ENVIRONMENTAL ASSESSMENT FOR AL-DAHRYIA OLD CITY

By

Haneen Abu-SubhaSajida Al-Daraweesh

Supervisor:

Eng. Samah Al-jabari

Submitted to the College of Engineering

in partial fulfillment of the requirements for the

Bachelor degree in Environmental Technology Engineering

Palestine Polytechnic University

Des. 2015

ENVIRONMENTAL ASSESSMENT FOR AL-DAHRYIA OLD CITY

By

Haneen Abu-Subha Sajida Al-Daraweesh

Supervisor:

Eng. Samah Al-jabari

Submitted to the College of Engineering
in partial fulfillment of the requirements
Bachelor degree in Environmental Technology Engineering

Palestine Polytechnic University

Dec. 2015

ABSTRACT

ENVIRONMENTAL ASSESSMENT OF AL-DAHRYIA OLD CITY

Project Team

Haneen Abu-SubhaSajida Al-Daraweesh

Project Supervisor:

Eng. Samah Al-jabri

The architectural heritages of the region reflect the identity, culture, and the link between past and present and clear evidence of original and authenticity.

Old Cities makea connection with ancestor and give a sense and understanding of history that no other documents or evidence exist.

Old Cities should to keep them and rehabilitate of architectural heritage to protect it and to develop it to suit the circumstances of the times and cultural transformations ongoing. Preservation and reuse of historic buildings serve resource and reduce material consumption and consumes less energy than demolishing buildings and constructing new ones.

Palestine has many oldest historical cities which having an important value for national and international sector.

Al-Dahriya old city is one of the most important areas in Palestine that has a historical and religious value .it is located in the southern part of Hebron city.

This study make an environmental assessment for Al-Dahriya old city by studying the current situation of the area then making an evaluation and assessment of all environmental parameters including parts of infrastructure then making adesignsfor the waste water and storm water systems , this study also make the design of a suitable septic tank for the study area and it engineering solution for some environmental problems.

إهداء

لابد لنا ونحن نخطو خطواتنا الأخيرة في الحياة الجامعية من وقفة نعود إلى أعوام قضيناها في رحاب الجامعة مع أساتذتنا الكرام الذين قدموا لنا الكثير باذلين بذلك جهودا كبيرة في بناء جيل الغد لتبعث الأمة من جديد.

وقبل أن نمضي نهدي عملنا هذا

إلى منارة العلم والإمام المصطفي إلى الأمي الذي علم المتعلمين إلى سيد الخلق إلى رسولنا الكريم سيدنا محمد صلى الله عليه وسلم.

الى الأسرى البواسل .... يا من تقبعون خلف قضبان الحديد...في زنازين الغدر والقهر والجلادين

الى روح الشهداء العظام الذين تتوشح فلسطين اليوم بأثواب اجسادهم

إلى الذين مهدوا لنا طريق العلم والمعرفة.... إلى جميع أساتذتنا الأفاضل ونخص بالذكر مشرفة المشروع المهندسة سماح الجعبري على الجهد الذي بذلته معنا .

وكذلك نشكر كل من ساعد على إتمام هذا البحث وقدم لنا العون ومد لنا يد المساعدة وزودنا بالمعلومات اللازمة لإتمام هذا البحث ونخص بالذكر

المهندس احمد الحرباوي، **مؤسسة رواق** ،بلدية الظاهرية، **شعبة المعماري لعام ٢٠١٥**، الاستاذ لبيب **ابو** حمدية.

إلى أبي النور الذي ينير لي درب النجاح الذي لم يبخل علي يوماً بشيء..

إلى أمي الحبيبة...من بها أكبر وعليه أعتمد .... إلى شمعة متقدة تنير ظلمة **حياتي** .... إلى من بوجودها أكتسب قوة ومحبة لا حدود لها..

إلى اخوتي وخواتي ....طالبات وطلاب هندسة تكنولوجيا البيئة .... إلى من تحلو بالإخاء وتميزوا بالوفاء والعطاء إلى ينابيع الصدق الصافي إلى من معهم سعدت ، وبرفقتهم في دروب الحياة الحلوة والحزينة سرت إلى من كانوا معي على طريق النجاح والخير.... إلى من عرفت كيف أجدهم وعلموني أن لا أضيعهم

إلى اختي توأم روحي ورفيقة دربي .... إلى صاحبة القلب الطيب والنوايا الصادقة...**إلى من رافقتني منذ أن حملنا** حقائب صغيرة ومعك سرت الدرب خطوة بخطوة وما تزال ترافقني حتى الآن

إلى اخي من أرى التفاؤل بعينه .... والسعادة في ضحكته...**إلى شعلة الذكاء والنور**..

فريق العمل

حنين ابوصبحة

ساجدة الدراويش

ACKNOWLEDGEMENT

We would like to express our thanks and gratitude to Allah, the Most Beneficent, the most Merciful who granted us the ability and willing to start and complete this project. We pray to his greatness to inspire us the right path to his content and to enable us to continue the work started in this project to the benefits of our country.

We wish to express our deep and sincere thanks and gratitude to PalestinePolytechnic University, College of Engineering, the Department of Mechanical Engineering . We wish to express our thanks to Eng.Samah Al-Jabari, for a valuable help, encouragement, supervision and guidance in solving the problems that we faced from time to time during this project.

We can find no words to express our sincere, appreciation and gratitude to our parents, sisters and brothers, for their endless support and encouragement, we are deeply indebted to you and we hope that we may someday reciprocate it in someway.

Work Team

TABLE OF CONTENT

CHAPTER 1 : INTRODUCTOIN

CHAPTER 2 : CHARACTERISTICS OF THE PROJECT AREA

CHPTER 3 : CURRENT SITUATION OFAL-DAEHRIYA OLD CITY

CHPTER 4 : DESIGN PARAMETERS

CHPTER 5 : ANALYSIS AND ASSESSMENT

CHPTER 6 : Bill of Quantity

CHPTER 7 : Conclusions and Recommendations

Appendix

References

LISTS OF TABLES

LISTS OF FIGURES

Chapter One

Introduction

1.1 General

Before the First World War, rapid industrialization and urbanization in western countries was causing rapid loss of natural resources. This continued to the period after the Second World War giving rise to concerns for pollution, quality of life and environmental stress. In early 60s, investors and people realized that the natural environment and the projects they were under taking were affecting the environment, resources, raw materials and people must be study, evaluation and analysis. As a result of this, experience groups formed with the aim of getting a tool that can be used to safeguard the environment in any development this will be done by environmental assessment [1] .

Environmental assessment implies the determination of the environmental consequences, or impact, of current natural environment or proposed projects or activities. An environmental assessment is, therefore, a study of the probable changes in the various socioeconomic and biophysical characteristics of the environment which may results from proposed or impending action [1].

The USA decided to respond to these issues and established a National Environmental Policy Act in 1970 to consider its goal in terms of environmental protection. The USA became the first country to enact legislation on Environmental Impact Assessment (EIA). This was the first time that EIA became the official tool to be used to protect the environment. The United Nations Conference on the Environment in Stockholm in 1972 and subsequent conventions formalized EIA, So comparison between Environmental Impact Assessment and Environmental Assessment must be considered.

EIA is a tool designed to identify and predict the impact of a project impact means change any change, positive or negative-from a desirability standpoint on the bio-geophysical environment and on man's health and well-being, to interpret and communicate information about the impact, to analyze site and process alternatives and provide solutions to mitigate the negative consequences on man and the environment.

An EA is : “A management tool comprising a systematic, documented, periodic and objective evaluation of how well environmental organization, management and equipment are performing in the aim of helping to safeguard the environment by :

- Facilitating management and control of environmental practices,

• Assessing compliance with company policies, which would include meeting regulatory requirements”.

Environmental assessment encompasses varied disciplines, and consequently requires the expertise of personal knowledgeable in various technical areas.

Environment attribute consisting of both natural and human caused factor .The environment is admittedly difficult to characterize because of its many attribute and complex interrelationship among them.

So it's better to create a set of attribute before we began to prepare environmental documentation as shown in Table (1.1).

Table (1.1):Example of environmental attribute. [1]

Air	**Water**	**Ecology**	**Sound**
Diffusion factor	Flow variation	Large animals	Physical effects
Particulate	Suspended solid	Small game	Communication effects
Sulfur oxide	Acid &Alkali	Aquatic plants	Performance effects
Nitrogen oxide	Biological oxygen demand (BOD)	Natural and vegetation	Sound behavior effect
Carbon monoxide	Chemical oxygen demand COD	Field crops	
Odors	Dissolved solid	Threatened species	
Hazardous toxicants	Fecal coliforms		

Human aspects	**Economic**	**Resources**	**Land**
Life styles	Regional economic Stability	Fuel resources	Soil stability
Community needs	Public sector review	Nonfuel resources	Natural hazards
Psychological needs		aesthetics	Land use patterns

Many methodologies have developed which allow the user to have more accurate information. Depending upon the specific needs of the user and type of project being undertaken .One particular methodology may be more useful than another.

1.2 Problem Definition

The old city (historic center) in any city of the world is considered as a famous site from archaeological, cultural, religious, and historical side.

There are many historic centers in Palestinian cities that has recently been suffering from significant environmental problems such as water shortages, air pollution, soil pollution, and lots of other problems as a result of leaving these areas and largely neglected.

One of the most historic centers in Palestine is Al-Dahriya City.

Al-Dahriya Old City located in the center of Al-Dahriya and represents the cultural and historical side of city .It suffers from a series of environmental problem such as unconsciousness of the value of heritage building, Shortage of water resources and treatment where there is no sanitary networks and bad management of the solid waste.

1.3 Project Objectives

This project includes the following main objectives:

1. Make an environmental study for the current satiation in Al-Dahriya Old City this done by studying the following points:

a) Infrastructure.

b) Water.

2. Make an analysis for the environmental study throughout comparison between the parameter current situation and the international parameter.

3. Make an environmental assessment for the whole area.

4. Making a complete design for some parts of infrastructure or making redesign for parts that are need rehabilitation.

5. Design of primary treatment of the collected waste water.

1.4 Phases of Project

The project consists of four phases, which are designed to be completed in accordance with time schedule shown below .The description of each of the four phases of the project and tasks involved are listed below:

Table (1.2): phases of the project with their expected duration

Title	Duration "year 2015"							
	1/2	1/3	1/4	1/5	1/9	1/10	1/11	1/12
Data collection and survey								
Field work								
Study and analysis								
Analysis and design parameter								
Assessment and writing and preparing the report								

1.4.1 First phase: Data collection and survey

During this phase available data and information were collected from different sources.

Moreover many site visits were done. This phase includes the following activates:

1. All needed maps for the area were collected.
2. Metrological data were collected from different source.
3. Collecting Infrastructure data.

1.4.2 Second phase: Field work

Many site visits to evaluate the environmental condition of Al-Dahriya Old City, visits were done for:

a) Studying area to assess the environmental factors and samples of soil and water were collected.
b) Visiting the municipality of Al-Dahriya city to get more information about the old city there.
c) Visit Riwaq Institution to get required maps and information.

1.4.3 Third phase: Study and Analysis

During third phase certain task were done as following:

1. Define the requirement activities.
2. Define the affected attribute.
3. Evaluate environmental impact and summarize them.

1.4.4 Fourth phase: Assessment, design and/or redesign, and preparing the report

During this phase the final estimation of the last stage, the project team prepared a complete design for some parts of infrastructure.

Final report prepared and submitted to the department of Environmental Technology Engineering at Palestine Polytechnic University.

1.5 Organization of the study

The study report has been prepared in accordance with the objectives and of work.

The report consists of seven chapters.

The first chapter entitled "Introduction" introduce basic concept associated with environmental assessment also the comparison between environment assessment and environment impact assessment, then talk about environment assessment elements and methodologies.

Chapter two entitled "Characteristics of the Project Area" which deals with history, socio-economic, geographic data, and climate characterization of site.

Chapter three entitled "Current Situation" which deals with the environmental condition of Al-Dahriya Old City.

Chapter four entitled "Design Parameters" which deals with quantity and volumes of the solution described in chapter four.

Chapter five entitled "Analysis and Assessment" which deals with analysis the result and find solution for present environmental problems.

Chapter six "Bill of Quantity " which deals with numbers required of pipe, manholes for both waste water collection system and drainage system, and containers' for solid management.

Chapter seven entitled "Conclusions and recommendations" which deals with the conclusions of the study and provide recommendation for mitigation of the potential negative impacts and enhancement of the positive ones.

Chapter two

Characteristics of the Project Area

"Al- Dahriya Old City"

2.1. General

In this chapter, basic data of Al-Dahriya City will be discussed. Topography, meteorological data, Population data, water consumption, and wastewater production.

2.2. Project Area

Al-Dahriya City is located to the northwest of the main street connecting between the cities of Hebron and Beersaba, extending from the beginning of the valley Ghemari south to the north east area of Abu Alroazin. Figure (2.1) below show general view of Al-Dahriya Old City.

Figure (2. 1) General View of the of AL-Dahriya Old City[2].

It is twenty three kilometers south-west of Hebron. It surrounding from north Dura city, Samu from east, Berg and Ramadeen from west, and Beersaba from south. Figure (2.2) show the location of Al-Dahriya Old City.

Figure (2.2): Location map of AL-Dahriya Old City.

2.3. Meteorological Data

The hydrology of region depends basically on its climate, and topography. Climate is largely dependent on geographical position of the earth surface, humidity, temperature, and wind. These factors are affecting on evaporation and transpiration. So this study will include needed data about these factors. Figure (2.3) show Digital Elevation Model of Al-Dahriya Old City.

The city rising 651 meters above sea level which means medium height characterized by semi – desert to Mediterranean basin climate [3].
According to Riwaq Institution climate in general can split to two seasons:

a) Rainfall season ,usually start in October and reach its peak in February then decrease gradually in May month .This climate consist of two seasons went season, and part of spring, autumn season.
b) Dry season consist of summer and part of spring, and autumn seasons .It start from May till September and sometimes continue to October month.

2.3.1 Rainfall

The average annual rainfall at area reaches approximately 337 mm .Rainfall occurs between October and May while it rarely rains in the summer season .The driest month is June, with 0 mm of rainfall. The greatest amount of precipitation occurs in January, with an average of 250 mm.. Figure 2.4 and table 2.1 show the amount of rainfall in Al-Dahriya City.

Figure (2.3):Digital Elevation Model of Al-Dahriya Old City.{Project Team}

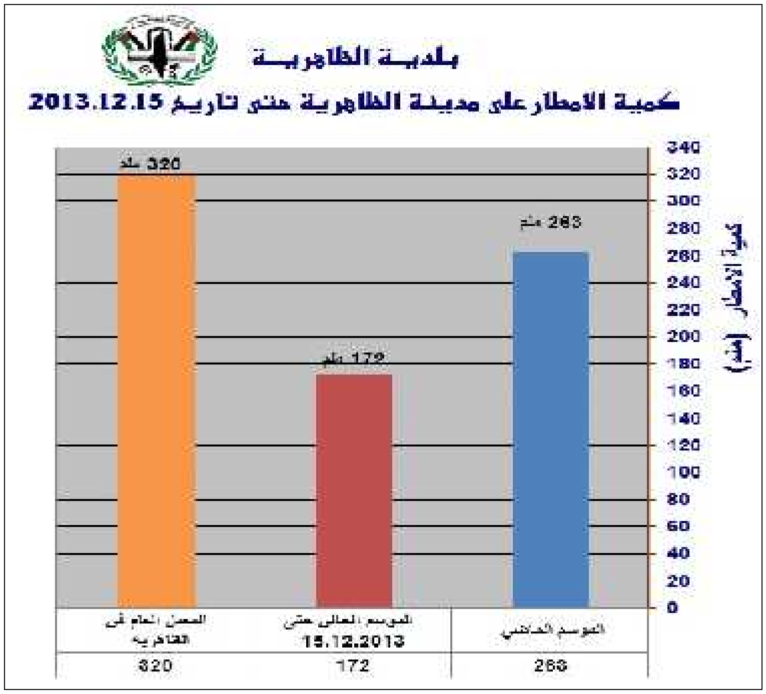

Figure (2.4): Rainfall in Al-Dahriya City till 2013 [2].

Table(2.1):Al-Dahriya Rainfall 2013 [2].

Station	Accumulative Rainfall	General rate	Percent Ratio
Dahriya	155.9	336.5	46

2.3.2 Temperature

The climate here is classified as Subtropical Dry Arid (Desert) (BWh)by the Köppen-Geiger system. The annual average Annual rate is (17-19 c˚) .Rate of colder temperatures ranging from 6 to 14 c˚, while the highest temperature (26-34 ˚C).The warmest month of the year is August, with an average temperature of 26.7 °C. The lowest average temperatures in the year occur in January, when it is around 12.3 °C. The variation in temperatures throughout the year is 14.4 °C, as shown in figure 2.6 and table 2.2 below.

Table (2.2):Al-Dahriya climate [4].

month	1	2	3	4	5	6	7	8	9	10	11	12
mm	14	11	6	3	2	0	0	0	0	3	8	12
°C	12.3	13.1	15.8	19.0	22.9	25.6	26.6	26.7	24.7	22.6	18.7	14.2
°C (min)	6.1	6.6	8.8	11.3	14.9	18.1	19.5	19.6	17.8	15.7	12.6	8.1
°C (max)	18.6	19.7	22.8	26.8	30.9	33.2	33.8	33.9	31.7	29.5	24.8	20.4
°F	54.1	55.6	60.4	66.2	73.2	78.1	79.9	80.1	76.5	72.7	65.7	57.6
°F (min)	43.0	43.9	47.8	52.3	58.8	64.6	67.1	67.3	64.0	60.3	54.7	46.6
°F (max)	65.5	67.5	73.0	80.2	87.6	91.8	92.8	93.0	89.1	85.1	76.6	68.7

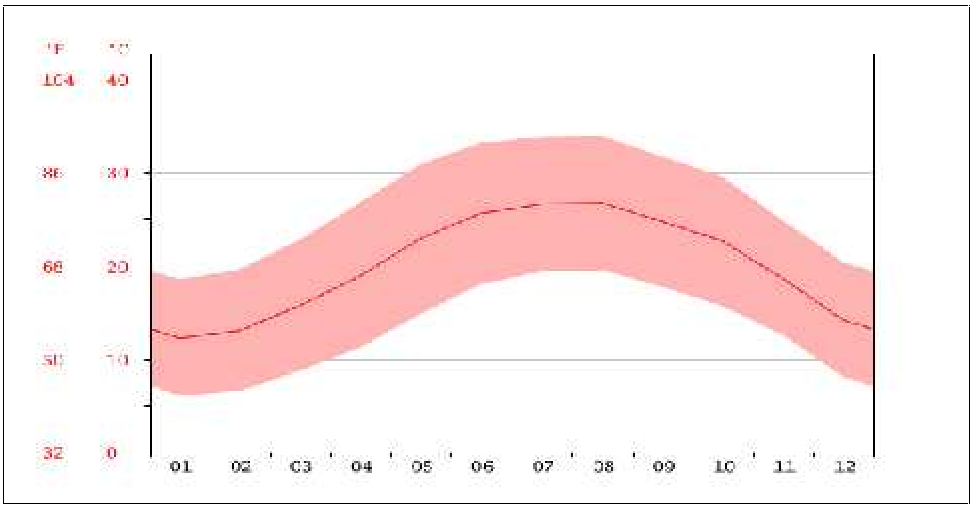

Figure (2.5): Temperature graph in Al-Dahriya City[4].

2.4. Population

2.4.1 Population projection

The base for the forecast is the 2007 population for Al-Dahriya City obtained from Palestine Central Bureau of Statistics (PCBS) of 28776 parsons. The annual growth rates is 3.8% in the west bank [1].

To calculate the population for the coming 25 year, a geometric increase is assumed, represented by the following equation:

$$P = P_0 * (1+ r)^{n} \quad (2.1)$$

Where:

P_f: Future population.

P_o: Current population.

n: Time period.

r: Population growth.

2.4.2 Population Forecast for Al-Dahriya Old City

The population of Al-Dahriya Old City was approximately 1300 parsons. The old city has annual average population growth of (3.5 %). Table 2.3 presents the population projection up to the year 2036. The data show that the population of Al-Dahriya Old City is estimated to be 3693.8 in year 2036.

Table (2.3) Population Forecast for Al-Dahriya Old City [Project Team].

Year	2007	2011	2015	2020	2025	2030	2036
Population(capita)	1300.0	1544	1772	2105	2500	2970	3651

2.5. Importance of the Area(capital)

The historical importance of a city can be measured of how much the city have historical monuments, and cultural heritage. Al-Dahriya City have a particular importance because the line of communication between the two natural environments are the Hebron mountains and the Negev desert .The figure 2.6 show famous site in Al-Dahriya Old City of archeological site. Also the city have within it many of historical monuments which reach eight hundred and eighty one historical buildings as Rawq Institution Statistics like:

1. Hisen Qisaria.
2. Al-Omaree Mosque.
3. Maqam Om Al- Fadel.
4. Maqam Al-Shohda.

5. Maqbara and Maqam Abu-Dabor.

6. Maqam Abu-Hashim.

7. Maqam Al-Gamaree.

Some of the important buildings discussed below:

1- Hisen Qisaria

It is located in the center of the Old City, it is a huge stone wall, and seems that it is a wall of old castle. Figure(2.7) show Hisen Qisaria building.

Figure (2.7): Hisen Qisaria [Project Team].

Figure (2.6): famous site

2- **Maqbara and Maqam Abu-Dabor**

It is located in the center of the Old City, and opposite to the Hisen from the west. It is a small cemetery where the great Tomb painted with weigh color and have a place to put the wax which called Maqam Abu-Dabor, and it is a shrine to the man from the city.Figure(2.8) show Maqbara and Maqam Abu-Dabor.

Figure (2.8): Maqbara and Maqam Abu-Dabor [Project Team].

3- Maqam Abu Al-Fasel

It is located on the side of Maqbara Abu-Dabor ,and exactly opposite to Hisen site. It is four building blocks have a very small square window to put the wax. Figure (2.9) show Maqam Abu Al-Fasel.

Figure (2.9): Maqam Abu Al-Fasel [Project Team].

4- **Al-Omaree Mosque**

Mosque is located on the edge of the Old City in the south east. It is a large room where a niche and are around with modern cement additives. It is believed that the mosque dates back to the Mamluk period Baibars days. Figure(2.10) show Al-Omaree Mosque.

Figure (2.10): Al-Omaree Mosque [Project Team].

5- Qisaria Castel

Located in the centre of the old town, and the old market area. The site features have several large rooms and Al-Ahawash contains many distinctive architectural details. Figure (2.11) show Qisaria Castel.

Figure (2.11): Qisaria Castel [Project Team].

6- Maqam Abu-Karoba

The place is situated by the highway leading to Arab Al-ramadin, about 1 km west of the Old City. It consists of a large square room with a dome and a niche, and has some modern planting seedlings. Figure (2.12) show Maqam Abu-Karoba.

Figure (2.12): Maqam Abu-Karoba [5].

2.6. Structure of the buildings in Al-Dahriya Old City

The structures of the old buildings in Al-Dahriya Old City is classified according to :

2.6.1. Uses of buildings in Al-Dahriya Old City

Through the doing form of the same existing buildings within the Old City by municipality, the types of uses are divided into eight types:

1. Type number one

Residential use; it was found that the number of residential buildings in the area around "188" building, and these accounted for 52 percent of total buildings. Figure (2.13) show old building for residential use [6].

Figure (2.13): Old building for residential use [Project Team].

2. Type number two

The number of buildings used for business purposes was found "28" building. Figure (2.14) show old building for commercial use [6].

Figure (2.14): Old building for commercial use [Project Team].

3. Type number three

Buildings used for industrial purposes was found "4" building and represent 1.1% of the total buildings, these are light industries, such as: a factory for packing liquid soap, toilet paper packaging factory, as well as solar water heaters factory [6].

4. **Type number four**

The educational use where there is a school of Andalusia and some nearby buildings, and four buildings in percentage 0.8%. Figure (2.15) show school in Al-Dahriya Old City [6].

Figure (2.15): Old building for educational use (Al-Dahriya School)[Project Team].

5. **Type number five**

Social, which is a single building used as a dewan to Qisia.

6. **Type number six**

The religious buildings and mosques, its two building within study area, namely the Al-Omari mosque and Al-Atqia mosque. Figure (2.16) show Al-Omari mosque [5].

Figure (2.16): Old religious building (Al-Omari mosque) [Project Team].

7. Type number seven

The buildings which are used for several purposes its number is "16" building, with 4 percent, where it was used the buildings for housing, but are now used for storage purposes, especially for agricultural products, such as grain, hay and others, as well as using part of sheds for animals, and various other uses. Figure (2.17) show old building used for storing food, also figure(2.18) show old building used for livestock breeding and animals [6].

Figure (2.17): Old building for storing [Project Team].

Figure (2.18): Old building for livestock breeding and animals[Project Team].

8. Type number eight

The abandoned buildings and an estimated "118" building 32.8%, and the currently neglected buildings not used, they are clustered in the Central old town adjacent to the Hasin and Shouhadaa cemetery .And it is Rabaa Hosh ,part of Al-Weradat,also part of Al-Tel,and Abu-Allan.All these Al-ahwash had not been subjected to deliberate demolition, and left after the departure of the owners to their new homes, which have more services, and modern kind of life. Figure (2.19) show abandoned old building [6].

Figure (2.19): Abandoned old building [Project Team].

2.6.2. Number of Floors

1. Part one

It is composed of one-story buildings, where it is found that "249" building, the percentage is estimated at 69 percent, of the total buildings, this is a great majority of the buildings in the old city. Figure (2.20) show one-story buildings [6].

Figure (2.20): One-story buildings [Project Team].

2. Part Two

A two-storey buildings and number "98" building, with 27 percent, these buildings are lofts, may reflect physical and social situation characteristic for the owners. Figure (2.21) show two-story buildings [6].

Figure (2.21): Two-story buildings [Project Team].

3. Part Three

It is composed of three-story buildings, the "12" building; the percentage is 3.3%, and the buildings around the commercial market. Figure (2.22) show three-story buildings [6].

Figure (2.22): Three-story buildings [Project Team].

4. Part Four

It composed of five floors, its one building in Wadi Al-Gamaree area.

2.6.3. Buildings Frame

By analyzing the situation existing in the old construction found that buildings are divided into three sections:

1. First Part

Buildings that are under construction. Figure (2.23) show building under construction.

Figure (2.23): Building under construction [Project Team].

2. Second Part

Buildings containing expansion. Figure (2.24) show Building containing expansion.

Figure (2.24): Building containing expansion [Project Team].

1.9.1. Third Part

Completed buildings. Figure (2.25) show completed building.

Figure (2.25): Completed building [Project Team].

2.6.4. Quality of the buildings

Through the analysis of existing buildings within the study area were found to be grouped into the four categories:

1. First Part

The buildings are in a good construction. Figure (2.26) show buildings in a good construction.

Figure (2.26): buildings in a good construction [Project Team].

2. Second Part:

Building in moderate condition, as shown in figure (2.27).

Figure (2.27): Building in moderate condition [Project Team].

3. Third Part

Buildings in poor condition as shown in figure (2.28) show Buildings in poor condition.

Figure (2.28): Buildings in poor condition [Project Team **].**

4. Fourth Part

Destroyed buildings, as shown in figure (2.29).

Figure (2.29): Destroyed buildings [Project Team].

2.6.5. The nature of the building and its design

The old city characterized of cave under old building and little, small window at high level and verse to the door, so the polluted air will transfer out of building and deceased the humidity in the building .But the ignorance of this benefits of design they cover the door and so increase the humidity in the buildings . Figures below shows The nature of the building and its design.

Figure(2.30):Window design in Al-Dahriya Old City buildings [Project team].

Figure(2.31):Doors and windows design in Al-Dahriya Old City [Project team].

Figure(2.32):Nature building in Al-Dahriya Old City [Project team].

2.7.Water

2.7.1 Water Quantity

According to Al-Dahriya municipality the water resources is 12% covered by Israeli water company distributed by municipality net ,36% by collection of rainwater wells ,48.9% by water tanks, and 19% other resources .So the city suffer from pollution and limitation of water to different causes .

2.7.2 Water Consumption

Water demand in Al-Dahriya, like other West Bank towns, is continuously increasing due to the increasing in population. The population of is estimated about 28776 parsons for year 2007 and 81762.9 for year 2036. The result of all this is obvious, the total water requirement is ever on the increase, and per capita water consumption is also on increase. Water consumption is not constant, yearly, monthly, weekly, daily and hourly variations in water consummations are observed, it is range from 18 to 22 liter per day. Certain dry years cause more consumption. In hot months water is consumed in drinking, bathing, and watering lawns and gardens. On holidays and weekends the water consumption may be high.

Even during day water use various with high use during morning hours and low use at night. Maximum daily demand or maximum daily consumption usually occurs during summer months Forecast water consumption.

2.7.3 Wastewater Quantity

Sanitary sewage is mostly the spent water of the community draining into the sewer system. It has been observed that a small portion of spent water is lost in evaporation, seepage in ground, leakage, etc. Usually 80% of the water supply may be expected to reach the sewers.

In overall the amount of Domestic wastewater produced per capita per day is usually 80% of water consumption.

Unfortunately the city have no sewerage system ,they collect the sewage from houses by cesspits and letrains then thrown it to the wadis**.**

2.7.4 Storm Water

There was no storm water drainage system in the Al-Dahriya Old City; some people collect the storm water and use it when there is shortage of water from municipality.

Chapter Four

Design Parameter

4.1 Wastewater Collection System Design

4.1.1 General

Once used for intended purposes, the water supply of community is considered to be wastewater . The individual conduits used to collect and transport wastewater to the treatment facilities or to the point of disposal are called sewers.

There are three type of sewers: sanitary, storm, and combined. Sanitary sewers are designed to carry wastewater from residential, commercial, and industrial areas, and a certain amount of infiltration/inflow that may enter the system due to deteriorated conditions of sewers and manholes. Storm sewers are exclusively designed to carry the storm water. Combined sewers are designed to carry both the sanitary and the storm flows.

The network of sewers used to collect wastewater from a community is known as wastewater collection system. The purpose of this chapter is to define the types of sewers used in the collection systems, types of wastewater collection systems that are used, the appurtenances used in conjunction with sewers, the flow in sewers, the design of sewers, and the construction and maintenance of sewers.

4.1.2 Municipal Sewerage System

TypeOf Sewers

The types and sizes of sewers used inmunicipal collection system will vary with sizeof the collection system and the location of the wastewater treatment facilities. The municipal or the community sewage system consist of:

1.Building sewers(also called house connections).

2.Laterals or branch sewers .

3.Main and sub main sewers.

4.Trunk sewers.

House sewer connect the building plumbing to the laterals or to any other sewer lines mentioned above. Laterals or branch sewers convey the wastewater to the main sewers. Several main sewers connect to the trunk sewers that convey the wastewater to large intercepting sewers or the treatment plant.

The diameter of a sewer line is generally determined from the peak flow that the line must carry and the local sewer regulations, concerning the minimum size of the laterals and house connections. The minimum size recommended for gravity sewer is 200 mm (8in).

Sewer Material

Sewers are made from concrete, reinforced concrete, vitrified clay, asbestos cement, brick masonry, cast iron, corrugated steel, sheet steel, and plastic or polyvinyl chloride or ultra polyvinyl chloride. Concrete and ultra polyvinylchorides are the most common materials for construction.

4.1.3 Types Of Wastewater Collection Systems

Gravity Sewer System

Collection both wastewater and storm water in one conduct(combined system) or in separate conduct (separate system). In this system , the sewers are partially filled. A typical characteristic is that the gradients of the sewers must be sufficient to create self-cleansing velocities for the transportation of sediment. These velocities are 0.6 to 0.7 m/s minimum when sewers are flowing full or half-full. Manholes are provided at regular intervals for the cleaning of sewers.

Pressure Type System

Collection wastewater only. The system, which is entirely kept under pressure , can be compared with a water distribution system. Sewage from an individual house connection

, which is in manhole on the site of the premises, is pumped into the pressure system. These are no requirements with regard to the gradients of the sewers.

Vacuum Type System

Collection wastewater only in an airtight system. A vacuum of 5-7 m is maintained in the system for the collection and transportation of the wastewater . There is no special requirement for the gradients of the sewers.

Pressure and vacuum-type systems require a comparatively high degree of mechanization, automation and skilled manpower. They are often more economical than gravity system, when applied in low population density and unstable soil conditions. Piping with flexible joints has to be used in areas with expansive soils.

4.1.4 Sewer Appurtenances

Manholes

Manholes should be of durable structure, provide easy access to the sewers for maintenance, and cause minimum interference to the sewage flow. Manholes should be located at the start and at the end of the line, at the intersections of sewers, at changes in grade, size and alignment except in curved sewers, and at intervals of 40-60 m in straight line.

The general shapes of the manholes are square, rectangular or circulation in plan , the latter is common. Manholes for small sewers are generally 1.0-1.2 m in diameter. For larger manhole bases are provided. The maximum spacing of manholes is 40-60 m depending on the size of sewer and available size of sewer cleaning equipment [13].

Slandered manholes consist of base, risers, top, frame and cover manholes benching , and step-iron. The construction materials of the manholes are usually precast concrete section, cast in place concrete or brick. Frame and cover usually made of cast iron and they should have adequate strength and weight.

Drop manholes

A drop manholes is used where an incoming sewer, generally a lateral, enters the manhole at a point more than about 0.6 m above the outgoing sewer. The drop pipe permits workmen to enter the manholes without fear of being wetted, avoid the splashing of sewage and corrosion of manhole bottom.

4.1.5 Design Parameters

Flow Rate Projections

The total wastewater flow in sanitary sewers for industrial area is made up of two components:

1.Domestic

2. infiltration.

Sanitary sewers are designed for peak flows from domestic , and peak infiltration allowance for the entire service area. The flow rate projection are necessary to determine the required capacities of sanitary sewers.

- The peak coefficient

In general, this coefficient increases when the average flow decrease, it will be determined from the practice and experience of the designer. The following relation has been used commonly by the designer and gives satisfactory results:

$$Pf = 1.5 + (2.5/\sqrt{q}). \qquad (4.1)$$

Where, q (in L/s) is the daily average flow rate of the network branch under consideration and Pf is the peak factor.

Important Numbers

- Maximum velocity=3m/s
- Minimum velocity = 0.6 m/s
- Maximum slope =15%
- Minimum slope =0.5%
- H/D =70%
- Minimum diameter 200 mm
- Minimum cover 1.5 m
- Maximum cover 5 m

4.2 Storm Design System Design

4.2.1 General

Rapid effective removal of storm runoff was a luxury not found in many cities in the early nineteenth century. Today, the modern city dweller has come to think of this as essential service . Urban drainage facilities have progressed from crude ditches and stepping stones to the present intricate coordinates systems of curbs, gutters, inlet, and underground conveyance.

The design must consider meteorological factors, geomorphologic factors, and the economic value of the land , as well as human value considerations such as aesthetic and public safety aspects of the design. The design of storm water detention basins should also consider the possible effects of inadequate maintenance of the facility.

4.2.2 Storm Water Runoff

Storm water runoff is that portion of precipitation which flows over the ground surface during and a short time after a storm. The dependence parameters that controlled the quantity of the storm water which carried by a storm or combined sewer are the surface of the drainage area (A, ha),the intensity of rainfall (I, L/s.ha), and runoff coefficient C dimensionless(the condition of the surface). There are many methods and formulas to determine the storm flow , and in all of them above parameters show up. One of the most common methods is rational method which will be discussed below.

Rational method

The rational method has probably been the most popular method for designing storm systems.It has been applied all over the world and runoff is related to rainfall intensity by the formula,

Q=C.i.A(4.2)

Where:

Q= peak runoff rate(L/s)

C=runoff coefficient, which is actually the ratio of the peak runoff rate to the average rainfall for a period known as the time of concentration.

I= average intensity, mm/min, for period equal to the time concentration

A= drainage area, hectar.

For small catchments areas, it continues to be a reasonable method, provided that it is used properly and that results and design concepts are for reasonableness.

This procedure is suitable for small systems where the establishment of a computer model is not warranted.

The step in the rational method calculation procedure are summarized below:

1.The drainage area is first subdivided into sub-areas with homogeneous land use according to the existing or planned development.

2.For each sub-area, estimate the runoff coefficient C and the corresponding area A.

3.The layout of the derange system is then drawn according to the topography, the existing or planned streets and roads and local deign practices.

4.Inlet points are then defined according to the detail of design considerations. For main drains, for example,the outlets of the earlier mentioned homogeneous sub-areas should serve as the inlet nodes. On the other hand in very detailed calculations all the inlet points should be defined according to local design practices.

5.After the inlet points have been chosen , the designer must specify the drainage sub-area for each inlet point A and the corresponding mean runoff coefficient C . If the sub-area for a given inlet has non-homogeneous land use, a weighted coefficient may be estimated.

6.The runoff calculation are then done by means of the general rational method equations for each inlet point, proceeding from the upper parts of the watershed to the final outlet.

7. After the preliminary minor system is designed and checked for its interaction with the major system, reviews are made of alternative , hydrological assumptions are verified computations are made, and final data obtained on street grades and elevations. The engineer thenshould proceed with final hydraulic design of the system.

Runoff Coefficient, C

Runoff coefficient is a function of infiltration capacity, interception by vegetation, depression storage, and evapotranspiration. It is requires greatest exercise of judgment by engineer and assumed constant, actually variable with time. It is desirable to develop composite runoff coefficient(weighted average) for each drainage area as:

$$C=\frac{\sum Ci.Ai}{\sum Ai} \qquad (4.3)$$

Where:

Ai = I th area

Ci = I th runoff coefficient.

The range of coefficient with respect to general character of the area is given in the following tables (Table 4.1 and Table 4.2).

Table (4.1):The range of coefficient with respect to general character of the area [18].

Description of Area	Runoff coefficient
Business	
Down town	0.7 to 0.95
Neighborhood	0.5 to 0.7
Residential	
Single family	0.3 to 0.5
Multi-unit, detached	0.4 to 0.6
Multi-unit, attached	0.6 to 0.75
Residential (suburban)	0.25 to 0.4
Apartment	0.5 to 0.7
Industrial	

Light	0.5 to 0.8
Heavy	0.6 to 0.9
Parks, Cemeteries	0.1 to 0.25
Playground	0.2 to 0.35
Railroad yard	0.2 to 0.35
Unimproved	0.1 to 0.3

Table (4.2):The range of coefficient with respect to surface type of the area [18].

Character of surface	Runoff Coefficient
Pavement	
Asphalt and concrete	0.7 to 0.95
Brick	0.7 to 0.85
Lawns, Sandy soil	
Flat, 2 %	0.05 to 0.1
Average, 2-7 %	0.1 to 0.15
Steep, 7%	0.15 to 0.2
Roofs	0.75 to 0.95
Lawns, heavy soil	
Flat, 2 %	0.13 to 0.17
Average, 2-7 %	0.18 to 0.22
Steep, 7%	0.25 to 0.35

Rainfall Intensity, i

In determining rainfall intensity for use in rational formula it must be recognized that the shorter the duration , the greater the expected average intensity will be . The critical duration of rainfall will be that which produce flow from the entire drainage area .Shorter periods will provide lower flows since the total area is notinvolved and longer periods will produce lower average intensities. The storm sewer designer thus requires some relationship between duration and expected intensity. Intensities vary from place to another and curves or equations are specified for the areas for which they were developed.

The rainfall intensity depended on many factors through which we can do our calculations; we can list these factors as follow:

1. Average frequency of occurrence of storm (1/n) or (f).

Average frequency of occurrence is the frequency with which a given event is equaled or exceed on the average , once in a period of years. Probability of occurrence, which is the reciprocal of frequency, (n) is preferred by sum engineers. Thus , if the frequency of a rain once a 5 year (1/n) =5), then probability of occurrence n=0.2. Selection of storm design rain frequency based on cost-benefit analyses or experience. There is range of frequency of often used:

a. Residential area: f=2 to 10 years(5 year most common).
b. Commercial and high value districts: f=10 to 50 (15 year common).
c. Flood protection: f=50 year.

2. Intensity, duration and frequency characteristics of rainfall.

Basic data derived from gage measurement of rainfall (point rainfall) over a long period can be used to obtain a rainfall height diagram that show therelation between the height of the rain (mm) and time (min). The slope of the curve or rain height per unit time is defined as rain intensity:

$$i = (\Delta \text{ height of rain} / \Delta \text{ time}) \quad \frac{mm}{min}$$

The rain intensity in liter per second .hectare is equal:

$$I\left(\frac{L}{s.ha}\right) = 166.7\ i\ \frac{mm}{min}$$

In order to drive intensity-duration-frequency curves long-term observation of rainfall is needed. Analysis of such observation is given in any text in sanitary engineering.

3. Time of concentration.

The time of concentration is the time required for the runoff to become established and flow from the most remote part (in time) of the drainage area to the point under design.

$$t_c = t_i + t_f \qquad (4.4)$$

Where t_C: time of concentration.

t_i: inlet time.

t_f: flow time.

Time of flow in storm, $t_f = \frac{Length\ of\ pipe\ line\ (L)}{Velocity\ of\ flow\ (v)}$

Inlet time (t_i): is the time required for water to flow over ground surface and along gutters to drainage inlet. Inlet time is function of rainfall intensity, surface slope, surface roughness, flow distance, and infiltration capacity and depression storage.

4.2.4 Selection of Design Parameters

Many design factors must be investigated before storm sewer design can be completed. Factors such as design period ; peak, average , and minimum flow; storm sewer slope and minimum velocities … etc.are all important in developing storm sewer design. Many of the factors are briefly discussed below.

1. Design Flow Rate

Storm water sewer should be designed to carry the largest storm that occurred in the period of design; commonly it is years because of consideration of the cost and the frequency factors.

2. Minimum Size

The minimum size storm sewer recommended is 250 to 300 mm for closed system, and for open channel depended on the type of profile that selected.

3. Minimum and Maximum Velocities

In storm water sewers, solids tend to settle under low-velocity conditions. Self-cleaning velocities must be developed regularly to flush out the solids. Most countries specify minimum velocity in the sewer under low flow conditions. The minimum allowable velocity is 0.75 m/s, and 0.9 m/s is desirable. This way the lines will be flushed out at least once or twice a day. The maximum velocities for storm water system are between 4 to 6 m/s . The maximum velocity is limited to prevent the erosion of sewer inverts.

4. Slope

For closed system minimum slopes determined from minimum velocities, for minimum velocity 1 m/s, the slopes are shown in Table (4.3).

Table (4.3): Minimum recommendation slopes of storm sewer (n=0.015) [18].

Pipe Diameter (D)		Slope (min)	Slope (max) = 1/D
Mm	inch	mm	Cm
250	10	0.00735	0.04
300	12	0.00576	0.033
450	18	0.00336	0.0222
600	24	0.00229	0.0167

Note : For a velocity of 0.75 m/s the slope shown above should be multiplied by 1.56

Minimum slopes determined from maximum velocities, 1/D (cm) can be used as a guide. For open channel, the slope also depended on the profile type , and generally used as the slope of the road.

5. Depth

The depth of storm sewers when using closed system is generally just enough to receive flow but not less than 1 m, below the ground surface. Depth depends on the water table, lowest point to be served , topography, and the freeze depth. But for the open channel it is at the ground surface.

6. Appurtenances

Storm sewer appurtenances include manholes, inlet, outlets and outfall, and others. Appropriate storm sewer appurtenances must be selected in design of storm water sewers.

Important Numbers

- Maximum velocity=5m/s
- Minimum velocity = 1 m/s
- Maximum slope =15%
- Minimum slope =0.5%

- H/D =100%
- Minimum diameter 250-300 mm
- Minimum cover 1 m
- Maximum cover 5 m

4.3 Septic Tank Design

4.3.1 General

The term "septic" refers to the anaerobic bacterial environment that develops in the tank which decomposes or mineralizes the waste discharged into the tank. In which Wastewater flows from the waste water collection system to the septic tank through the sewer pipe. The septic tank treats the wastewater naturally by holding it in the tank long enough for solids and liquids to separate. The wastewater forms three layers inside the tank. Solids lighter than water (such as greases and oils) float to the top forming a layer of scum. Solids heavier than water settle at the bottom of the tank forming a layer of sludge. This leaves a middle layer of partially clarified wastewater.

So we have three distinct layers of sewage in the septic tank that will describe below. Figure(4.1) show the layer in septic tank.

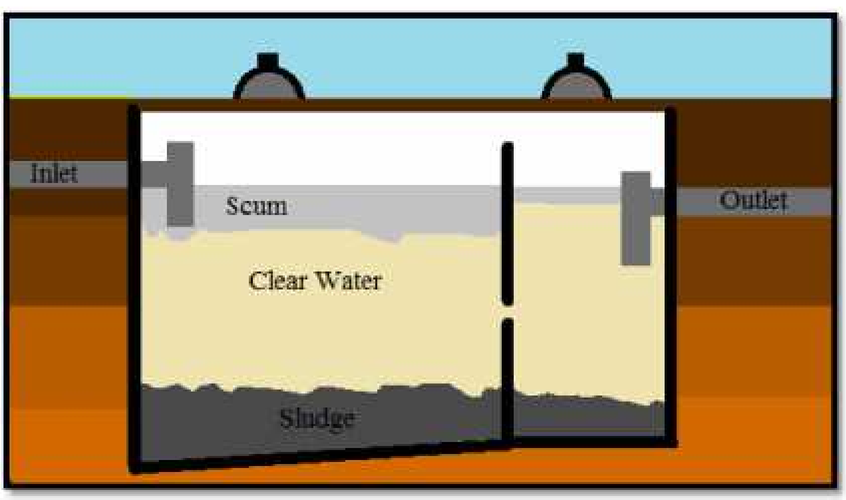

Figure (4.1): Different layers of septic tank

a) Sludge Layer: All solids that are heavier than water settle at the bottom of the tank to make up the sludge layer. The anaerobic bacteria breakdown and digest the biodegradable solids in the sludge. During the process, the solids become lighter and migrate upwards to the middle of the tank or the clear zone.

b) Clear Zone: The clear zone in the septic tank holds grayish or brown colored water that contains fine and microscopic biodegradable and non-biodegradable materials suspended in the liquid. It is in this liquid environment that the bacteria further break down most of the remaining biodegradable solids. The clarified liquid then flows into the soak pit.

c) Scum Layer: The scum layer at the top of the septic tank contains grease, oils, soap films and other materials that are lighter than water. The sludge and scum that cannot be broken down are retained in the tank until the tank is pumped.

The baffle wall and outlet TEE prevent any of the scum on the top layer from exiting the septic tank before being treated. The inlet, outlet and the baffle wall are designed and constructed to allow only the liquid from clear zone to exit into the soak pit.

Any system must have a design parameter that classified it. Septic tank system has many design parameter but the main parameters are:

1. Effective volume: The floating scum and sludge layers take up the top and bottom space of the septic tank respectively. The effective volume is the liquid volume in the clear space between the scum and sludge layers in the septic tank.

2. Retention time: This is the time that elapses from the entry point of sewage into the clear zone to the time of exit of the sewage from the clear zone of the septic tank. This is an important parameter for the design of septic tank, as each molecule of the incoming sewage enters and exits the clear zone under the design retention time period. The

retention time is the function of the effective volume and the daily household wastewater flow.

3. Organic flow rate: One of the principal parameters used in wastewater system design is the organic flow rate which also called hydraulic loading rate. It defines as a unit volume of filter or per unit area per day of treated wastewater water.

The tank must have configuration on these points:

1. Base

The base is usually constructed of plain concrete with the thickness of about 100-150 millimeters. This is the minimum thickness required to withstand the uplift pressure when the tank is empty. The base also acts as a foundation for the side walls. A designer may also reinforce the base slab in larger tanks.

2. Side Walls

The side walls of the septic tank are made of brick, stone masonry or concrete. The septic tank must be watertight.

3. Inlet and Outlet

The correct installation of the inlet and outlet are critical in the performance of the septic tank.

4. Ventilation

The decomposition of the organic wastes produce gases and the safe exit of the gases must be provided in the septic tank. The simplest option is to install a vent pipe with a screen on the roof slab of the septic tank. The gases coming out of septic tank has a strong stench and so the height of the vent pipe should be higher than the normal height of a person.

5. Maintains

Adequate care must be taken to design, construct, operate and maintain the septic system so that it can provide years of reliable service. A poorly designed and maintained septic system can be a source of pollution, which causes disease outbreaks and other environmental problems. Therefore, it is important to understand the consequences of a poorly designed and maintained septic system and to take necessary precautions.

To assess the system you must compare between the advantages and disadvantages of the system.

- Advantages of Septic Tanks

1. It needs little maintenance
2. Anaerobic system will break down solids faster so less solids will reach the draining field and groundwater.
3. For cement septic tanks, they last much longer The lifespan of a properly installed septic tank is usually between 20-40 years, but can be much longer with proper maintenance and care.
4. Septic systems provide simple, effective wastewater treatment for low-density urban and rural areas.
5. Septic systems are also simple in design, which make them generally less expensive to install and maintain.
6. Provide a storage space for the separated solids (sludge and scum).
7. Act as a sedimentation tank. As the sewage enters the tank, the rate of flow is reduced so that the larger solids in the sewage sink to the bottom of the tank.

- Disadvantages of Septic Tanks

1. Foul odors caused by poor maintenance or clogged septic systems
2. Soil contamination is also another problem that can manifest when poor maintenance is given to the septic system

3. There is a risk in rainy seasons that the septic system overflows bringing sewage to the surface.

4. Clogged drains by oil, grease, fats, and other materials that may be thrown into toilets, sinks, and showers causing obstruction.

5. Requires more responsibility and regular maintenance.

Figure (4.2): Collapse of Septic Tank due to lack of maintenance

A septic tank is designed to minimize pollution, but must follow with Soak for the natural filtering process in the soil.

A soak pit or seepage pit is a vertical leach line consisting of either a deep hole with porous walls or a hole filled with gravel or brickbats. Septic tanks should always be connected to a suitable soak pit or a sewer line. The soak pit can be constructed of pre-cast concrete-rings (with holes) or a dry cylindrical wall made of brick, block or stone as shown in Figure (4.3)The minimum diameter of the pit is 1.5 meters with a minimum depth of 3 meters. It must be located at least 10 meters away from any waterways in saturated soil conditions.

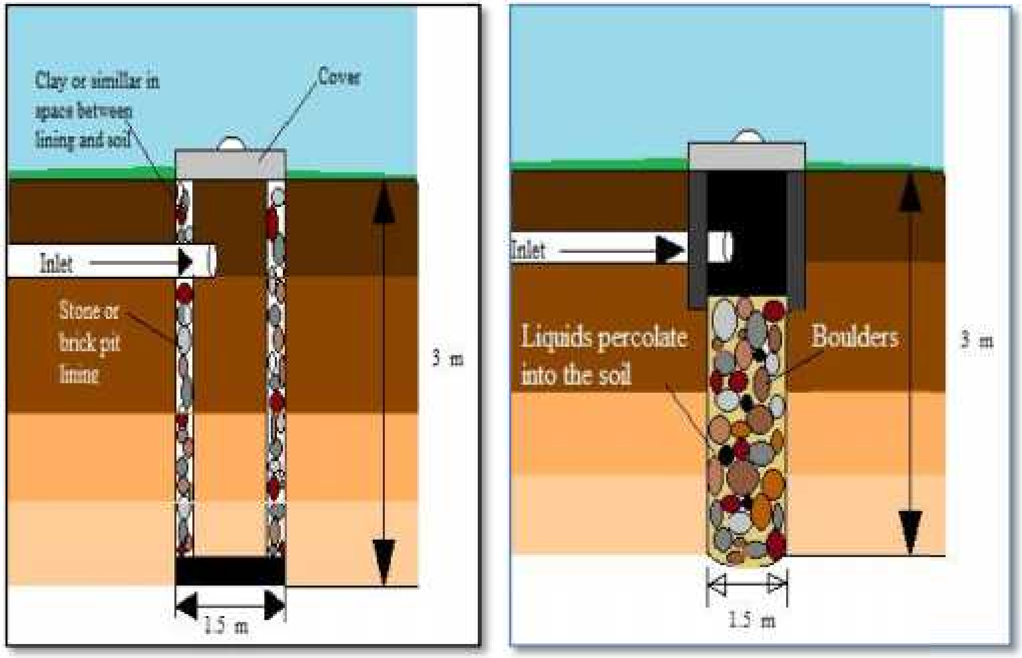

Figure (4.3): A lined soak pit An unlined soak pit

The location of the tank must be in an area where it will not experience vehicular traffic, and at the lowest point of the.

The sludge produced from the treatment of waste water. This is inherently because a primary aim of wastewater treatment is removing solids from the wastewater. In addition, soluble organic substances are converted to bacterial cells, and the latter is removed from the wastewater. So needing of sludge treatment is important for:

1. Reduces organic ingredients.
2. Removes odor.
3. Reduces volume and weight.
4. Improves hygiene by removing of pathogen organisms.
5. Prepares sludge for further utilization or disposal.

There are different ways of handling the sludge treatment such as:

1. Concentrating the sludge.

2. Aerobic/anaerobic sludge digestion.
3. Mechanical drying of sludge.
4. Natural drying tank for sludge.

The most efficient way in our case is natural drying tank for sludge, due to high temperature of the city; also make sure the death of fly larvae and fermentation of organic material, and so increasing the efficiency of outlet sewage.

This can be done by installing a shallow basin, having area range from 100- 200 m^2

It made from Concrete resistance to sulphate and the bottom of this basin supply with pipes to collect the waste water and it cover with 30 cm of gravel.

The sludge spread along the basin less than or equal 10 cm depth to dray for seven days, then spread another layer of sludge and so on till the total sludge depth reaching 30 cm . After that cover the final layer of sludge with sand after five days from spread the last layer.

The sludge treated can be used in different ways such as:

1. Agricultural Use as compost material, but our religion have constrain in this side so e eliminate this use.
2. Incineration, and use its energy for powering system.
3. Land filling, but It is important consider to whether the sludge isconsistent enough to be land filled.

4.3.2 Design Parameter of Septic Tank

Characteristics of manual septic tank:

1. The inlet pipe shall be fixed inside the tank, with top limb rising above scum level and the bottom limb extending about 300 mm below the top water level.

2. The final outlet for tanks should be by 100 mm pipe diameter, the bottom limb extending to about 1/3 of the liquid depth below top water level.

3. Free-Board: A minimum free board of 300 mm should be provided.

4. Ventilating Pipe: Every septic tank shall be provided with ventilating pipe of at least 50 mm diameter. The ventilating pipe shall extend to a height which would cause no

smell nuisance to any building in the area. Generally the ventilating pipe may extend to a height of about 2 m when the septic tank is at least 20 m away from the nearest building and to a height of 2 m above the top of the building when it is located closer than 20 meters.

5. Floor

The floor may be of cement concrete of minimum slope of 1 : 10 may be provided towards the sludge outlet to facilitate desludging.

6. Walls

The walls should be of such thickness as to provide adequate strength and water tightness.

7. BOD removal = 25 - 35 % (4.5)

8. Removal of suspended solid (SS) = 40 - 60 % (4.6)

The equations used in the design of septic tank are:

a) $Volume = Flow\,rate * Hydraulic\,retention\,time$

$V = Q * HRT$ (4.7)

b) $Surface\,area = Flow\,rate * Organic\,flow\,rate$

$As = Q * OFR$ (4.8)

c) $Depth = \frac{Volume}{Surfacearea}$

$D = \frac{V}{As}$ (4.9)

a) $Surface\,area = Width * Length$

$As = W * L$ (4.10)

4.4 Solid Waste Management

Solid waste is the collecting, treating, and disposing of solid material that is discarded because it has served its purpose or is no longer useful. While solid waste management Systematic control of generation, collection, storage, transport, source separation, processing, treatment, recovery, and disposal of solid waste [19].

By cooperation of architectural and environmental engineering we make a design of small park that located near grave which have large quantity of solid waste in random distribution way, also we make a waste collection and transportation of solid waste of the city by finding the number of container needed and capacity of compactor and transportation for each trip.

To make an analysis of solid waste management for Al- Dahriya city, required data was collected from different source, majority from the Land, history and human heritage in Al- Dahriya city book [20].

Chapter Six
Bill of Quantity

Chapter Six
Bill of Quantity

1. For the Proposed Wastewater Collection System

No.	EXCAVATION	UNIT	QTY	UNIT PRICE		TOTAL PRICE	
				$	C	$	C
A1	Excavation of pipes trench in all kind of soil for one pipe diameter 200 mm depth and disposing of the debris and the top soil unsuitable for backfill outside the site	LM	2685				
A2	Excavation of pipes trench in all kind of soil for one pipe diameter 250 mm depth and disposing of the debris and the top soil unsuitable for backfill outside the site	LM	128				
A3	Excavation of pipes trench in all kind of soil for one pipe diameter 300 mm depth and disposing of the debris and the top soil unsuitable for backfill outside the site	LM	92				
Sub-Total							
B	**PIPE WORK**						
	Supplying, storing and installing of uPVC	LM	2905				
Sub-Total							

No.	BACKFILLING	UNIT	QTY	UNIT PRICE		TOTAL PRICE	
C	**PIPE BEDDING AND BACKFILLING Dimension and material**						

C1	Supplying and embedment of sand for one pipe diameter 8 inch, depth up to 1.5 meter and disposing of the debris and the top soil unsuitable for backfill outside the site.	LM	2685				
C2	Supplying and embedment of sand for one pipe diameter 10 inch, depth up to 1.5 meter and disposing of the debris and the top soil unsuitable for backfill outside the site.	LM	128				
C3	Supplying and embedment of sand for one pipe diameter 12 inch, depth up to 1.5 meter and disposing of the debris and the top soil unsuitable for backfill outside the site.	LM	92				
	Sub-Total						
D	**MANHOLES, Details according to the drawing**						
D1	Supplying and installing of precasted manhole including excavation pipe connection, epoxytar coating, 25-ton cast iron cover and backfill, size 1200mm, depth up to 1.5m.	NR	85				
D2	Supplying and installing of precasted manhole including excavation pipe connection, epoxytar coating, 25-ton cast iron cover and backfill, size 1200mm, depth up to 2.5m.	NR	26				
	Sub-Total						
E	**Concrete Surround**						
E1	Supplying and cast iron (B200) surround for sewer.	M^3	109				
	Sub-Total						

No.	**EXCAVATION**	**UNIT**	**QTY**	**UNIT PRICE**		**TOTAL PRICE**	
F	**Air And Water Leakage Test**						
F1	Air leakage test for sewer pipe lines 8,10,12,and 14inch according to specifications, including for all t emporary works.	LM	2905				

F2	Water leakage tests for manholes, depth up to 1.5 meter according to specifications.	NR	85				
F3	Water leakage test for manholes , depth up to 2.5 meter according to specification	NR	26				
	Sub-Total						
G	**Rode reinstatment**						
G1	Removing and dispose of the asphalt anf repaaviing and re-Asphalting after BACKFILL, road structure layers compacted basecoarse 125+125 mm, MCO layer 11/m2, asphalt layer 50mm(3/4”).	LM	2905				
Sub-Total							
H	**Survey work**						
H1	Topographical survey required for shop drawings and as built DWGS using absoluet Elev. And coordinate system	LM	2905				
Sub-Total							

2.For The Proposed Storm water Collection System

No.	EXCAVATION	UNIT	QTY	UNIT PRICE		TOTAL PRICE	
				$	C	$	C
A1	Excavation of pipes trench in all kind of soil for one pipe diameter 200 mm depth and disposing of the debris and the top soil unsuitable for backfill outside the site	LM	561				
A2	Excavation of pipes trench in all kind of soil for one pipe diameter 250 mm depth and disposing of the debris and the top soil unsuitable for backfill outside the site	LM	212				
A3	Excavation of pipes trench in all kind of soil for one pipe diameter 300 mm depth and disposing of the debris and the top soil unsuitable for backfill outside the site	LM	236				
A4	Excavation of pipes trench in all kind of soil for one pipe diameter 375 mm depth and disposing of the debris and the top soil unsuitable for backfill outside the site	LM	281				
A5	Excavation of pipes trench in all kind of soil for one pipe diameter 450 mm depth and disposing of the debris and the top soil unsuitable for backfill outside the site	LM	507				
A6	Excavation of pipes trench in all kind of soil for one pipe diameter 600 mm depth and disposing of the debris and the top soil unsuitable for backfill outside the site	LM	406				

A7	Excavation of pipes trench in all kind of soil for one pipe diameter 750 mm depth and disposing of the debris and the top soil unsuitable for backfill outside the site	LM	96				
A8	Excavation of pipes trench in all kind of soil for one pipe diameter 900 mm depth and disposing of the debris and the top soil unsuitable for backfill outside the site	LM	94				
A9	Excavation of pipes trench in all kind of soil for one pipe diameter 1050 mm depth and disposing of the debris and the top soil unsuitable for backfill outside the site	LM	24				
A10	Excavation of pipes trench in all kind of soil for one pipe diameter 375 mm depth and disposing of the debris and the top soil unsuitable for backfill outside the site	LM	28				
Sub-Total							
B	**PIPE WORK**						
	Supplying, storing and installing of uPVC	LM	2445				
Sub-Total							

No.	**BACKFILLING**	**UNIT**	**QTY**	**UNIT PRICE**		**TOTAL PRICE**	
C	**PIPE BEDDING AND BACKFILLING Dimension and material**						
C1	Supplying and embedment of sand for one pipe diameter 200 mm, depth up to 1.5 meter and disposing of the debris and the top soil unsuitable for backfill outside the site.	LM	561				

C2	Supplying and embedment of sand for one pipe diameter 250 mm, depth up to 1.5 meter and disposing of the debris and the top soil unsuitable for backfill outside the site.	LM	212				
C3	Supplying and embedment of sand for one pipe diameter 300 mm, depth up to 1.5 meter and disposing of the debris and the top soil unsuitable for backfill outside the site.	LM	236				
C4	Supplying and embedment of sand for one pipe diameter 375 mm, depth up to 1.5 meter and disposing of the debris and the top soil unsuitable for backfill outside the site.	LM	281				
C5	Supplying and embedment of sand for one pipe diameter 450 mm, depth up to 1.5 meter and disposing of the debris and the top soil unsuitable for backfill outside the site.	LM	507				
C6	Supplying and embedment of sand for one pipe diameter 600 mm, depth up to 1.5 meter and disposing of the debris and the top soil unsuitable for backfill outside the site.	LM	406				
C7	Supplying and embedment of sand for one pipe diameter 750 mm, depth up to 1.5 meter and disposing of the debris and the top soil unsuitable for backfill outside the site.	LM	96				
C8	Supplying and embedment of sand for one pipe diameter 900 mm, depth up to 1.5 meter and disposing of the debris and the top soil unsuitable for backfill outside the site.	LM	94				

C9	Supplying and embedment of sand for one pipe diameter 1050 mm, depth up to 1.5 meter and disposing of the debris and the top soil unsuitable for backfill outside the site.	LM	24				
C10	Supplying and embedment of sand for one pipe diameter 1200 mm, depth up to 1.5 meter and disposing of the debris and the top soil unsuitable for backfill outside the site.	LM	28				
Sub-Total							
D	**MANHOLES, Details according to the drawing**						
D1	Supplying and installing of precasted manhole including excavation pipe connection, epoxytar coating, 25-ton cast iron cover and backfill, size 1200mm, depth up to 1.5m.	NR	35				
D2	Supplying and installing of precasted manhole including excavation pipe connection, epoxytar coating, 25-ton cast iron cover and backfill, size 1200mm, depth up to 2.5m.	NR	45				
Sub-Total							
E	**Concrete Surround**						
E1	Supplying and cast iron (B200) surround for sewer.	M^3	221				
Sub-Total							

No.	**EXCAVATION**	**UNIT**	**QTY**	**UNIT PRICE**		**TOTAL PRICE**	
F	**Air And Water Leakage Test**						
F1	Air leakage test for sewer pipe lines 8,10,12,and 14inch according to specifications, including for all t emporary works.	LM	2445				
F2	Water leakage tests for manholes, depth up to 1.5 meter according to specifications.	NR	35				
F3	Water leakage test for manholes , depth up to 2.5 meter according to specification	NR	45				
	Sub-Total						
G	**Rode reinstatment**						

G1	Removing and dispose of the asphalt anf repaaviing and re-Asphalting after BACKFILL, road structure layers compacted basecoarse 125+125 mm, MCO layer 11/m2, asphalt layer 50mm(3/4”).	LM	2445				
Sub-Total							
I	**Survey work**						
I1	Topographical survey required for shop drawings and as built DWGS using absoluet Elev. And coordinate system	LM	2445				
Sub-Total							

3. For the Proposed Septic tank:

No.		UNIT	QTY	UNIT PRICE		TOTAL PRICE	
				$	**C**	**$**	**C**
A	**Septic Tank**						
A1	Volume of septic tank	M^3	555.4				

4. For the Proposed Solid Waste management:

No.		UNIT	QTY	UNIT PRICE		TOTAL PRICE	
				$	**C**	**$**	**C**
A	**Container**						
A1	Type 240 L	NR	125				
A2	Type 1100 L	NR	164				
A3	Type 4 m^3	NR	23				

ChapterSeven

"Conclusions and Recommendations"

CONCLUSIONS

In this project, the trial is done make an environmental assessment for Al-Dahriya Old City in addition to make a design for wastewater and storm watercollection systems for the coming 25 years . The main conclusions drown from the present study are summarized below:

1.The environmental condition in Al-Dahriya Old City is assessed in bad condition, anabsence of sanitary systems, and anabsence ofsolid waste management.

2.Al-Dahriya Old City like other city in Palestine has no sewage facilities. The people are using latrines, and cesspits . The wastewater has been seeping into the ground through the over flow of the deteriorated cesspits and latrines, causing series environmental and health problems.

3. The proposed wastewater and storm water systems coveredall of the areas of Al-Dahriya Old City and the two systems are done by gravity.

4.The septic tank for hole area is with volume equal 555.4 m^3 and it design in order to save environment.

5.Making a solid waste management to avoid random landfilling, and design small park at the old damping site in order to save environment, heritage and vegetation land.

RECOMMENDATIONS

1. This study was done for Al-Dahriya Old City and we recommend to make a complete study for all old cities in Palestine.
2. A cooperation with architectural and civil engineers is in high need and very use fall to make a good assessment.

APPENDIX

(A)

- **WASTE WATER QUANTITY TABLES**

- **STORM WATER QUANTITY TABLE**

First: Waste water quantity calculation

Example on calculation of waste water quantity for manhole number 1 to manhole number 2:

- Unit sewage = $waste\ water * Pop\ density$
- Waste water = 0.8* water consumption

= 0.8* 100/1000

* Waste water = 0.08 m^3 $c.day$

- Pop density = $\frac{population}{Area}$

- Population growth= 3.5 %

$$P_f = P_p \left(1 + \frac{r}{100}\right)^n$$

Pop 2040 = 1772 $\left(1 + \frac{3.5}{100}\right)^{25}$

Pop 2040 =4188 Cap

- Area of Old City = 44.82 dounum.

- Pop Present density = $\frac{No\ of\ floor * No\ of\ House * avg\ individual}{Total\ Area}$

Pop density = $\frac{2*718*6}{44.82}$

Pop density = 192.24 $Cap\ /dounm$

- Pop Future density

$$D_f = D_p \left(1 + \frac{r}{100}\right)^n$$

Pop Future density =

$$D_f = 192.24 \left(1 + \frac{3.5}{100}\right)^{25}$$

$Df = 454.31\ Cap/\ dounm$

Unit sewage = 0.08* 454.3 = 36.34m^3/day.dounum

The incremental area is the expected area for each manhole.

Total area is the sum of all previous manholes area.

- Q Average = Unit sewage * Total Area

  = 36.34 * 0.06

- Q Average = 2.18m^3/day

- Peak factor = $1.5 + \frac{2.5}{Qavg}$

  Peak factor = $1.5 + \frac{2.5}{\sqrt{2.18}}$

  Peak factor = 3

Peak factor should be less than 3

Maximum Q= Peak factor * Qavg

= 3*2.18

= 6.54 m^3/day

Infiltration = 0.1 * Qavg

= 0.1 * 2.18

Infiltration = 0.22 m^3/day

Total Average = Infiltration + Qavg

= 0.22 + 2.18

Total Average = 2.4 m^3/day

Total Max = Infiltration + Qmax

= 0.22 + 6.54

Total Max = 6.76 m^3/day

Second: Storm water quantity calculation:

Example on calculation of waste water quantity for manhole number 1 to manhole number 2:

- Pipe length =103.67 m.
- Tributary area = 0.64 m^2.
- Runoff coefficient = 0.65.
- C.A= 0.416 ha.
- ∑C.A= 0.416 ha.
- Concentration time (Tc) = ti +tf
- ti = 10 min.
- tf = $\frac{\text{Distance}}{\text{Velocity}}$.

  tf =$\frac{103.67}{1*60}$ = 1.728 min.

- Tc = 10+1.73=11.728 min.
- Rain Fall intensity = 71.62 $\frac{mm}{\text{hr}}$.

  Rain Fall intensity = 199.117 $\frac{l}{\text{s.h}}$.

  Qmax =C.I.A

  Qmax = 0.416 * 199.117 *

  =82.83$\frac{l}{s}$

REFERENCES

1- R.Jain,L.V.Urban.Environmental Assessment, New Yurok ,2001.

2- Al-Dahriya Municipality, West Bank, Palestine.
(aldahrieh.ps/ar/**municipality**/about).

3- Riwaq, Protection Plan of Al- Dahriya, September 2006(www.riwaq.org/)

4- en.climate-data.org

5- www.panet.co.il/article/432007

6- تخطيط وإعادة تأهيل الوسط التاريخي البلدة القديمة في الظاهرية، إعداد إسماعيل حسان إبراهيم رباع

7- vprofile.arij.org/hebron/ar/pdfs/Adahriya_ar.pdf

8- **موسوعةبلادنافلسطين**، :مراد مصطفى الدباغ, 1991،

9- Palestinian Central Bureau of Statistics “PCBS”.

10- Al-Jabari, S and Al-Herbawi, H. 2002 “Design of Waste Water Collection System forBaniNaimTown”, Palestine Polytechnic University, Hebron, Palestine.

11- Mc Ghee, Terence J. (1991), “Water Supply and Sewage “, Sixth Edition, MC Ghee- Hill International Editions, U.S.A.

12- Viessman, Warren.JR. And Hammer, Mark J. (1985), “Water Supply and Pollution Control", Fourth Edition, Harper and Row, Publishers, Inc., New Yourk, U.S.A.

13- QasimSayed R. (1985), "Waste Water treatment plants planning, Design, and operation".The University of Texas at Arlington, U.S.A.

14- Mc Ghee, Terence J. (1991), "Water Supply and Sewage", Sixth Edition, Mc Ghee-Hill International Edition, U.S.A.

15- Metcalf and Eddy, Inc. (1982), "Waste Water Engineering:Treatment,Disposal, and Reuse ", McGraw – Hill, U.S.A.

16- W.Schofield, Engineering surveying, Kingston University.

17- Metclaf and Eddy “waste water engineering and reuse”, McGraw-Hill Higher Education, 2003.

18- Saekaya , H ,"Sanitry Engineering ", Civil Engineering Department,Jeedah, 1984.

19- www.businessdictionary.com/definition/solid-waste-management.htmlDec.2015

20- www.palestineremembered.com/GeoPoints/al_Dhahiriya_988/Article_13235.html Dec.2015