framework established to properly implement resettlement?</li> <li>(f) Are any plans developed to monitor the impacts of resettlement?</li> </ul>	<ul> <li>(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?</li> <li>(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?</li> </ul>	(a) Is there a possibility that the project will damage the local archeological, instorical, cultural, and religious heritage sites? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	<ul> <li>(a) Are considerations given to reduce the impacts on culture and lifestyle of ethnic minorities and indigenous peoples?</li> <li>(b) Are the rights of ethnic minorities and indigenous peoples in relation to lands and resources respected?</li> </ul>
Environmental Item	(2) Eosystem	(1)Transfer of people	(2) Living and Livelihood	(3) Heritage	(4)Landscape	(5) Ethnic Minorities and Indigenous Peoples
Category	3.Natural Environment		4.Social Fivironment			

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Sewerage
Check Lists :
Environmental (

or Confirmation of Environmental Considerations	<ul> <li>(a) Project will be carried out under the law in Palestine.</li> <li>(b) Every necessary facility will be prepared.</li> <li>(c) Every necessary procedure will be prepared and carried out.</li> <li>(d) Safety staff will be assigned and a proper safety plan will be formulated.</li> </ul>	<ul> <li>(a) Necessary measures will be prepared.</li> <li>(b) No adversely affect</li> <li>(c) Countermeasures for traffic jam and dust nuisance will be prepared.</li> <li>(d) Traffic of the target area is not so busy, but countermeasures, such as detour, will be prepared.</li> </ul>	<ul> <li>(a) A monitoring program will be prepared.</li> <li>(b) Shown in attachment</li> <li>(c) Adequate framework will be established</li> <li>(c) Adequate framework will be established</li> <li>(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</li> </ul>	(a) Influent by the water contarnination 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
Yes o No	イ ベ ベ ベ (9) (9)	Х X V (ф) (б) (б) (б) (б) (б) (б) (б) (б) (б) (б	G(G) ↔ , ≺ , ≺	- (3)
Main Check Items	<ul> <li>(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?</li> <li>(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?</li> <li>(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.?</li> <li>(d) Are appropriate measures taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local mediaters.</li> </ul>	<ul> <li>(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)?</li> <li>(b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts?</li> <li>(c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?</li> <li>(d) If the construction activities might cause traffic congestion, are adequate measures considered to reduce such impacts?</li> </ul>	<ul> <li>(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts?</li> <li>(b) What are the items, methods and frequencies of the monitoring program?</li> <li>(c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)?</li> <li>(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?</li> </ul>	(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).
Environmental Item	(6)Work Condition	(1) Impacts during Construction	(2) Monitoring	Note on Using Environmental Checklist
Category		<b>`</b>	5. Others	

be made based on compansons with appropriate standards of other countries (including Japan' expenence). į n So

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.

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### A. Plan for Environmental Monitoring

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Division	Items	Contents	Agency	Frequency	Timing
Grasping of	Along the	<ul> <li>Facilities required paying special attention; such as</li> </ul>	PWA	At preliminary	EIA
Present	Sewer-pipes	hospitals and schools	1	survey in EIA	
Condition		Irattic density and noise by the hour	4		
		Situation of Traffic congestion generation			
		Locations and kinds of historical heritage	1		
	Surrounding	Land utilization conditions			
	conditions	Facilities in surrounding areas			
	of WWTP	<ul> <li>Surrounding housings and others</li> </ul>	]		
		Dust generation situation by wind	1		
1		• Landscape	1		
	Effluent	Condition of effluent point			
	Water	Groundwater quality (Survey of Wells)			
		Water quality of Dead Sea	4		
1	Solid Waste	Collection and disposal methods for domestic solid waste	4		
	bond traite	in municipality			
-	Managemen	· Collection and disposal methods for industrial solid waste	1		· ·
	Ŭ	in municipality			
	Į	Reusing ways for dried sludge from WWTP		· ·	
Mitigation	Installation	Countermeasure for noise/vibration	Prepared by	The Contractor	Formulation
Countermea	of Sewer-	Traffic countermeasures including detour	the	shall prepare as	of
sures and	pipes	Historical ruins and procedures of handling when	Contractor	"Environment	Construction
check		Construction time scheduling	and	Protection	Plan
	Construction	Countermeasure for noise/vibration	reviewed by	plan" in the	
	of WWTP	Traffic countermeasures	Consultant/P	planning of	
		Countermeasures to facilities requiring paying attention	WA	Construction	
		Prevention measure for dust		Plan	
		Consideration to landscane			
]	Treated '	Treated water quality, quality of groundwater, influence to			FIA
[	Water	quality of Dead sea	l		2.171
	Solid Waste	· Solid Waste Management Plan (Recycling, Disposal of			Formulation
	Management	domestic waste and industrial waste)			
		Treatment and disposal/reuse of dried sludge and			of
		screenings in operation phase			Construction
Monitoring	Installation	<ul> <li>Noise/vibration during construction(working points and</li> </ul>	Prepared by	Daily	During
during	of Sewer-	nearby facilities requiring paying attention	construction		Construction
Construction	pipes	<ul> <li>Generation of traffic congestion by construction and effect</li> </ul>	contractor	Daily	
		by countermeasures	and		
		Finding run/relic and handling procedures when	reviewed by	Daily	
	Construction	Nuisance by Noise/vibration and influence to surrounding	Consultants/	Daily	
	or wwiP	Generation of traffic congestion by vehicles for	PWA	Daily	
		Generation condition of dust and effect of mitigation		Daily	
	Solid Waste	Observance situation of Solid Waste Management Plan		Weekly	
	Management	<ul> <li>Disposal methods and quantities of domestic/industrial</li> </ul>		Weekly	
		Recycling methods and quantities		Weekly	
Monitoring	ļ	Detection of odor by monitor	Conducted	As required	During Test
in		<ul> <li>Measurement of Noise/Vibration</li> </ul>	by	Moring, Evenin	Operations
Commission	WWTP		construction	g, Night	
ing		Quality tests of wastewater and treated water	contractor	Weekly	
Operations		Water content and odor measurement for dried sludge	and	Every Disposal	
Monitoring	Sewer-pipe	Occurrence of odor nuisance and clogging	Conducted	As required	Operation
in operation		· Generation of caving-in	by Jericho 🛛	As required	Phase
phase	WWTP	Complaint for odor/noise/vibration	Municipality	As required	
	[	Regular analysis for treated water	and	Monthly	1
	ſ	· Quantity/purpose of reused treated water, complaint by	reviewed by	As required	
	ſ	· Quantity/purpose of reused dried sludge, complaint by	EQA	As required	

B. Monitoring Form1. Grasping of Present Condition

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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					
i	surrounding area					
Along the	Natural condition					
sewer	Land-use condition					
installation	Soil condition					
route	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	°C				

### 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	Items	Contents	Countermeasure
entity			
			······

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# Monitoring for Construction Stage Check for EMP (Environmental Management Plan)

Category	item	Results/pointed items	Countermeasure
General	Policies		
	Organization		
	Connection system		
Construction	Traffic		
for WWTP	Noise/vibration		
	Dust		
	Sludge disposal		
	Domestic wastewater		
	Littering in the site		
	Monitoring plan	-	
	Correction	- ·	
Sewer	Traffic		
installation	Noise/vibration		
	Dust		
	Sludge disposal		
	Littering in the site		
	House along the load		
	Monitoring plan		
	Correction		
Solid-waste	Generation projection		
management	Segregation/disposal		
Plan	of domestic waste		
	Recycling of package		
	Treatment and		
	disposal of		
	construction waste		
	Safety storage and		
	disposal of hazardous		
	Monitoring plan		
	Correction		
	Concolion		1

### 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	Clearing up				
	onice	Domestic				
		wastewater				
Sowor	Brobloma	Others	-			
installation	and				· · · · · · · · · · · · · · · · · · ·	
	Complaint					
	Traffic	Detour				
		Troffic icm		<u> </u>		
		Noiso/uibration	-			
		Dust				
		Others			······	
	Excavation	Breasting	1			
		Influence to				
		traffic				
		Influence to				
		along				
		Structures				
		Soil diepocal				
		site				
		Others	· · · · · ·			
Solid-waste	Problems		·			
Management	and					
	Complaint					
					· · · · · · · · · · · · · · · · · · ·	
	Generation	Domestic			· · .	
	amount(t/m)	Package				
		Construction		•• •		
		Hazardous				
	Disposal	Contents	Amount	Place	of	
	(t/m)			dispos	al	
		Domestic				
		Package		[		
		Construction				
1		hazardous				
	Recycling	Contents	Amount(t/m)	Ratio	Method	
		Demestic		(%)		
		Domestic				
	F	Construction				
	ŀ	Hazardous				
Evaluation	Construction o	fWWTP				
	Sewer installat	ion	· · · · · · · · · · · · · · · · ·			
	Solid-waste m	anagement				
	Othere					
	0000		·····		I	

# Monitoring for Commissioning after Completion of Construction Water quality

ltem	unit	Inflow	Outflow	Effluent standard	Analysis method	Note
рН	()					
SS	(mg/L)					
BOD	(mg/L)					
COD	(mg/L)		ļ			
T-N	(mg/L)					
T-P	(mg/L)					
Oil & Grease	(mg/L)					
Total dissolved solid	(mg/L)					
Coliform	(n/100cc)		<u> </u>			
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(FI)	(mg/L)					
Iron(Fe)	(mg/L)					
Mercury(Hg)	(mg/L)				<u> </u>	
Lithium(Li)	(mg/L)					
Temperature	°C					

### 3-2 Noise

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

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

### 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		

### **Appendix 2** Survey Results

### **Appendix 2-1 Soil Survey**

### 1. Report

A-58 ~ A-100

### 2. Outline of the Survey Results

Depth of 20m of five(5) borings were executed at the WWTP candidate site, and depth of 10m of a boring and 5m of nine(9) these were done along the road in Jericho Municipality. These locations are shown in the report. Although two(2) of them ( \_ , \_ ) were planed to be depth 10m at the crossing points of the Wadi, one of point \_ only drilled by depth 5m because of a hard gravel layer.

The standard penetration tests by each one meter and laboratory tests for each different layer were carried out to each boring. The existing groundwater cannot be found in every borehole. The N values and laboratory test results are shown in Table 2-1-1. As shown in the table, majority of the layers were stable and relatively hard silty soil, and partly hard gravel layers were confirmed.

Some layers' N value was less than 10, minimum 6, but most of N values were over 20, and then basically, the most layers were strong. In addition the cohesions of around 30kN/cm<sup>2</sup> and the angle of internal frictions of over 12 degree shown the physical stabilization, and at the view of Atterberg Limit, the value of LL (Liquid Limit) and PI (Plastic Limit) shown the stabilization to water content.

At the WWTP site, the bearing capacity of 100kN/m<sup>2</sup> is required, because the maximum loading by the rector structure will be 97 kN/m<sup>2</sup>. While the location of borehole of S3 with minimum N value of six(6) is just at the point of the reactor position, the bearing capacity is estimated to be 105 kN/m<sup>2\*1</sup>.

\*1 The relation between the N value (N) and the bearing capacity (BC) is shown below;

 $BC_1 = N \times 10 kN/m^2$  in the case of the sand layer,

 $BC_2 = N \times 25 kN/m^2$  in the case of the clay layer,

BC = N x  $(10+25)/2 = 6 x (10+25)/2 = 105 \text{kn/m}^2$ 

because the silt layer is middle between sand and clay half

In addition, the bearing capacity of soil with cohesion 30kN/cm<sup>2</sup> is usually said to be around 100kN/m<sup>2</sup> and it is matched with above results. However, since there is no allowance, the plate load test shall be carried out and if the bearing capacity is not enough, the weak layer shall be replaced and compacted to meet the required value. This simple method is available because the thickness of these weak layers was thin.

The layers along loads where sewer pipes will be installed are not too hard to excavate these and are hard for the stable excavation. The pillars will be installed at the crossing point of Wadi, because the sewer pipes are crossed by the pipe bridges. The N values at these points are over 20, and it is enough to install the pillars.

<u>ν</u> μο		標高	深さ	最小N値	含水率	粒度	液性限界	塑性限界	粘着力	内部摩擦角	分類
易戶 lac	No.	Elevation	depth	Min-N	Moisture	<0.075mm	LL	PL	С	Ø	Clas s
부 더		m	m	Number	Content(%)	%	%	%	kN/m2	0	ification
	<b>S</b> 1	-311.263	0-4	12	20.5	67	38.1	10.2	39	15	ML
	51		4-20	10	33.2	70	40.1	9.7	38	15	ML
	52	-313.602	0-1.5	13	12.5	74	40.2	13.9	40	12	ML
و ب	52		1.5-20	9	32.5	80	45.6	14.3	39	15	ML
$\frac{1}{2}$	\$3	-315.577	0-5	6	12.9	71	38.2	11.0	37	16	ML
場- LD	33		5-20	19	29.9	83	41.5	14.3	38	15	ML
≣≥	S1	-316.187	0-2	15	11.8	79	40.1	15.5	39	14	ML
処ゞ	54		2-20	16	31.0	81	40.9	15.9	40	15	ML
		-317.336	0-3	15	12.2	84	41.1	14.9	40	15	ML
	S5		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
	1	-301.682	0-5	13	9.9	68	36.1	9.1	35	16	ML
		-309.245	0-1.5	22	10.2	62	35.2	8.5	33	17	ML
	2		1.5-5	27	17.7	58	37.3	7.4	32	18	ML
کر ا			5-10	21	18.4	64	36.8	8.8	34	16	ML
alit		-293.057	0-1.5	42	8.8	77	34.4	11.5	37	15	ML
cip	3		1.5-3	12	18.1	82	36.9	14.0	39	16	ML
- ini			3-5	19	19.3	80	37.0	13.9	38	16	ML
ΫĮ	4	-268.461	0-5	>50	4.3	47	33.5	13.3	32	18	GP
站 i i	5	-264.650	0-5	33	9.0	45	34.5	14.9	33	16	GP
迴g	6	-239.252	0-5	>50	8.1	49	33.9	14.7	32	19	GP
Ro IA	7	-263.504	0-1.5	26	7.5	54	33.3	14.0	35	16	ML
he ⊒	/		1.5-5	34	8.4	14	35.0	14.0	29	20	ML
1g (	0	-246.504	0-2	26	9.0	28	31.8	18.1	30	16	ML
loı	0		2-5	30	16.9	76	29.9	15.0	34	15	ML
A	0	-282.959	0-1.5	>50	11.0	74	41.1	15.6	34	16	ML
	7		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
	10		0.5-5	13	7.9	90	42.9	17.2	40	13	ML

 Table 2-1-1
 Soil Survey Results

Note: ML-Low Platicity Silt, GP - Poorly Graded Gravel

### **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

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### **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

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11.), ;+



Schematic Plan of Sewer Network and Soil Investigation Points Number

1- Treatment Plant Site									
Boring No.	S1	\$2	S3	S4	<b>S</b> 5				
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				

### Table. 1 Locations of boreholes

### 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 <u>alluvium</u>, 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).

<u>Geological cross sections</u> 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.

					SUM	MARY (	of lab	BORAT	ORY <sup>·</sup>	TEST RE	SUL	ΓS	
	Hijjawi	i	<b>Ref.</b> : S	SI/625	Project	: Jericho	o Wastev	vater Ti	reatmen	t Plant			
			Site : J	ericho									
	Sample	Moisture		Gradation	ı = % Finer	<sup>.</sup> Sieve No.		Atte Li	erberg mits	Direct Sl Parame	near ters	USCS	Coefficient of
BH No.	Deptil	Content	3/8″	#4	#40	#100	#200	LL		С	Ø	Classifi -	Permeability
	(m)	(%)	9.5 mm	4.75 mm	0.425m m	0.150 mm	0.075 mm	(%)	PI	(KN/m²)	(°)	cation	(K) (m/s)
61	-311.26-307.263	20.5	100	100	84	76	67	38.1	10.2	39	15	ML	5X10 <sup>-7</sup>
51	-307.263-291.263	33.2	100	94	88	79	70	40.1	9.7	38	15	ML	4X10 <sup>-7</sup>
											•		
ເລ	-313.602-312.102	12.5	100	100	92	82	74	40.2	13.9	40	12	ML	2X10 <sup>-8</sup>
32	-312.102-301.602	32.3	100	100	94	88	80	45.6	14.3	39	15	ML	8X10 <sup>-7</sup>
												-	
63	-315.577-310.577	12.9	100	98	91	80	71	38.2	11.0	37	16	ML	3X10 <sup>-7</sup>
55	-310.577-295.577	29.9	100	100	98	89	83	41.5	14.3	38	15	ML	6X10 <sup>-7</sup>
								-		-		_	
54	-316.187-314.187	11.8	100	99	92	86	79	40.1	15.5	39	14	ML	8X10 <sup>-7</sup>
54	-314.187-296.187	31.0	100	100	94	89	81	40.9	15.9	40	15	ML	4X10 <sup>-8</sup>
								-		-		_	
	-317.336-314.336	12.2	100	100	98	90	84	41.1	14.9	40	15	ML	2X10 <sup>-7</sup>
S5	-314.336-302.336	38.5	100	100	99	93	90	45.9	13.5	41	15	ML	2X10 <sup>-8</sup>
	-302.336-297.336	32.0	92	89	84	79	68	44.1	14.0	35	17	ML	9X10⁻ <sup>6</sup>

	Hijjawi	i	Ref. : S	61/625 ericho	SUMN Project	/IARY( :Jericho	DF LAB o Sewage	ORAT e Trunk	ORY Lines	TEST RE	SULT	٢S	
	Sample Depth	Moisture Content		Gradation	i = % Finer	Sieve No.		Atte Lir	rberg nits	Direct Sl Paramet	near ters	USCS	Coefficient of
BH No.	Deptil	ooment	3/8″ 9.5	#4	#40	#100 0.150	#200 0.075	LL	PI	С	Ø	Classifi -	Permeability (K)
	(m)	(%)	mm	mm	m	mm	mm	(%)		(KN/m²)	(°)	cation	(m/s)
1	-301.682-296.682	9.9	100	90	84	79	68	36.1	9.1	35	16	ML	6X10 <sup>-6</sup>
	1	1	1	1	1		1			T		T	
_	-309.245-307.745	10.2	96	88	77	69	62	35.2	8.5	33	17	ML	8X10 <sup>-°</sup>
2	-307.745-304.245	17.7	100	96	85	76	58	37.3	7.4	32	18	ML	8X10 <sup>-5</sup>
	-304.245-299.245	18.4	100	98	84	79	64	36.8	8.8	34	16	ML	7X10⁻°
	[		100	<b></b>					44 5	~7	45		0)(10-/
•	-293.057-291.557	8.8	100	96	90	8/	//	34.4	11.5	37	15	ML	2X10 <sup>7</sup>
3	-291.557-290.057	18.1	100	100	94	88	82	36.9	14.0	39	16	ML	/X10/
	-290.057-288.057	19.3	100	100	96	85	80	37.0	13.9	38	16	ML	/X10/
4	2/0 //1 2/2 //1	10	0.2	77	60	FO	47	22 5	10.0	20	10	CD	7,10-4
4	-208.401-263.461	4.3	03	11	07	57	4/	33.5	13.3	32	ΙÖ	GP	/ / / / /
5	-264 650-259 650	9.0	84	71	64	58	45	34 5	14 9	33	16	GP	4X10 <sup>-4</sup>
5	-204.050-257.050	7.0	04	71	04	50	73	54.5	14.7	- 55	10	0	4/10
6	-239.252-234.252	8.1	77	68	61	59	49	33.9	14.7	32	19	GP	2X10 <sup>-4</sup>
	I		r	T	·		r	-		T	1	T	ļ
7	-263.504-262.004	7.5	89	81	77	64	54	33.3	14.0	35	16	ML	6X10 <sup>-5</sup>
	-262.004-258.504	8.4	82	71	60	48	14	35	14.0	29	20	ML	7X10⁻⁴

	Hijjawl	i	Ref. : S Site : J	61/625 ericho	SUMN Project	IARY C	<b>F LAB</b> Sewage	ORAT	ORY T	EST RE	SULT	S	
	Sample	Moisture		Gradation	= % Finer	Sieve No.		Atte	erberg mits	Direct Sh Paramet	near ters	USCS Classi	Coefficient of
BH No	Depth	Content	3/8″	#4	#40	#100	#200	LL		С	Ø	fi-	Permeability
110.			9.5	4.75	0.425m	0.150	0.075		PI	(1/1) (		catio	(K)
	(m)	(%)	mm	mm	m	mm	mm	(%)		(KN/m²)	(*)	n	(m/s)
ο	-246.504-244.504	9.0	80	70	59	49	28	31.8	18.1	30	16	ML	2X10⁻⁵
0	-244.504-241.504	16.9	100	100	89	80	76	29.9	15.0	34	15	ML	5X10 <sup>-7</sup>
			_										
0	-282.959-281.459	11.0	100	94	90	84	74	41.1	15.6	34	16	ML	6X10 <sup>-7</sup>
9	-281.459-277.959	13.8	100	100	99	96	93	47.9	24.8	39	13	ML	8X10⁻ <sup>8</sup>
10	279.643-279.143	6.0	90	80	72	54	33	34	14.1	32	17	ML	4X10 <sup>-5</sup>
10	-279.143-274.643	7.9	100	100	99	94	90	42.9	17.2	40	13	ML	2X10 <sup>-8</sup>

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6. APPENDICES

#### APPENDIX-A

# BOREHOLE LOGS FOR WASTEWATER TREATMENT PLANT SITE

Project		Jeric	ho Waste	wate	er Treati	ne	nt Plant	Loc	ation	Jer	icho	
Borehole No.	•	S1	Page No.		1/2		Date	16-2-2	011			
Ground level		-311	.263				Weather	Sunny				
Drill Rig		Mob	ile B-31				Operator	Sharif				
Scale	am-	oler _ype	Sample	р	escrintic	on (	of soil strata	USCS	(N	SI Io. of	PT blow	s)
	s		recovery		osonptie		or son strata		15	15	15	Ν
-311.263 0 -310.263 1		$\langle$				<i>c</i> .			5	5	7	12
-309.263 2		$\langle \rangle$	100%	Gra	ayısh, so arl with	ler co	formation of ises of white lor	ML	5	7	11	18
-308.263 3												
-307.263 4	$\leq$	$\langle \rangle$							3	4	6	10
-306.263 5	$\leq$	$\langle \rangle$							11	14	19	33
-305.263 0	$\leq$	$\langle \rangle$	100%	Gra	ayish, so	oft	formation of	ML	12	13	15	28
-304.203 7	$\leq$	$\langle \rangle$				1110			16	17	10	37
-302.263 9		$\searrow$							7	9	10	19
	$\geq$	$\triangleleft$										
301.263 10				En	d of bor	ing	g @ -301.263		8	9	10	19
L					Water R	ec	ord			1		
Level, at whi Remarks :	<u>ch v</u>	vater	r was en	cour	ntered		- C	olor of w	ater	-		
<b>USCS –</b> Unifie <b>R –</b> Refusal (n	d So nore	oil Cla: than	ssification 50 blows	i Sys )	tem							
SPT sampl	( ler)	(Split	spoo	n								
Core :	Sam	pling	(Shelby)									
Approved :		Dr.	Sami A. I	Hijja	wi							

		1	h = \//==++	BU						Lau		
Project		Jeric	no waste	water	Treat	me	nt Plant	Loca	ation	Jer	cno	
Borehole No	0.	S1	Page No.		2/2		Date	16-2-2	011			
Ground level		-301	.263				Weather	Sunny				
Drill Rig		Mob	ile B-31	-			Operator	Sharif	-			
Scalo	Ļ	د م								SI	РΤ	
(m)	am	ple. Typ	Sample	De	scriptio	on e	of soil strata	USCS	(N	lo. of	blow	ys)
(11)	0,		recovery	_					15	15	15	Ν
-301.263 10	_								8	9	10	19
	$\geq$	$\prec$										
-300.263 11	_								5	10	11	21
	>	$\leq$										
-299.263 12	_								15	15	20	35
	>	$\leq$										
-298.263 13									15	20	20	40
	>	$\leq$										
-297.263 14	<								13	17	23	40
	$\geq$	$\leq$	100%	Gray	yish, so	oft	formation of	MI				
-296.263 15	<		10070			ma	arl		13	16	17	33
	$\geq$	$\leq$										
-295.263 16	<								12	15	18	33
	$\geq$	$\sim$										
-294.263 17	<								11	12	17	29
10	$\geq$	$\searrow$								10	10	22
-293.263	$\leq$								ð	10	12	22
	/	$\searrow$							20	24	24	14
-292.263	$\leq$								20	24	20	40
	/	$\sim$		End	ofbor	inc	0 201 242					
-291.263 20				EIIU	Watar	n iy Do	r = -271.203	[				
Level at w	nick	<b>n</b> w/st	or was a	ncou	ntere	d Ne	_208 263 C	olor of w	ator	-		
Remarks ·	nol	i wat				u	270.203 0		aiti			
USCS – Unif	ied	Soil C	lassificati	on Sv	stem							
<b>R</b> – Refusal (	(mo	re tha	an 50 blov	NS)								
				,								
SPT		(Spl	lit sp	oon								
sam	pler	r)										
Core	e sa	mplin	g (Shelby	')								
Approved		Dr	Sami A I	Hiiiay	vi							
Approved :		ייוס	Sami A. I	пјја	VI							

Project		Jeric	ho Waste	wate	r Treatn	ne	ent Plant	Loca	ation	Jer	icho	
Borehole No.		S2	Page No.		1/2		Date	17-2-2	011			
Ground level		-313	.602				Weather	Sunny				
Drill Rig		Mob	ile B-31				Operator	Sharif				
Scale	am-	oler ype	Sample	Б	oscrintio	n	of soil strata	11505	(N	SI Io. of	PT blow	rs)
(m)	s	<u>∽</u> ⊢	recovery		escriptio			0303	15	15	15	Ν
-313.602 0	$\leq$		100%	W	hitish so	ft	and dry silty	МІ	5	6	8	13
-312.602 1		$\geq$	10070			ma	arl		7	9	10	19
-311.602 2	$\geq$	$\leq$										
-310.602 3	$\leq$								5	8	9	17
-309.602 4									9	12	13	25
-308.602 5		$\checkmark$		_								
			100%	Gra	ayish, so I	ft ma	formation of arl	ML	10	20	17	27
-307.602	$\leq$	$\leq$							7	20	17	57
-306.602	$\leq$	$\leq$							/		13	24
-305.602 8	$\leq$	$\leq$							10	12	13	25
-304.602 9	$\leq$	$\langle$							9	13	15	28
-303.602 10		>		End	d of bori	nc	g @ -303.602		5	4	5	9
					Water R	ec	ord					
Level, at whi	ich v	vater	was en	cour	ntered		- (	Color of w	ater	-		
Remarks :												
<b>USCS</b> – Unifie <b>R</b> – Refusal (n	ed Sc nore	il Cla: than	ssification 50 blows	) Syst	tem							
SPT samp	( ler)	(Split	spoo	n								
Core :	sam	oling	(Shelby)									
Approved :		Dr.	Sami A. I	Hijja	iwi							

Project		leric	ho Waste	Water Treatr	רב חפ	nt Plant		ation	leri	icho	
FIGECI		JUIL			nc		LUC		501		
Borehole N	0.	S2	No.	2/2		Date	17-2-2	011			
Ground level		-303	.602			Weather	Sunny				
Drill Rig		Mobi	le B-31			Operator	Sharif				
Saala	1	ιo							SI	РΤ	
(m)	am	plei _vp	Sample	Descriptio	n (	of soil strata	USCS	()	lo. of	blow	's)
	S		recovery	Decemptic		or con on and		15	15	15	Ν
-303.602 10								5	4	5	9
	$\geq$	$\left \right $									
-302.602 11								5	9	11	20
	$\sim$	<									
-301.602 12		>						4	7	12	19
	$\sim$	<									
-300.602 13	_	$\geq$						7	10	15	25
	$\leq$								_	-	-
-299.602 14	_	$\geq$						5	9	12	21
	$\leq$	<	1000/	Gravish, so	oft	formation of					
-298.602 15		$\geq$	100%	j, .	ma	arl	ML	9	10	13	23
	$\triangleleft$										
-297 602 16		>						7	9	14	23
	$\leq$							,			20
-296 602 17		>						5	10	13	23
	$\leq$										0
-295 602 18		>						10	11	12	23
	$\leq$									•	
-294 602 19		>						17	17	19	36
-274.002	$\leq$							17	17	17	50
202.602 20	_			End of bor	inc	n@_301.602					
-273.002 20				Water	Re	cord	I	1	1	1	<u> </u>
level at w	hick	n wat	er was e	ncountered	u Ve			ater	-		
Remarks ·		· vvat			4	000.002 0					
USCS - Unif	hei	Soil C	lassificati	on System							
<b>R</b> – Refusal	(mo	re tha	n 50 hlov	ws)							
	(110										
		(Snl	it sn	oon							
	plei	r)	sp								
	r	,									
	, sa	mnlin	a (Shelby	)							
	s Ju	Pini	g (oneby	/							
Approved		Dr 4	Sami A I								
Approved :		ן Dr. ג	sami A. I	nijjawi							

Project		Jeric	ho Waste	wate	r Treat	me	nt Plant	Loca	ation	Jer	icho	
Borehole No.		S3	Page No.		1/2		Date	17-2-2	011			
Ground level		-315	.577				Weather	Sunny				
Drill Rig		Mob	ile B-31				Operator	Sharif				
Saala	1	, O								SI	РΤ	
(m)	am	pler 「yp	Sample	De	escriptio	on (	of soil strata	USCS	(N	lo. of	blow	s)
	0		recovery						15	15	15	Ν
-315.577 0	$\leq$	$\langle$							7	5	9	14
-314.577 1									11	12	7	19
-313.577 2	$\geq$		100%	Soft of	: and gi mal wi	ray th v	ish formation white lenses	ML			4	0
-312.577 3	$\leq$				(	slic	ces)		4	5	4	9
-311.577 4	$\leq$								5	4	5	9
210.577 5									4	3	3	6
-310.377 5									3	14	12	26
-309.577 6		>							8	7	12	19
-308.577 7	$\geq$	$\triangleleft$	100%	Soft	and gi c	ray of n	ish formation narl	ML	8	7	12	19
-307.577 8	$\geq$	$\smallsetminus$							Q	Q	12	20
-306.577 9	$\leq$	$\overline{\langle}$							0	0		20
-305.577 10	- 	$\geq$		End	l of bor	ing	g @ -305.577		7	10	12	22
					Water F	?ec	ord			-		
Level, at whi	ch v	vater	was en	coun	tered		C	olor of w	ater	-		
Remarks :												
<b>USCS</b> – Unifie <b>R</b> – Refusal (n	ed Sc nore	il Cla than	ssification 50 blows	n Syst )	em							
SPT samp	( ler)	(Split	spoo	n								
Core :	sam	oling	(Shelby)									
Approved :		Dr.	Sami A. I	Hijja	wi							

Draigat		Ioric	ha Wasta	BORLIN water Treatm	ont Diant		ation	lori	icho	
Project		Jenc				LOC	ation	Jen	CHO	
Borehole N	0.	S3	Page No.	2/2	Date	17-2-2	011			
Ground level		-305	.577		Weather	Sunny				
Drill Rig		Mobi	le B-31		Operator	Sharif				
Scale	÷	ιu						SI	РΤ	
(m)	San	ple Typ	Sample	Descriptior	of soil strata	USCS	()	lo. of	blow	's)
(,	••		recovery	-			15	15	15	Ν
-305.577 10	$\langle$						70	10	12	22
	$\geq$	$\leq$					_	0	10	00
-304.577	$\langle$						5	9	13	22
202 577 12	/	>					Q	12	15	27
-303.577	$\leq$						0	12	15	21
-302.577 13		>					7	12	14	26
	$\leq$									
-301.577 14		>					9	11	16	27
	$\wedge$	$\left \right $	100%	Soft and gra	yish formation	М				
-300.577 15			10070	of	marl		8	9	12	21
	$\geq$	$\leq$								
-299.577 16	$\langle$						9	10	16	26
17	$\geq$	>					F	0	10	22
-298.577 I <i>I</i>	$\leq$						5	9	13	22
-297 577 18		>					7	10	13	23
-277.377	$\leq$						,	10	10	20
-296.577 19		>					10	15	17	32
	$\geq$	$\sim$								
-295.577 20				End of borir	ig @ -295.577					
				Water R	ecord			-		
Level, at w	hic	n wat	er was e	encountered	-300.577 C	olor of w	ater	-		
Remarks :										
		0		current current						
D Defuce	ied	5011 C	iassificati	on System						
<b>r</b> – Refusal (	(1110			v5)						
		(Snl	it sna	oon						
sam	pler	r)	sp							
Core	e sa	mplin	g (Shelby	)						
Approved :		Dr. S	Sami A. I	Hijjawi						

Project		Jeric	ho Waste	wate	r Treat	me	nt Plant	Loca	ation	Jer	icho	
Borehole No.		S4	Page No.		1/2		Date	18-2-20	011			
Ground level		-316	.187				Weather	Sunny				
Drill Rig		Mob	ile B-31				Operator	Sharif				
C lu		. 1)					-			S	РΤ	
Scale	am	oler ype	Sample	D	escrintio	n n	of soil strata	USCS	(N	lo. of	blow	s)
(III)	S		recovery		eson priv		or son strata	0000	15	15	15	Ν
-316.187 0									8	13	13	26
	>	$\leq$	100%	So	ft and c	lry	formation of	М				
-315.187 <b>1</b>			10070	silt	y marl v	vitl	h white slices		5	7	8	15
	$\geq$	$\leq$										
-314.187 2	$\geq$	$\leq$										
	<								7	10	11	21
-313.187 3	$\geq$	$\leq$										
	<								5	6	10	16
-312.187 4	$\geq$	$\sim$									10	
	<								5	9	13	22
-311.187 5	>	<		Cof	نه اممید ۱		formation of					
		$\geq$	100%	501	t and g	ray	normation of	ML		10	10	22
-310.187 0	<				50	л	IIIdII		0	10	12	22
200.107 7	>	<										
-309.187		$\geq$							7	11	11	25
-308 187 8	$\leq$								/		14	25
-300.107		$\geq$							8	12	14	26
-307 187 9	$\leq$								0	12		20
307.107		>							6	11	15	26
-306.187 10				End	d of bor	inc	a @ -306.187		-			
	1				Water F	?ec	ord	1	1	1	1	1
Level, at whi	ch v	vater	was en	cour	ntered		- C	olor of w	ater	-		
Remarks :							<b>I</b>					
USCS – Unifie	d Sc	oil Cla	ssification	i Syst	tem							
<b>R –</b> Refusal (n	nore	than	50 blows	)								
SP1	)  )	Split	spoo	n								
samp	ier)											
Core :	samj	oling	(Shelby)									
		_										
Approved :		Dr. S	Sami A. I	Hijja	wi							

Project         Jericho Wastewater Treatment Plant         Location         Jericho											
Project		Jenc		water ne	eatme		LOC	ation	Jen	cho	
Borehole No	<b>)</b> .	S4	Page No.	2/2		Date	18-2-2	011			
Ground level		-306	.187			Weather	Sunny				
Drill Rig		Mobi	le B-31			Operator	Sharif				
Scale	Ę	r 9							SF	PT	
(m)	Sar	ag T	Sample recoverv	Descri	ption	of soil strata	USCS	(N 15	10. Of		S)
-306,187 10			, , , , , , , , , , , , , , , , , , ,					15	15	15	1N 24
	$\leq$							0		10	20
-305 187 11	_	>						0	10	11	27
	$\leq$							9	12	14	20
-304 187 1 0	_	>						E	0	11	22
	$\leq$							5	9	14	23
-303.187 12		>						Б	0	11	22
	$\leq$							5	7	14	23
-302.187 1 /	_	>						7	11	12	24
14	$\leq$			Soft and	d ara	formation of		/	11	13	24
-301.187 15		>	100%	JUIT and	soft	marl	ML	7	12	1/	26
	$\leq$				3011	man		/	12	14	20
-300.187 16		>						9	14	17	21
	$\leq$							/	17	17	51
-299.187 17	_	>						8	10	16	26
	$\leq$								10	10	20
-298.187 18	_	>						14	22	27	49
	$\leq$									/	17
-297.187 <b>19</b>	_	>						12	23	27	50
	$\leq$	<									
-296.187 20	_			End of	borin	n @ -296.187					
				Wa	ter Re	ecord	<u>I</u>	1	1		1
Level, at wh	nicł	ו wat	er was e	encounte	ered	-301.187 <b>C</b>	olor of w	ater	-		
Remarks :						· •			•		
USCS – Unifi	ied	Soil C	lassificati	on Syster	n						
R – Refusal (	mo	re tha	n 50 blov	vs)							
SPT		(Spl	it sp	oon							
sam	pler	.)									
Core	e sa	mplin	g (Shelby	)							
Approved :		Dr. S	Sami A. I	Hijjawi							

Proiect	Jerio	ho Waste	ewater	Treatr	ne	nt Plant	Loca	ation	Jer	icho	
Borehole No.	S5	Page No.	•	1/2		Date	18-2-2	011			
Ground level	-317	.336				Weather	Sunny				
Drill Rig	Mob	ile B-31				Operator	Sharif				
	5								SI	РТ	
Scale	-ple	Sample						(N	lo. of	blow	s)
(m)	Sam Ty	recovery	De	scriptio	on (	of soil strata	USCS	1 5	1 5	1 5	Ν
-317.336 0	$\langle$			Soft ar	201	and dry		5	7	8	15
-316.336 1	$\geq$	100%	fo	ormation	n c	of mar with	ML	3	8	10	18
-315.336 2	$\succ$		ler	nses (si	liC€ ma	es) of white arl					
_31/ 336 <b>3</b>	$\langle$							5	7	8	15
	>							6	10	11	21
-313.336 4	$\geq$							6	10	11	21
-312.336 5	$\geq$										
-311.336 6		100%	Soft	and gr satur	ay ate	formation of ed marl	ML	9	12	13	25
-310.336 7								7	10	11	21
-309.336 8	$\searrow$							6	9	11	20
-308.336 9	$\leq$							6	10	12	22
207 226 10			End	of hor	inc	1@_307 336		0	10	12	22
-307.330 10	<u> </u>		<u> </u>	Nater R	ec	ord	<u>I</u>	I			I
Level, at whi	ch wate	r was en	count	tered		- C	olor of w	ater	-		
Remarks :						1					
USCS – Unifie	d Soil Cla	ssificatior	ו Syste	em							
<b>R –</b> Refusal (m	nore than	50 blows	)								
SPT	(Split	spoo									
	sampling	(Sneiby)									
Approved :	Dr.	Sami A.	Hijjav	Nİ							

Project	DONLITOLL LOG										
FIOJECI		JEIIC					LUC	ation	Jen		
Borehole No	0.	S5	No.	2/2		Date	18-2-2	011			
Ground level		-307	.336			Weather	Sunny				
Drill Rig		Mob	ile B-31			Operator	Sharif				
		л.							SF	РΤ	
Scale		-ple	Sample					(N	lo. of	blow	's)
(m)		Sam Ty	recovery	Description	n c	of soil strata	USCS	1 5	1 5	1 5	Ν
-307.336 10	$\checkmark$							6	10	12	22
-306.336 11	$\langle \rangle$	$\searrow$						8	12	15	27
205 224 12	$\geq$	$\searrow$		Soft and ar	av	formation of		5	0	1/	23
-303.330	$\leq$	$\leq$	100%	satura	ate	ed marl	ML	5		14	20
-304.336 13	$\leq$	$\overline{}$						8	12	15	27
-303.336 14	$\langle$									15	23
-302.336 15	$\setminus$	$\langle \rangle$					22	12	19	31	
-301.336 16	$\setminus$	$\langle \rangle$					9	25	30	55	
-300.336 17	$\langle \vee \rangle$	$\land$	100%	Soft and gra	ay lit	formation of	ML	23	27	19	46
-299.336 18	$\langle \vee \rangle$	$\land$				j		22	25	18	43
-298.336 19	$\langle$	$\land$						20	20	22	42
-297 336 20		/		End of hori	na	@ _297 336					
277.330 20	1			Water E	y ?er		l	1	1	1	<u> </u>
Level, at w	hick	n wat	er was e	ncountered		-301.336	olor of w	ater	-		
Remarks ·			5. 1145		-	001.000 0			1		
USCS - Unif	ied	Soil C	lassificati	on System							
<b>R</b> – Refusal (	(mo	re tha	an 50 blov	vs)							
SPT sam	pler	(Spl <sup>r</sup> )	it spo	oon							
Core	e sa	mplin	g (Shelby	)							
Approved :		Dr.	Sami A. I	lijjawi							

APPENDIX-B

BOREHOLE LOGS FOR TRUNK LINES

Draigat		loric	ha Souver				200		ation	lori	cho	
Floject		Jenc	Dage	aye i	TUTIK			LUC	ation	Jen		
Borehole No.		1	No.		1/1		Date	19-2-2	011			
Ground level		-301	.682				Weather	Sunny				
Drill Rig		Mobi	le B-31				Operator	Sharif				
Scale	Ļ	ιų								SF	РΤ	
(m)	San	ple Typ	Sample	De	scriptio	n d	of soil strata	USCS	(N	<u>o. of</u>	blow	s)
201 (02	•••		recovery		•				15	15	15	N
-301.082	<								5	/	9	16
000 (00	$\geq$	$\leq$										
-300.682	$\langle$								4	8	10	18
	>	<										
-299.682 2			100%	Soft f	ormation	of	creamy marlstone	MI				
	$\leq$		10070		with occa	isio	nal pebbles		5	6	9	15
-298.682 3	>	<										
-297.682 4									10	7	6	13
	>	<										
-296.682 5												
				Enc	d of bor	inç	g @-296.682					
				N	Nater R	ec	ord			1		
Level, at which	ch v	vater	was en	coun	tered		None C	olor of w	ater	-		
Remarks :												
USCS – Unified	d So	il Cla	ssification	n Syste	em							
<b>R</b> – Refusal (m	ore	than	50 blows	)								
		<b>.</b>										
SPT .	(	Split	spoo	n								
sample	er)											
	amr	olina (	(Shelby)									
	ապ	, ing	(Shelby)									
Approved :		Dr. S	Sami A. I	Hijjav	wi							

Project		Jeric	ho Sewer	age	Trunk			Location Jericho				
Borehole I	No.	2	Page No.	1	1/1		Date	19-2-2	011			
Ground leve		-309	.245				Weather	Sunny				
Drill Rig		Mob	ile B-31				Operator	Sharif				
Scale		am- oler ype	Sample		oscrintio	'n	of coil strata		(N	SI Io. of	PT blow	rs)
(m)		о ч н	recovery	U	escriptio	, , , ,	or son strata	0303	15	15	15	Ν
-309.245 0				So	ft and d	ry	formation of		7	10	12	22
		$\succ$	100%	gr	ayish br	OV	vn marl with	ML				
-308.245 1				Ū	little	e g	ravels		9	14	15	29
		$\checkmark$										
-307.245 2		$\frown$										
									8	15	16	31
-306.245 3	$\leq$	$\sim$	100%	Sof	t and w	hit	ish formation	МІ	-			• ·
		>	10070	of	marl w	ith	little gravel		15	19	24	43
-305.245	$\leq$	$\overline{}$							10	17	21	10
		>							11	12	1/	27
-304.245 <b>F</b>	$\leq$	$\leq$							11	13	14	21
		>							12	11	17	21
-303 245	<	$\leq$							12	14	17	31
000.210 0	_	>						f ML	11	15	20	25
-302 245 7	<	$\leq$		So	ft and d	ry	formation of			15	20	35
-302.243		$\rightarrow$	100%	g	rayish n	nai	rl with little			10	4.4	01
201 245	$\sim$	$\langle \rangle$			g	rav	vels		8	10	11	21
-301.245 8		$\rightarrow$			Ū					10	10	0.5
200.245	<								8	12	13	25
-300.245 9		>										
200.245	_								10	12	15	27
-299.245 1	0			En	d of bori	ing	<u>g @ -299.245</u>					
					Water R	ec	ord					
Level, at w	vhich	wate	r was en	cour	ntered		None C	olor of w	ater	-		
Remarks :												
USCS – Un	ified S	Soil Cla	ssificatior	i Sys	tem							
<b>R</b> – Refusa	l (mor	e than	50 blows	)								
SP'	Т	(Split	spoo	n								
sar	mpler	)										
Co	re sar	npling	(Shelby)									
Approved	:	Dr.	Sami A.	Hijja	wi							

Project		Jeric	ho Sewer	age	Trunk			Location Jericho				
Borehole No	).	3	Page No.		1/1		Date	19-2-2	011			
Ground level		-293	.057				Weather	Sunny				
Drill Rig		Mob	ile B-31				Operator	Sharif				
Scale (m)	-me	pler Type	Sample	D	escriptio	n	of soil strata	USCS	(N	SI Io. of	PT blow	s)
(11)		,	recovery						15	15	15	Ν
-293.057 0	$\langle$				Dry soft	fo	rmation of	ML	7	21	21	42
-292.057 1		$\overline{}$			DIOWI	5	andy sin					
201.057				So	ft aravis	h	formation of		6	15	18	33
-291.057 2		$\langle$		00	it grayis	ma	arl	ML	6	4	6	10
200.057	$\langle \cdot \rangle$	$\rightarrow$			<u> </u>		<u> </u>		0	0	0	12
-290.057 3	$\geq$	$\leq$		So	ft grayis	h	formation of					
				ma	ri with o of w	occ hit	asional silces e marl	MIL	7	8	10	18
-289.057 4	$\triangleright$											
									8	8	11	19
-288.057 5												
	_											
				End	d of bori	ng	g @ -288.057					
					Water R	ec	ord			1		
Level, at wh	ich ۱	wate	r was en	cour	ntered		None	Color of w	ater	-		
Remarks : USCS – Unifie R – Refusal (r	Wernanks :         USCS – Unified Soil Classification System         R – Refusal (more than 50 blows)         SPT (Split spoon											
Approved :	sam	pling	(Shelby) Sami A. I	Hiiia	wi							

	BOREHOLE LOG										
Project		Jeric	ho Sewer	age	Trunk		Loca	ation	Jeri	icho	
Borehole No	•	4	Page No.		1/1	Date	19-2-2	011			
Ground level		-268	.461			Weather	Sunny				
Drill Rig		Mobi	ile B-31			Operator	Sharif				
Scale	L L	L e							SI	РТ	
(m)	Sar	ple Typ	Sample recoverv	D	escription	of soil strata	USCS	(N 15	NO. OF	blow	S)
-268.461			<b>,</b>					15	15	15	IN
0								14	22	р	D
-267.461 1		-						10	32	к	ĸ
				Mix	of cilty c	andy clay and		D			D
-266.461 <b>ว</b>		-	100		or sirry s bou	anuy ciay anu Idore	GP	ĸ			К
					bou			P			D
-265.461 2								71			К
5								R			R
-264.461											IX.
-							R			R	
-263.461 5										IX.	
5											
				Fno	d of borin	n @ -263.461					
	1				Water Red	cord		1	1	I	
Level, at whi	ich v	vater	<sup>r</sup> was en	cour	tered		Color of w	ater	-		
Remarks :						I			1		
_											
<b>USCS –</b> Unifie	ed Sc	oil Cla	ssificatior	i Syst	tem						
<b>R –</b> Refusal (n	nore	than	50 blows	)							
SPT samp	SPT (Split spoon sampler)										
Core	SAM	PLINC	G (Shelby)	)							
DTH :	Sami	plina									
Approved :	Approved : Dr. Sami A. Hiijawi										

#### 

Project		Jeric	ho Sewer	age Trunk		Loc	Location Jericho			
Borehole	No.	5	Page No.	1/1	Date	20-2-2	011			
Ground leve	el	-264	.650		Weather	Sunny				
Drill Rig		Mob	ile B-31		Operator	Sharif				
Scale		r r e						SI	РΤ	
(m)		Dle Typ	Sample recovery	Descriptio	n of soil strata	a USCS		lo. of	blow	s)
-264.650	2						21	22	15	
		_					21	32	40	к
-263.650 1	1						25	40	D	D
		_		Light to I	medium dark		25	40	N	Γ
-262.650	2		100%	brown silty	v gravelly san	d GP	30	R		R
				with occas	ional boulder	S	50	IX.		
-261.650	3						21	15	18	33
										00
-260.650	4									
							20	42	R	R
-259.650	5									
6	5									
				End of bori	ng @ -259.6	50				
				Water R	ecord	1		-1		
Level, at v	which	wate	r was en	countered	None	Color of w	/ater	-		
Remarks	:									
USCS – Ur	nified S	oil Cla	ssification	Svstem						
<b>R</b> – Refusa	al (more	e than	50 blows	)						
	``		,							
SF	PT (mpler)	(Split	spoo	n						
	ore sam	pling	(Shelby)							
D	TH Sam	pling								
Approved	:	Dr.	Sami A. I	lijjawi						

BO	RE	HO	LE I	LOG
				200

Project	Jeric	ho Sewer	age Trunk		Loca	ation	Jeri	icho	
Borehole No.	. 6	Page No.	1/1	Date	20-2-20	011			
Ground level	-239	.252		Weather	Sunny				
Drill Rig	Mob	ile B-31		Operator	Sharif				
Scale	r r ě						S	РΤ	
(m)	San ple Typ	Sample	Description	of soil strata	USCS	(N	lo. of	blow	s)
-230 252						15	15	10	N
-237.232 0						/	14	19	33
-238 252 1									
			Light brown	formation of		ĸ			ĸ
-237.252		100%	sandy silt wi	th gravels and	GP	D			D
			bou	Iders		ĸ			ĸ
-236.252 3						P			P
5									<u> </u>
-235.252 4						R			R
-234.252 5									
			End of borin	g @ -234.252					
			Water Re	cord			_		
Level, at whi	ch water	r was en	countered	None C	olor of w	ater	-		
Remarks :									
USCS – Unifie	d Soil Cla	ssification	System						
<b>R</b> – Refusal (n	nore than	50 blows	)						
	(Split	5000	n						
samp	ler)	spoo	11						
Core :	sampling	(Shelby)							
DTH S	Sampling								
Approved :	Dr.	Sami A. I	Hijjawi						

Project		Jeric	ho Sewer	age Trunk		Loc	ation	Jer	icho	
Borehole	No.	7	Page No.	1/1	Date	20-2-2	011			
Ground leve	el	-263	.504	·	Weather	Sunny				
Drill Rig		Mob	ile B-31		Operator	Sharif				
Scale		n- ir e						S	РΤ	
(m)		San ple Typ	Sample recoverv	Descriptio	n of soil strata	USCS	(N 15	10. of	blow	/S) NI
-263.504	h		·····,	Poddisk	brown soft		15	15	15	IN
	,		100%	formation o	f sandy silt with	М	5	11	15	26
-262.504 1	1	_	10070	little	aravels		5	11	15	20
-	•				graveis		5	14	15	29
-261.504	2								10	27
			100%	Light brown	sandy silt with	ML	29	33	R	R
-260.504	3			occasio	hal boulders					
							19	17	17	34
-259.504 4	1									
							19	17	18	35
-258.504 5	5									
				End of bori	ng @ -258.504					
	1			Water R	ecord					
Level, at v	wnicn	wate	r was en	countered	None	olor of w	ater	-		
Remarks	:									
	aifind (		ssification	Systom						
<b>B</b> – Refusa	al (mor	e than	50 blows	)						
		c than	SO BIOWS	)						
SP sa	PT Impler)	(Split )	spoo	n						
Cc	ore bar	rrel san	npling							
D	TH Sar	npling								
Approved	:	Dr.	Sami A. I	Hijjawi						

Project			Jeric	ho Sewer	age	Trunk		Loca	ation	Jeri	icho		
Borehole	e No.		8	Page No.		1/1		Date	20-2-2	011			
Ground le	vel		-246	.504				Weather	Sunny				
Drill Rig			Mobi	le B-31				Operator	Sharif				
Scale		am-	oler _ype	Sample	D	escrintio	n d	of soil strata	USCS	(N	SI Io. of	PT blow	s)
(III)		s		recovery					0000	15	15	15	Ν
-246.504	0			100%	Ligł	nt browr	S	andy gravelly	MI	24	22	25	47
-245.504	1			10070			si	lt	IVIL	14	12	14	26
-244.504	2	$\geq$	$\triangleleft$	1000/	S	oft form	at	ion gravish		14	14	16	30
-243.504	3	$\leq$	$\leq$	100%	-	brown	cl	ayey silt	ML	15	15	18	33
-242.504	4	$\leq$	$\leq$						10	15	10	01	
-241.504	5									12	15	16	31
					End	d of bori	no	ı@-241.504					
			I			Water R	ec	ord		1			1
Level, at	t whi	ch v	vater	was en	cour	ntered		None C	olor of w	ater	-		
Remarks	s :												
USCS – l R – Refu	Unified	d So	il Clas	ssification	i Syst	tem							
	Sur (III		than	oo blows	/								
	SPT sample	( er)	Split	spoo	n								
	Core s	samp	oling	(Shelby)									
	DTH S	Samp	oling										
Approve	d :		Dr. S	Sami A. I	Hijja	wi							

RΟ	RF	н∩		G
DО	RΕ	пΟ	LU	G

Project	Jeric	ho Sewer	age Trunk	_	Loca	ation	Jeri	cho	
Borehole No.	. 9	Page No.	1/1	Date	20-2-2	011			
Ground level	-282	.959		Weather	Sunny				
Drill Rig	Mob	ile B-31		Operator	Sharif				
Scale	έ Έ						SPT		
(m)	Sar ple Tyj	Sample recovery	Descriptior	of soil strata	USCS	(N 15	15 15 15 N		
-282.959 0		100%	Reddish bro with	own sandy silt gravels	ML	28	42	R	R
-280.959						15	25	19	44
-279.959 3		100%	Dark brown with very	sandy silty clay little pebbles	CL	15	24	17	41
-278.959 4						10	15	18	33
-277.959 5	$\geq$								
			Final of howing						
			Und of Dorif	<u>ig @ -277.959</u>					
Level, at whi	ch water	r was en	countered	None C	olor of w	ater	-		
Remarks :	on nato								
USCS – Unified Soil Classification System R – Refusal (more than 50 blows) SPT (Split spoon sampler) Core sampling (Shelby) DTH Sampling									
Approved :	Dr.	Sami A. I	Hijjawi						

BO	RFF	IOI	FΙ	OG
				.00

Project		Jeric	ho Sewer	age Trunl	k	-	Loca	ation	Jer	icho	
Borehole	e No.	10	Page No.	1/1		Date	20-2-20	011			
Ground le	vel	-279	0.643			Weather	Sunny				
Drill Rig		Mob	ile B-31			Operator	Sharif				
Scale		5 <u>5</u> 8							SI	т	
(m)		San ple Typ	Sample recovery	Descrip	otion	of soil strata	USCS	(No. of blows)			s)
-279.643	0		100%	Liaht browr	ר Sand	v silt with boulders	MI	15	15 17	15 19	36
	Ŭ	$\leq$	10070			,		,	.,	17	00
-278.643	1	>						7	6	7	13
		$\geq$		Coft	and	drauthita					
-277.643	2		100%	forr	anu natio	n of marl	ML	9	7	6	13
074 440		$\geq$		1011	natio						
-276.643	3	$\langle$						12	15	11	26
-275.643	Δ	>						1/	15	18	22
	-	$\leq$						14	15	10	55
-274.643	5										
				End of b	poring	g@-274.643					
				Wate	er Rec	ord					
Level, at	t whi	ch wate	r was en	countere	ed	None C	olor of w	ater	-		
Remarks	S :										
	Inifio	d Soil Cla	colfication	Sustam							
$\mathbf{D}_{\mathbf{D}} = \mathbf{D}_{\mathbf{D}}$ United Soli Classification System $\mathbf{P}_{\mathbf{D}} = \mathbf{P}_{\mathbf{D}}$ Pafusal (more than 50 blows)											
SPT (Split spoon sampler)											
Core sampling (Shelby)											
	OTH S	Samplina									
Approve	d :	Dr.	Sami A.	Hijjawi							

#### Appendix 2-2 Social Survey

#### 1. Report

A-103 ~ A157

#### 2. Outline of the Survey Results

A social survey was executed in January 2011 in Jericho Municipality. The targets of the survey were residential houses (170), hotels (4), business shops (25) and factories (11) and the location of targets was chosen not to uneven in the municipality. Various conditions of each category are shown in Table 2-2-1 as residential house, Table 2-2-2 as hotel and Table 2-2-3 as business shop and factory. The whole survey results of 210 samples are summarized in Table 2-2-4.

Table 2-2-1 Condition of Residential Houses

Item				
Average inco	2,512			
Average exp	enditure ( NIS/m)	2,532		
Frequency	Each house ( time/house/y )	48.2		
ofsickness	Per capita ( times/c/y)	8.6		
	Water	11.2		
Cause of	Food	5.3		
sickness(%)	Sanitary system	4.7		
	Others	78.8		
Annual healt	Annual health care costs ( NIS/y)			
	Agriculture	7.1		
	Commercial	14.7		
Major source of income(%)	Service	32.9		
	Tourism	1.4		
	Construction	43.5		
	Others	0.6		

#### Table 2-2-2 Condition of Hotels

Item	Average		
Number of gest ro	85.5		
Gest	Annual	7,975	
number(person)	daily	29	

#### Table 2-2-3 Condition of Business Shops and Factories

Business Shop		Factory			
Selling Goods	Ratio (%)	Selling Goods	Ratio (%)		
General trade	40	Food processing	36.4		
Clothing	20	Plastic processing	9.1		
Construction materials	4	Metal processing	9.1		
Housing ware appliances	16	Wood processing	9.1		
Others	20	Others	36.4		

Items			Residential	Hotel	Shop	Factory
Sample Num	har	170	1	25	11	
Number of A	ve Resident (Staff)	5.61	50	2.5	20.3	
Av Area $(m^2)$		125	8 314	53	3 081	
Ave Water (	) Tharge (NIS/Month)		101	12 643	46	1 472
		Inside	97.6	100	68	1,472
	Location	Outside	2.4	100	28	100
Toilet	Location	None	2.7		20	
Tonet		Flushing	81.8	100	56	81.8
	Туре	Pit Latrine	18.2	100	12	18.2
		Inside	78.2	100	68	63.6
	Location of Faucet	Outside	21.8	100	28	36.4
		None	21.0		20	50.1
Water		Monthly(m <sup>3</sup> )	43 34	584	26.7	272.5
Supply	Summer Consumption	lncd	258	501	20.7	272.5
		Monthly(m <sup>3</sup> )	21.32	351	174	183.1
	Winter Consumption	lncd	127	551	17.1	105.1
		Whole	87.6	100	68	100
	Grav water into cessnit	Partly	11.8	100	00	100
	Gray water into cesspit	None	0.6		32	
	Ownership of cesspit	Executive	31.8	100	4	63.6
Cesspit		Sharing	68.2	100	64	36.4
		None	00.2		32	50.1
	Frequency of Withdraw ( t	6.42	0.75	2 72	23.4	
	Costs of Withdraw(NIS/tim	76.3	525	69.4	136.4	
	Oral			020	8	9
Cause of	Contact		4 1		4	
infection	Hygiene environment		84.1	100	88	91
(%)	Others		3.5	100		
	Concerning to surrounding	environment (%)	98.2	100	100	100
	Also to surrounding water	environment (%)	98.2	100	100	100
	Sewage connection is requi					
	above (%)	Ĩ	98.8	100	100	100
	Approve to reuse of treated sludge $\binom{9}{2}$	water and dried	70	100	92	90
	Approve to reuse of treated	water for				
Willingness	irrigation of farmland (%)		64.7	100	88	90
	Pay for water supply and se	ewage tariff (%)	85.9	50	96	100
	Upper limit of sewage tarif	f (NIS/month)	63	300	66	129
	Approve to construction of	sewerage system	97.1	100	100	100
	Use cesspit continuously af	ter connection of	31.2	50	Δ	9.1
	sewer (%)		51.2	50		2.1
	Water supply		8.8	7	8	8.8
	Sewerage		8.6	8	9.1	8.6
Priority of	Road	7.3	7.5	4.5	5	
public	Education		8.3	5	4.4	5.3
project	Communication		6.7	6.25	3	3.8
(Scale of	Power supply		7.8	7	5.3	6.7
0-10)	Medical care		9	6	6.8	6.7
	Irrigation		7.9	6.25	5.5	5
	Garbage collection	8.4	9.25	7.2	7.5	

#### Table 2-2-4 Summarized Social Survey Results

#### 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<sup>3</sup> per month.
- The average water consumption in houses during winter (the rain season) is about 21.32 m<sup>3</sup> 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

-		(%)
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

Where are the sanitation facilities located?

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

(%)

	x 1 <sup>1</sup> · 1 1		
	Individual	Outside faucet	Private
Area/Category			(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

		(%)
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

Will you still use the sanitation pit even after connecting to the sewage network?  $\binom{9}{2}$ 

Type of sanitary facility available in the house

		(%)
	Flushing Toilet	Pit latrine
Area/Category		
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?

	5 1	(%)
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?

	5				(%)
Area/Category	Agriculture	Commerce (business)	Services	Tourism	Construction
Ktef Al-Wade	7.1	13.1	29.8		50.0
Sabeaha Al-		20.0	31.4	5.7	42.9
khedaway					
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

	2	1		(%)
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

What are the infectious routes in your opinion?

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

se	wage system ?		(%)
ſ	Area/Category	Yes	No
	Ktef Al-Wade	100.0	
	Sabeaha Al-khedaway	100.0	
Ī	Al-Maghtas	94 9	51

100.0

98.8

1.2

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

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?

Algeria

Total

5 11 C	0 0	(%)
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?

	C		(%)
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?

5 11	U	5	(%)
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

Category/Area	Ktef Al-	Sabeaha Al-	Al-	Algeria	Total
Number of Fomily	Wade	khedaway	Maghtas	()	<b>Г</b> (
members	5.7	4.9	5.7	6.3	5.6
Average of water consumption during dry seasons (Summer)m <sup>3</sup> per day	37.5	49.1	50.1	56.4	43.3
Average of water consumption during wet seasons (Winter) m <sup>3</sup> 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 pitNIS 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

Basic information

	Ktef	Sabeaha	Al-	Algeria	Total
	Al-	Al-	Maghtas		
	Wade	khedaway	_		
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

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

# 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) -----m<sup>3</sup> per day



Average of water consumption during wet seasons (Winter) -----m<sup>3</sup> 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







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  $3080.91 \text{ m}^2$
- 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<sup>3</sup> per month.
- The average water consumption in factories during winter (the rain season) is about 183.09 m<sup>3</sup> 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?  $\binom{9}{2}$ 

	(%)
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

C .	(%)
Sanitary pit	100.0

Is the factory connected to a sanitary pit?

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

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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

 $\langle 0 \rangle$ 

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 <sup>2</sup>	3081
Average of water	272.5
consumption during dry seasons	
(Summer) m <sup>3</sup> per month	
Average of water consumption during	183.1
wet seasons (Winter) m <sup>3</sup> per month	
Distance from the source of water	645.1
meter	
Number of times the sanitary pit is	23.4
emptied times every year	
Cost of emptying the sanitary pit	136.4
NIS per time	
What is the average monthly water bill? -	1472
NIS per month	
what is the amount of many that you can	129
pay?	
NIS per month	

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





#### 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  $52.72 \text{ m}^2$
- 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<sup>3</sup> per month.
- The average water consumption in stores during winter (the rain season) is about 17.40 m<sup>3</sup> 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?  $\binom{0}{2}$ 

	(70)
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

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Basic information	
Number of employees in the store	2.24
Store square area: m <sup>2</sup>	52.72
Average of water consumption during dry seasons (Summer) m <sup>3</sup> per month	26.66
Average of water consumption during wet seasons (Winter) m <sup>3</sup> 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  $8314 \text{ m}^2$
- 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<sup>3</sup> per month.
- The average water consumption in hotels during winter (the rain season) is about 350.5 m<sup>3</sup> 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.

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- 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?

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		(70)
	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

0 0 0	(%)
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?

5	(%)
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?  $\binom{9}{6}$ 

	(%)
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?

	(70
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

	U	(%)
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

Are you willing to pay the water and sewage bill?

Will you support the construction of a sewerage system if it starts?  $\binom{9}{2}$ 

	(70)
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 <sup>2</sup>	1500	12000	580	19176	8314.00
Average of water consumption during dry seasons (Summer) m <sup>3</sup> per month	600	1700	4	30	583.50
Average of water consumption during wet seasons (Winter) m <sup>3</sup> 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 pitNIS 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 guest accommodation: ------ Persons/year



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



Number of employees



Hotel square area: ----- m<sup>2</sup>



Average of water consumption during dry seasons (Summer) ----- m<sup>3</sup> per month





Average of water consumption during wet seasons (Winter) ----- m<sup>3</sup> per month

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

	30000	)			35000 J 30000
		20000			25000
			_		15000
1264.5		70	_	500	- 5000
Total	City of Moon	Jericho Resort Village	Inter Continental	Al-Quds	+ 0