PALESTINE POLYTECHNIC UNIVERSITY
COLLEGE OF ENGINEERING AND TECHNOLOGY
CIVIL & ARCHITECTURAL ENGINEERING DEPARTMENT

GeoSpatial Electronic Map For Yatta City

BY

Samah Harahsheh

Shaymaa Younis

SUPERVISED BY

Dr.Nabil Al-Joulani

HEBRON- WEST BANK
PALESTINE

2013-2014

Abstract

Web-based GIS technology plays an effective role in the presentation, analyzing and planning of the geographic information. Users need not have specific training or software to be able to interact, It's easy and simplified access, without limitation, in terms of time and location should be able to increase the number of GIS users and involvement in the planning and development of activities. Web-based GIS is expected to cultivate a new working environment in the field of planning through involvement from various agencies and personnel in obtaining common benefits.

In this senior project, we attempt to develop a geospatial electronic map for Yatta city using GIS tools was developed. The map is very important for the municipality of Yatta and for local authorities to facilitate their services to the public of Yatta. Also, other municipalities may use the system to exchange information with Yatta municipality. About 14 layers were included in the map such as : hospitals, schools, pharmacies, clinics, health centers, mosques, houses, roads, electricity network, water network, farms, gas stations, stone cutting facilities, historical and important sites in Yatta city.

ملخص المشروع

نظام المعلومات الجغرافية (GIS) هو نظام قائم على الحاسوب يعمل على جمع وصيانة وتخزين وتحليل وإخراج وتوزيع البيانات والمعلومات المكانية. وهذه أنظمة تعمل على جمع وادخال ومعالجة وتحليل وعرض وإخراج المعلومات المكانية والوصفية لأهداف محددة، وتساعد على التخطيط واتخاذ القرار فيما يتعلق بالزراعة وتخطيط المدن والتوسع في السكن، بالإضافة إلى قراءة البنية التحتية لأي مدينة عن طريق إنشاء ما يسمى بالطبقات ، يمكننا هذا النظام من إدخال المعلومات الجغرافية (خرائط, صور جوية, مرئيات فضائية) والوصفية (أسماء، جداول) ومعالجتها و تخزينها و استرجاعها و تحليلها تحليل مكاني وإحصائي, وعرضها على شاشة الحاسوب أو على ورق في شكل خرائط, تقارير, ورسومات بيانية أو من خلال الموقع الإلكتروني.

يهدف هذا المشروع إلى انشاء خارطة موقعية الكترونية لمدينة يطا , باستخدام أوامر برنامج الـ ArcMap . تعتبر هذه الخارطة مهمة للبلدية ولسكان المدينة وللمؤسسات الموجودة في المدينة , ومهمة ايضا للبلديات الأخرى , حيث تتيح للمستخدم فرصة معرفة البيانات التي تخص موقع معين موجود على الخارطة وتسهل عليه جمع المعلومات ومعرفة البيانات , وتتيح للبلديات الأخرى فرصة استخدام تلك المعلومات المثلة على الخارطة , وتحتوي الخارطة المصممة بشكل نهائي على اربعة عشر طبقة وهي : المستشفيات , المدارس , الصيدليات , العيادات , المراكز الصحية , المساجد , المنازل, شبكة الطرق, شبكة الكهرباء, شبكة المياه, المزارع, محطات الوقود, مقالع ومناشير الحجر والرخام, المواقع الأثرية والمهمة في المدينة.

List Of Contents

CHAPTER 2 : Literature Review

CHAPTER 3 : Software & Data Processing

List Of Figures

List Of Tables

Chapter 1

Introduction

1.1 General

The recent development in the IT sector at Palestine municipalities are expanded to include the GIS Database application, which in turn add an extreme improvement to GIS spatial application. However, these GIS data are now available to be made accessible on the Internet by web-based GIS technology, using the ArcMap10 . This application will offer an effective media for public participation and collaborative planning. In addition, the sharing of information would be able to facilitate and support the planning agendas and urban management in The cities .

1.2 Study Area

Location and Physical Characteristics

Yatta is a city in the Hebron Governorate, located 9 km south of Hebron city, in the southern art of the West Bank of Hebron. It is bordered by Zif and Khallet al Maiyya to the East, Ar Rihiya, Al Fawwar Camp and Wadi as Sada to the North, Beit 'Amra to the West, and As Samu' to the South (Figure 1.1).

Yatta history dated back to the Canaanite Era, when the Canaanites settled Palestine in the early ages. It was called "Yuta" which means "the flat and curved"; the place covers about 270,000 dunums on a hill.

In the Roman ages, it got the name of "Letaem". However, the Town itself was established during the Ottoman age and was larger than the old one; it has old buildings, architectural onuments, and other buildings of interest.

The total area of Yatta town estimated to be 270,000 dunums, of which 14,000 dunums are classified as 'built up' area; whilst 115,000 dunums are agricultural area, 141,000 is forests, uncultivated, or public land. Yatta municipality has a master plan for 24,500 dunums of town lands.

Yatta town is located on the mountainous area south of Hebron city at an elevation of 793 m above the sea level, with a mean rainfall 303 mm, an average annual temperature of 18 °C, and average annual humidity at 61% (ARIJ GIS, 2007).

According to Ministry of Local Authority classification, Yatta is compromises the following localities: Yatta, Al Muntar, Khurisa, Raq'a, Qfair, Al Shawamreh, Sweidan, Qat'et As Shaikh, Al Farhaniyeh, Wadi Musalah, Al Farash, Al Dair, Fattooh, Al Marmlea', Khallet Salcam,

khallet Yerhas, Qurnet ar Ras, Wad I'zeiz, Al Heila, Khallet Tabeash, Khallet Mazaher, Al mqthea' and Al Goweata villages.

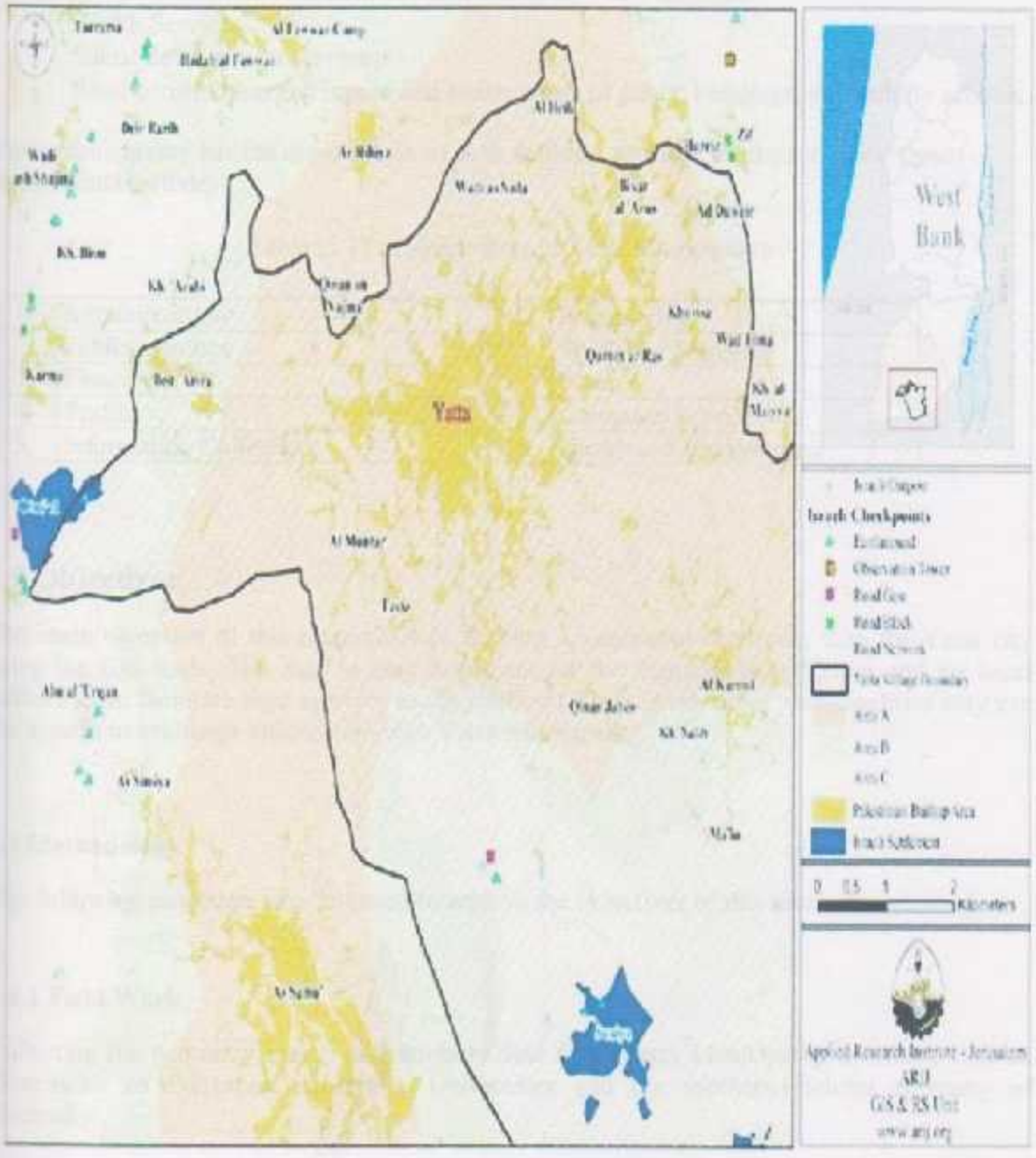


Figure (1.1) : Yatta city location and borders [ARIJ,2007]

Yatta town has been governed by a municipal council since 1971, which today consists of 13 elected members with 60 paid employees. In addition to drafting and implementing development programs, the council provides a number of services to the residents of Yatta, including :

- Infrastructure Services such as water and solid waste disposal.
- Health Services.
- Social development services.
- Road construction and repair, and construction of public buildings, particularly schools.

Yatta municipality has ten departments so as to facilitate services for the residents, these departments include:

Table (1.1) : Departments in Yatta Municipality

1.	Administration	6.	Engineering
2.	Public relations	7.	Study and Planning
3.	Financial	8.	Water
4.	Traffic	9.	Computer Services
5.	Information Collection	10.	Health and Environment

1.3 Objectives

The main objective of this research is to develop a geospatial electronic map for Yatta city using the GIS tools. This map is very important for the municipality of Yatta and for local authorities to facilitate their services to the public of Yatta. Also, other municipalities may use the system to exchange information with Yatta municipality.

1.4 Methodology

The following procedure was followed to achieve the objectives of this research:

1.4.1 Field Work

Collecting the necessary spatial and attribute data from Yatta Municipality, southern Hebron Directorate of Education, Hospitals, Universities and the southern Hebron company of electricity .

1.4.2 Software Work

Preparation of Spatial Data: This will include the preparation of the following layers;

- Road Network
- Important sites locations
- Schools
- Hospitals
- Pharmacies
- Health Centers
- Mosques
- Clinics
- Houses
- Water network
- Electricity network
- Gas Stations
- Farms
- Stone cutting facilities

1.4.3 Attribute Data

- Collection of available descriptive data on the mentioned spatial data.

1.4.4 Software Development

Developing the Web base GIS application based on Mango software. The Web GIS Tools will include:

- Map Navigation Tools
  - Center
  - Zoom Box
  - Zoom In0
  - Zoom Out and Zoom to Fit

- Information box.
- Query Builder
- Thematic Map
- Report generation
- Print Wizard
- Layer Panel

The progress of work in this project is shown in tables (1.5 and 1.6)

Table 1.5 shows the activities which carried out during first semester for layers 1-8

2013	Februray 2013				March 2013				April 2013				May 2013	
Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Activity														
Identificatin of the study area														
Data Collection and Coordinate determinatio using GPS														
Digitizing and Editing attribute table														
Preparing Thematic Maps														
Report Writing														

Table 1.6 shows the activities which carried out during next semester for layers 9-14

2013	September 2013				October 2013				November 2013				December 2013	
Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Activity														
Identification of the study area														
Data Collection and coordinate determination using GPS														
Digitizing and Editing Attribute table														
Preparing Thematic Maps														
Report Writing														

Chapter 2

Literature Review

2.1 Geographic Information System "GIS"

2.1.1 What Is a GIS?

A geographic information system (GIS) is a computer-based tool for mapping and analyzing things that exist and events that happen on earth. GIS technology integrates common database operations such as query and statistical analysis with the unique visualization and geographic analysis benefits offered by maps. These abilities distinguish GIS from other information systems and make it valuable to a wide range of public and private enterprises for explaining events, predicting outcomes, and planning strategies.

The major challenges we face in the world today overpopulation, pollution, deforestation, natural disasters have a critical geographic dimension.

Whether siting a new business, finding the best soil for growing bananas, or figuring out the best route for an emergency vehicle, local problems also have a geographical component GIS will give you the power to create maps, integrate information, visualize scenarios, solve complicated problems, present powerful ideas, and develop effective solutions like never before. GIS is a tool used by individuals and organizations, schools, governments, and businesses seeking innovative ways to solve their problems.

Mapmaking and geographic analysis are not new, but a GIS performs these tasks better and faster than do the old manual methods. And, before GIS technology, only a few people had the skills necessary to use geographic information to help with decision making and problem solving.

Today, GIS is a multibillion-dollar industry employing hundreds of thousands of people worldwide. GIS is taught in schools, colleges, and universities throughout the world. Professionals in every field are increasingly aware of the advantages of thinking and working geographically.

2.1.2 Components of a GIS

A working GIS integrates five key components: hardware, software, data, people, and methods.

Hardware
Hardware is the computer on which a GISoperates. Today, GIS software runs on a wide range of hardware types, from centralized computer servers to desktop computers used in stand-alone or networked configurations.

Software
GIS software provides the functions and tools needed to store, analyze, and display geographic information. Key software components are

- Tools for the input and manipulation of geographic information
- A database management system (DBMS)
- Tools that support geographic query, analysis, and visualization
- A graphical user interface (GUI) for easy access to tools

Data
Possibly the most important component of a GIS is the data. Geographic data and related tabular data can be collected in-house or purchased from a commercial data provider. A GIS will integrate spatial data with other data resources and can even use a DBMS, used by most organizations to organize and maintain their data, to manage spatial data.

People
GIS technology is of limited value without the people who manage the system and develop plans for applying it to real-world problems. GIS users range from technical specialists who design and maintain the system to those who use it to help them perform their everyday work.

Methods
A successful GIS operates according to a well-designed plan and business rules, which are the models and operating practices unique to each organization.

2.1.3 How GIS Works

A GIS stores information about the world as a collection of thematic layers that can be linked together by geography. This simple but extremely powerful and versatile concept has proven invaluable for solving many real-world problems from tracking delivery vehicles, to recording details of planning applications, to modeling global atmospheric circulation.

Geographic References

Geographic information contains either an explicit geographic reference, such as a latitude and longitude or national grid coordinate, or an implicit reference such as an address, postal code, census tract name, forest stand identifier, or road name. An automated process called geocoding is used to create explicit geographic references (multiple locations) from implicit references (descriptions such as addresses). These geographic references allow you to locate features, such as a business or forest stand, and events, such as an earthquake, on the earth's surface for analysis.

Vector and Raster models

Geographic information systems work with two fundamentally different types of geographic models - the "vector" model and the "raster" model. In the vector model, information about points, lines, and polygons is encoded and stored as a collection of *x,y* coordinates. The location of a point feature, such as a bore hole, can be described by a single *x,y* coordinate. Linear features, such as roads and rivers, can be stored as a collection of point coordinates. Polygonal features, such as sales territories and river catchments, can be stored as a closed loop of coordinates.

The vector model is extremely useful for describing discrete features, but less useful for describing continuously varying features such as soil type or accessibility costs for hospitals. The raster model has evolved to model such continuous features. A raster image comprises a collection of grid cells rather like a scanned map or picture. Both the vector and raster models for storing geographic data have unique advantages and disadvantages. Modern GISs are able to handle both models.

2.1.4 GIS Tasks

General purpose GISs essentially perform six processes or tasks:

- Input
- Manipulation
- Management
- Query and Analysis
- Visualization

Input

Before geographic data can be used in a GIS, the data must be converted into a suitable digital format. The process of converting data from paper maps into computer files is called *digitizing*.

Modern GIS technology can automate this process fully for large projects using scanning technology; smaller jobs may require some manual digitizing (using a digitizing table). Today

many types of geographic data already exist in GIS-compatible formats. These data can be obtained from data suppliers and loaded directly into a GIS.

Manipulation

It is likely that data types required for a particular GIS project will need to be transformed or manipulated in some way to make them compatible with your system. For example, geographic information is available at different scales (detailed street centerline files; less detailed census boundaries; and postal codes at a regional level). Before this information can be integrated, it must be transformed to the same scale (degree of detail or accuracy). This could be a temporary transformation for display purposes or a permanent one required for analysis. GIS technology offers many tools for manipulating spatial data and for weeding out unnecessary data.

Management

For small GIS projects it may be sufficient to store geographic information as simple files. However, when data volumes become large and the number of data users becomes more than a few, it is often best to use a database management system (DBMS) to help store, organize, and manage data. A DBMS is nothing more than computer software for managing a database.

There are many different designs of DBMSs, but in GIS the relational design has been the most useful. In the relational design, data are stored conceptually as a collection of tables. Common fields in different tables are used to link them together. This surprisingly simple design has been so widely used primarily because of its flexibility and very wide deployment in applications both within and without GIS.

Query and Analyses

Once you have a functioning GIS containing your geographic information, you can begin to ask simple questions such as:

- Who owns the land parcel on the corner?
- How far is it between two places?
- Where is land zoned for industrial use?

And analytical questions such as:

- Where are all the sites suitable for building new houses?
- What is the dominant soil type for oak forest?
- If I build a new highway here, how will traffic be affected?

GIS provides both simple point-and-click query capabilities and sophisticated analysis tools to provide timely information to managers and analysts alike. GIS technology really comes into its own when used to analyze geographic data to look for patterns and trends and to undertake

"what if" scenarios. Modern GISs have many powerful analytical tools, but two are especially important.

Proximity Analysis

* How many houses lie within 100 m of this water main?
* What is the total number of customers within 10 km of this store?
* What proportion of the alfalfa crop is within 500 m of the well?

To answer such questions, GIS technology uses a process called buffering to determine the proximity relationship between features.

Overlay Analysis

The integration of different data layers involves a process called overlay. At its simplest, this could be a visual operation, but analytical operations require one or more data layers to be joined physically. This overlay, or spatial join, can integrate data on soils, slope, and vegetation, or land ownership with tax assessment.

Visualization

For many types of geographic operation the end result is best visualized as a map or graph. Maps are very efficient at storing and communicating geographic information. While cartographers have created maps for millennia, GIS provides new and exciting tools to extend the art and science of cartography. Map displays can be integrated with reports, three-dimensional views, photographic images, and other output such as multimedia.

2.1.5 Data for GIS

What Map Data Do I Need?

If you are unfamiliar with map data, think first about how you want to use map data. Many project needs are met with the following common map data types. Then explore these links to learn more about map data!

Base Maps: Include streets and highways; boundaries for census, postal, and political areas; rivers and lakes; parks and landmarks; place names; and USGS raster maps.

Business Maps and Data: Include data related to census/demography, consumer products, financial services, health care, real estate, telecommunications, emergency preparedness, crime, advertising, business establishments, and transportation.

Environmental Maps and Data: Include data related to the environment, weather, environmental risk, satellite imagery, topography, and natural resources.

General Reference Maps: World and country maps and data that can be a foundation for your database.

How Do I Get Map Data?

Fortunately, volumes of existing geographic data are readily available. Through the ArcData Publishing Program, ESRI has established a partnership with leading commercial data vendors to provide a wealth of information in a plug-n-play format for use with ArcView GIS. ESRI's GIS Store and ArcData Online both offer a convenient way to get the most popular geographic data.

And, a variety of useful geographic data come bundled with ArcView GIS to help you get started quickly.

These data sets can be used as the foundation for your GIS projects or to supplement your existing data.

Related Technologies

GISs are closely related to several other types of information systems, but it is the ability to manipulate and analyze geographic data that sets GIS technology apart. Although there are no hard and fast rules about how to classify information systems, the following discussion should help differentiate GIS from desktop mapping, computer-aided design (CAD), remote sensing, DBMS, and global positioning systems (GPS) technologies.

Desktop Mapping

A desktop mapping system uses the map metaphor to organize data and user interaction. The focus of such systems is the creation of maps: the map is the database. Most desktop mapping systems have more limited data management, spatial analysis, and customization capabilities. Desktop mapping systems operate on desktop computers such as PCs, Macintoshes, and smaller UNIX workstations.

CAD

CAD systems evolved to create designs and plans of buildings and infrastructure. This activity required that components of fixed characteristics be assembled to create the whole structure. These systems require few rules to specify how components can be assembled and very limited analytical capabilities. CAD systems have been extended to support maps but typically have limited utility for managing and analyzing large geographic databases.

Remote Sensing and GPS

Remote sensing is the art and science of making measurements of the earth using sensors such as cameras carried on airplanes, GPS receivers, or other devices. These sensors collect data in the form of images and provide specialized capabilities for manipulating, analyzing, and visualizing those images. Lacking strong geographic data management and analytical operations, they cannot be called true GISs.

DBMS

Database management systems specialize in the storage and management of all types of data including geographic data. DBMSs are optimized to store and retrieve data and many GISs rely on them for this purpose. They do not have the analytic and visualization tools common to GIS.

2.1.6 What Can GIS Do for You?

Perform Geographic Queries and Analysis

The ability of GISs to search databases and perform geographic queries has saved many companies literally millions of dollars. GISs have helped reduce costs by

- Streamlining customer service.
- Reducing land acquisition costs through better analysis.
- Reducing fleet maintenance costs through better logistics.
- Analyzing data quickly, as in this example:

Improve Organizations Integration

Many organizations that have implemented a GIS have found that one of its main benefits is improved management of their own organization and resources. Because GISs have the ability to link data sets together by geography, they facilitate interdepartmental information sharing and communication. By creating a shared database, one department can benefit from the work of another - data can be collected once and used many times.

Make Better Decision

The old adage "better information leads to better decisions" is as true for GIS as it is for other information systems. A GIS, however, is not an automated decision making system but a tool to query, analyze, and map data in support of the decision making process. GIS technology has been used to assist in tasks such as presenting information at planning inquiries, helping resolve territorial disputes, and siting pylons in such a way as to minimize visual intrusion.

GIS can be used to help reach a decision about the location of a new housing development that has minimal environmental impact, is located in a low-risk area, and is close to a population center. The information can be presented succinctly and clearly in the form of a map and accompanying report, allowing decision makers to focus on the real issues rather than trying to

understand the data. Because GIS products can be produced quickly, multiple scenarios can be evaluated efficiently and effectively.

Making Maps

Maps have a special place in GIS. The process of making maps with GIS is much more flexible than are traditional manual or automated cartography approaches. It begins with database creation. Existing paper maps can be digitized and computer-compatible information can be translated into the GIS. The GIS-based cartographic database can be both continuous and scale free. Map products can then be created centered on any location, at any scale, and showing selected information symbolized effectively to highlight specific characteristics.

The characteristics of atlases and map series can be encoded in computer programs and compared with the database at final production time. Digital products for use in other GISs can also be derived by simply copying data from the database. In a large organization, topographic databases can be used as reference frameworks by other departments.

2.1.7 GIS in Everyday Life

Making GIS Data Working For You

In today's global community, the more information you have at your fingertips, the easier it is to make an informed decision. In today's high-tech world, information comes in many different ways, from company reports and statistics from down the hall to digital photos and multimedia from across the world.

-Information can be overwhelming and the need for timely decisions calls not only for innovative ways to access accurate, up-to-the minute information, but also tools to help present the information in useful ways.

-A geographic information system or GIS allows you to bring all types of data together based on the geographic and locational component of the data. But unlike a static paper map, GIS can display many layers of information that is useful to you.

-You will be able to integrate, visualize, manage, solve, and present the information in a new way.

-Relationships between the data will become more apparent and your data will become more valuable.

-GIS will give you the power to create maps, integrate information, visualize scenarios, solve complicated problems, present powerful ideas, and develop effective solutions like never before.

-GIS is a tool used by individuals and organizations, schools, governments, and businesses seeking innovative ways to solve their problems.

2.1.8 GIS Applications

There are several applications for GIS in our daily life. Some of these applications are :

1- GIS in agriculture

GIS is used in a variety of agricultural applications such as managing crop yields, monitoring crop rotation techniques, and projecting soil loss for individual farms or entire agricultural regions.

2- GIS in business

A GIS is a tool for managing business information of any kind according to where it's located. You can keep track of where customers are, site businesses, target marketing campaigns, optimize sales territories, and model retail spending patterns. A GIS gives you that extra advantage to make you and your company more competitive and successful.

3- GIS in electric/gas utilities

Cities and utilities use GIS every day to help them map and inventory systems, track maintenance, monitor regulatory compliance, or model distribution analysis, transformer analysis, and load analysis.

4- GIS in the environment

GIS is used every day to help protect the environment. As an environmental professional, you can use GIS to produce maps, inventory species, measure environmental impact, or trace pollutants. The environmental applications for GIS are almost endless.

5- GIS in forestry

Today, managing forests is becoming a more complex and demanding challenge. With GIS, foresters can easily see the forest as an ecosystem and manage it responsibly.

6- GIS in geology

Geologists use GIS every day in a wide variety of applications. GIS can be used to study geologic features, analyze soils and strata, assess seismic information, or create 3-dimensional displays of geographic features.

7- GIS in hydrology

You can use GIS to study drainage systems, assess groundwater, and visualize watersheds, and in many other hydrologic applications

8- GIS in land use planning

People use GIS to help visualize and plan the land use needs of cities, regions, or even national governments.

9- GIS in local government

People in local government use GIS every day to help them solve problems. Often the data collected and used by one agency or department can be used by another.

10- GIS in mapping

Mapping is an essential function of a GIS. People in a variety of professions are using GIS to help others understand geographic data. You don't have to be a skilled cartographer to make maps with a GIS.

11- GIS in the military

Military analysts and cartographers use GIS in a variety of applications such as creating basemaps, assessing terrain, and aiding in tactical decisions

12- GIS in risk management

A GIS can help with risk management and analysis by showing you which areas will be prone to natural or man-made disasters. Once identified, preventive measures can be developed that deal with the different scenarios.

13- GIS in Site Planning

People around the world use GIS to help them locate sites for new facilities or locate alternate sites for existing facilities

14- GIS in transportation

GIS can be used to help you manage transportation infrastructure or help you manage your logistical problems. Whether monitoring rail systems and road conditions or finding the best way to deliver your goods or services, GIS can help you.

15- GIS in the water/wastewater industry

People in the water/wastewater industry use GIS with the planning, engineering, operations, maintenance, finance, and administration functions of their water/wastewater networks

2.2 GPS Applications

There are so many devices made with the implementation of Global Positioning System. Google Earth is the most famous application that uses the signals received by the GPS receivers. It enables public also to access the maps which tell the users about the locations all around the world. There are several applications for GPS in our daily life. Some of these applications are :

1- Navigators

Navigation applications are the most famous GPS applications. The latest releases of those applications allow users to have much advanced features and facilities.

2- Tracking

A tracking applications are not that much popular as the navigation applications. But, so many people take uses of them. It enables users to find a location of any object that is tagged with a system.

3- Auto pilot Applications

An auto pilot application is software that enables a vehicle to travel automated with the GPS map. These have been tested and made so many applications where the accuracy is also high.

2.3 Cartography

Cartography is the study and practice of making maps. Combining science, aesthetics, and technique, cartography builds on the premise that reality can be modeled in ways that communicate spatial information effectively.

The fundamental problems of traditional cartography are to:

- Set the map's agenda and select traits of the object to be mapped. This is the concern of map editing. Traits may be physical, such as roads or land masses, or may be abstract, such as toponyms or political boundaries.
- Represent the terrain of the mapped object on flat media. This is the concern of map projections.
- Eliminate characteristics of the mapped object that are not relevant to the map's purpose. This is the concern of generalization.
- Reduce the complexity of the characteristics that will be mapped. This is also the concern of generalization.
- Orchestrate the elements of the map to best convey its message to its audience. This is the concern of map design.

Modern cartography is largely integrated with geographic information science (GIScience) and constitutes many theoretical and practical foundations of geographic information systems.

2.3.1 Map symbology

The quality of a map's design affects its reader's ability to extract information and to learn from the map. Cartographic symbology has been developed in an effort to portray the world accurately and effectively convey information to the map reader. A legend explains the pictorial language of the map, known as its symbology. The title indicates the region the map portrays; the map image portrays the region and so on. Although every map element serves some purpose, convention only dictates inclusion of some elements, while others are considered optional. A menu of map elements includes the neatline (border), compass rose or north arrow, overview map, bar scale, map projection and information about the map sources, accuracy and publication.

When examining a landscape, scale can be intuited from trees, houses and cars. Not so with a map. Even such a simple thing as a north arrow is crucial. It may seem obvious that the top of a map should point north, but this might not be the case.

Map coloring is also very important. How the cartographer displays the data in different hues can greatly affect the understanding or feel of the map. Different intensities of hue portray different objectives the cartographer is attempting to get across to the audience. Today, personal computers can display up to 16 million distinct colors at a time. This fact allows for a multitude of color options for even for the most demanding maps. Moreover, computers can

easily hatch patterns in colors to give even more options. This is very beneficial, when symbolizing data in categories such as quintile and equal interval classifications.

Quantitative symbols give a visual measure of the relative size/importance/number that a symbol represents and to symbolize this data on a map, there are two major classes of symbols used for portraying quantitative properties. Proportional symbols change their visual weight according to a quantitative property. These are appropriate for extensive statistics. Choropleth maps portray data collection areas, such as counties or census tracts, with color. Using color this way, the darkness and intensity (or value) of the color is evaluated by the eye as a measure of intensity or concentration.

2.3.2 Map generalization

A good map has to compromise between portraying the items of interest (or themes) in the right place on the map, and the need to show that item using text or a symbol, which take up space on the map and might displace some other item of information. The cartographer is thus constantly making judgments about what to include, what to leave out and what to show in a slightly incorrect place. This issue assumes more importance as the scale of the map gets smaller (i.e. the map shows a larger area) because the information shown on the map takes up more space *on the ground*. A good example from the late 1980s was the Ordnance Survey's first digital maps, where the *absolute* positions of major roads were sometimes a scale distance of hundreds of meters away from ground truth, when shown on digital maps at scales of 1:250,000 and 1:625,000, because of the overriding need to annotate the features.

2.3.3 Map projections

The Earth being spherical, any flat representation generates distortions such that shapes and areas cannot both be conserved simultaneously, and distances can never all be preserved. The mapmaker must choose a suitable map projection according to the space to be mapped and the purpose of the map.

Map projections are attempts to portray the surface of the earth or a portion of the earth on a flat surface. Some distortions of conformality, distance, direction, scale, and area always result from this process. Some projections minimize distortions in some of these properties at the expense of maximizing errors in others. Some projection are attempts to only moderately distort all of these properties:

* **Conformality** : When the scale of a map at any point on the map is the same in any direction, the projection is conformal. Meridians (lines of longitude) and parallels

(lines of latitude) intersect at right angles. Shape is preserved locally on conformal maps.

* **Distance**: A map is equidistant when it portrays distances from the center of the projection to any other place on the map.
* **Direction**: A map preserves direction when azimuths (angles from a point on a line to another point) are portrayed correctly in all directions.
* **Scale**: Scale is the relationship between a distance portrayed on a map and the same distance on the Earth.
* **Area**: When a map portrays areas over the entire map so that all mapped areas have the same proportional relationship to the areas on the Earth that they represent, the map is an equal-area map.

2.3.4 Map projections classes

* **Cylindrical projections:** result from projecting a spherical surface onto a cylinder.

  -When the cylinder is **tangent** to the sphere contact is along a great circle (the circle formed on the surface of the Earth by a plane passing through the center of the Earth).

  -In the **secant** case, the cylinder touches the sphere along two lines, both small circles (a circle formed on the surface of the Earth by a plane not passing through the center of the Earth).

  -When the cylinder upon which the sphere is projected is at right angles to the poles, the cylinder and resulting projection are **transverse**.

  -When the cylinder is at some other, non-orthogonal, angle with respect to the poles, the cylinder and resulting projection is **oblique**.

* **Conic projections:** result from projecting a spherical surface onto a cone.

  -When the cone is tangent to the sphere contact is along a small circle.

  -In the secant case, the cone touches the sphere along two lines, one a great circle, the other a small circle.

* **Azimuthal projections:** result from projecting a spherical surface onto a plane.

  -When the plane is tangent to the sphere contact is at a single point on the surface of the Earth.

-In the secant case, the plane touches the sphere along a small circle if the plane does not pass through the center of the earth, when it will touch along a great circle.

2.4 Digital Mapping

There has been a previous study (digital map) conducted for Hebron Municipality as a graduation project in Palestine Polytechnic University by Andaleeb Saadeh, Aseel Alkhalayleh Azeez Alhathalin.

Chapter 3

Software & Data Processing

3.1 Overview

This project includes several Information about important places in Yatta city. It includes information about schools, hospitals, mosques, health centers ,clinics, pharmacies, roads, houses, electricity network, water network, gas stations, farms, important sites, stone cutting facilities.

3.2 Yatta Municipality Data

An image of Yatta map was obtained from Yatta Municipality. This image was registered and georeferenced to Palestine 1923 Grid system using the georeferencing tools of ArcMap Software.

schools, hospitals, mosques, health centers ,clinics, pharmacies, roads, houses, electricity network, water network, gas stations, farms, important sites, stone cutting facilities shapefiles were created and their features were digitized from the georeferenced Yatta map.

3.3 Create GeoSpatial Data

3.3.1 Georeferncing

To georeference something means to define its existence in physical space. That is, establishing its location in terms of map projections or coordinate systems. The term is used both when establishing the relation between raster or vector images and coordinates, and when determining the spatial location of other geographical features. Examples would include establishing the correct position of an aerial photograph within a map or finding the geographical coordinates of a place name.

There are many steps to do georeferencing for the map:

1. Click Add Control Points on the Georeferencing Toolbar, Figure (3.1).
2. Input X,Y Palestinian Grid Coordinates , Figure (3.2).
3. Now we have a map with Palestinian Grid Coordinates , Figure (3.3).
4. Click layer/ Layer Properties/ General and then edit the unit of the map to meter , Figure (3.4).

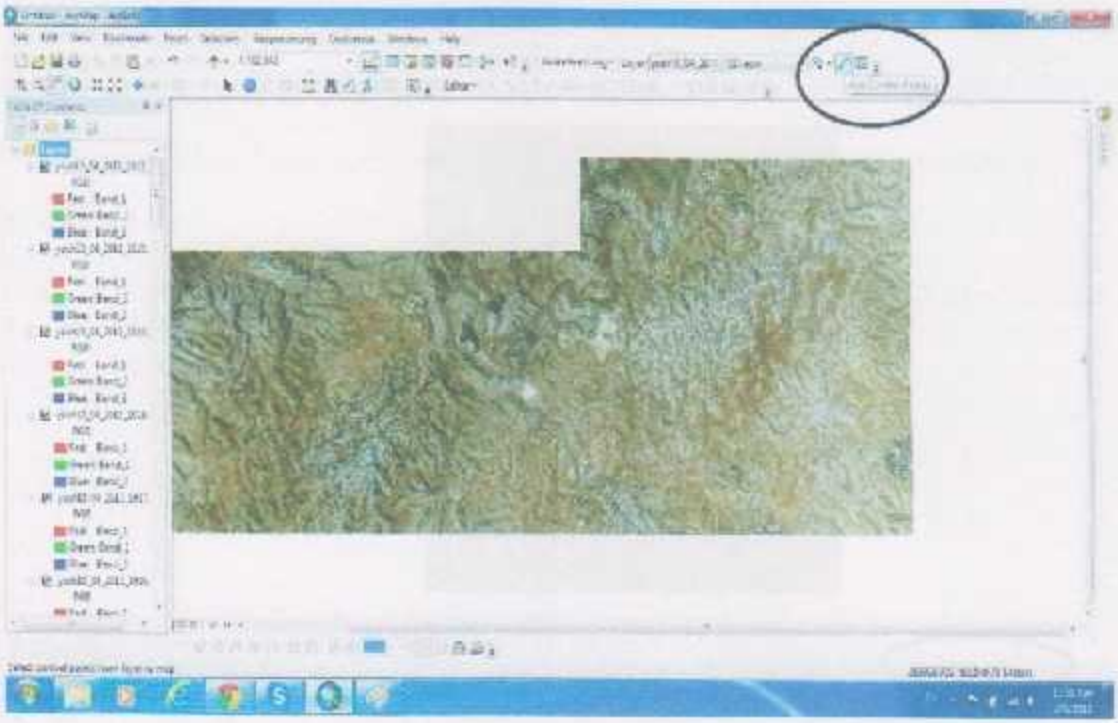


Figure (3.1) : Add Control Points

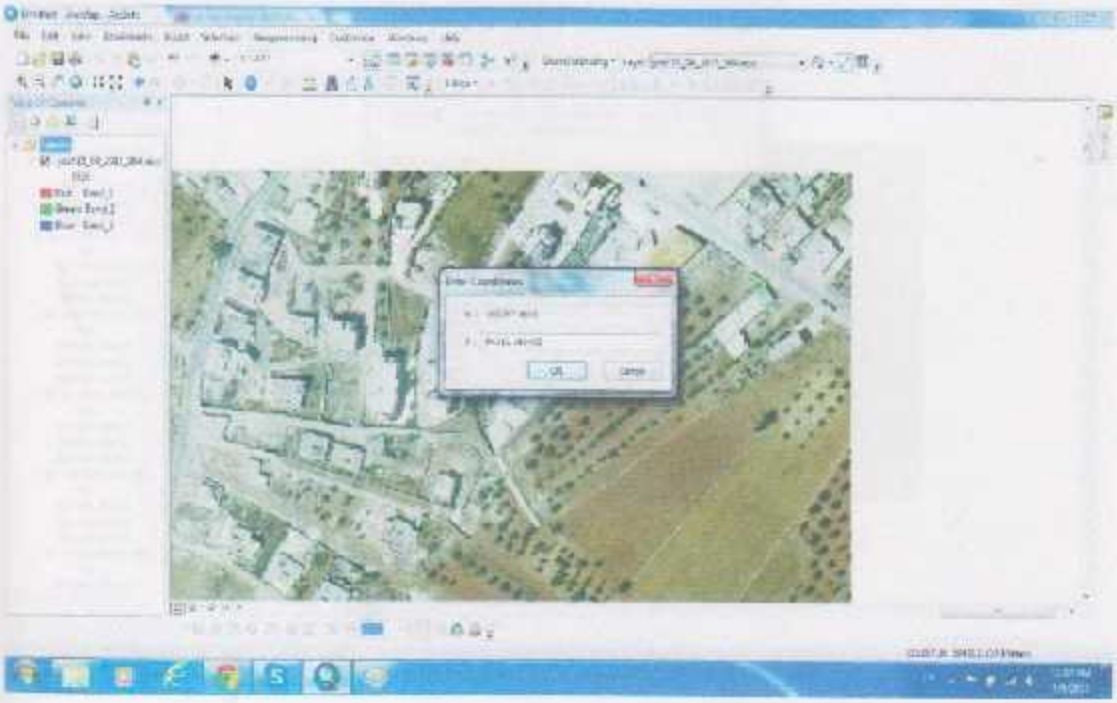


Figure (3.2) : Input X and Y Coordinates

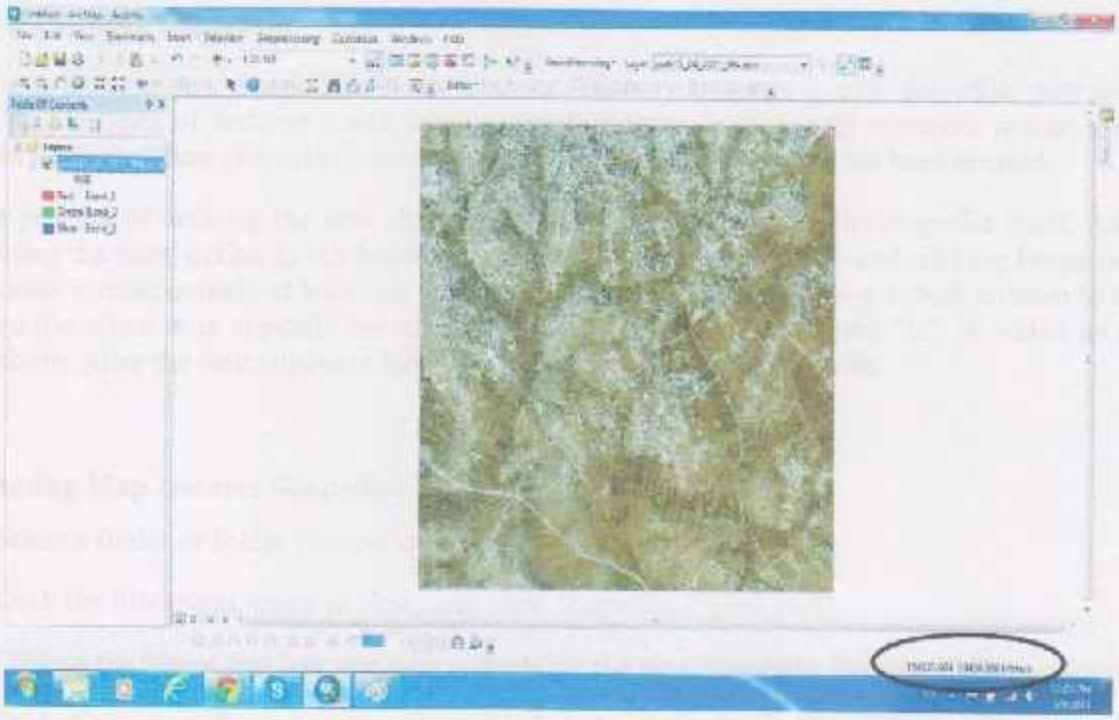


Figure (3.3) : New Coordinates

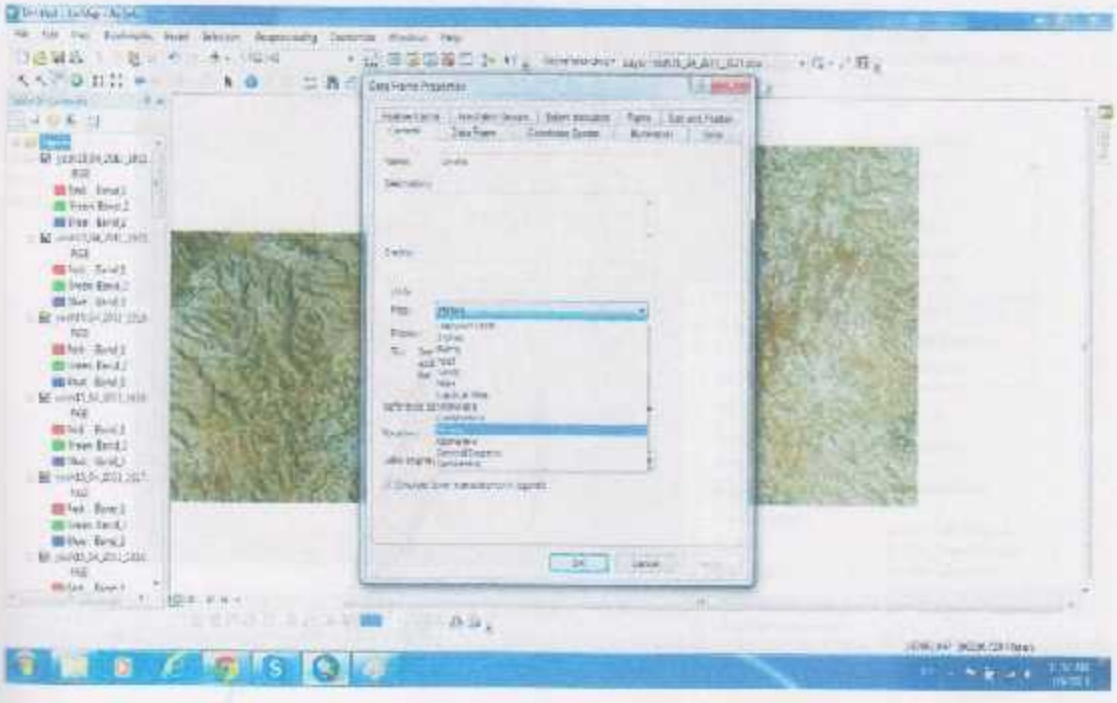


Figure (3.4) : Edit Units

3.3.2 Creating Shapefiles

You can create new Shapefiles in ArcCatalog. When you create a new shapefile, you must define the types of features it will contain, whether those features will represent routes, areas point or lines. These properties cannot be modified after the Shapefile has been created.

The process of defining the new shapefile is separate from creating the shapefile itself. After creating the item, define its attributes by right clicking it in ArcCatalog and clicking Properties. Because it must contain at least one attribute column, ArcCatalog adds a default column to the shapefile when it is created. For shapefiles, an integer column named "Id" is added as an attribute. After the new attributes have been saved as part of the Shapefile.

Creating Map features Shapefiles

1. Select a folder or folder connection in the Catalog tree.

2. Click the File menu, point to New, and click Shapefile, Figure (3.5).

3. Click in the Name text box and type schools for the new Shapefile, Figure (3.6).

4. Click the Feature Type dropdown arrow and click point schools Shapefile that Shapefile will contain.

5. Selection the Projection of Shapefile , Figure (3.7)

6. Repeat the steps 1,2,3,4,5 to create All Map Features Shapefiles.

Figure (3.5): Creation of School Shapefile

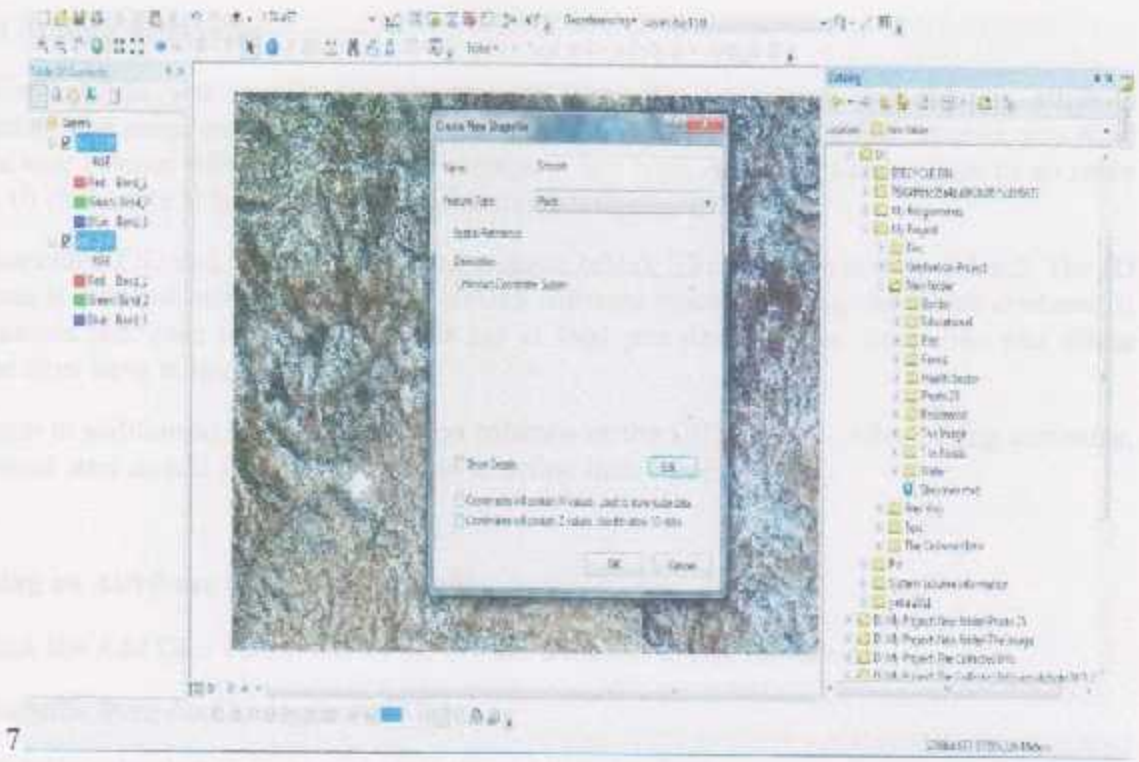


Figure (3.6) : Name and Type of Schools Shapefile

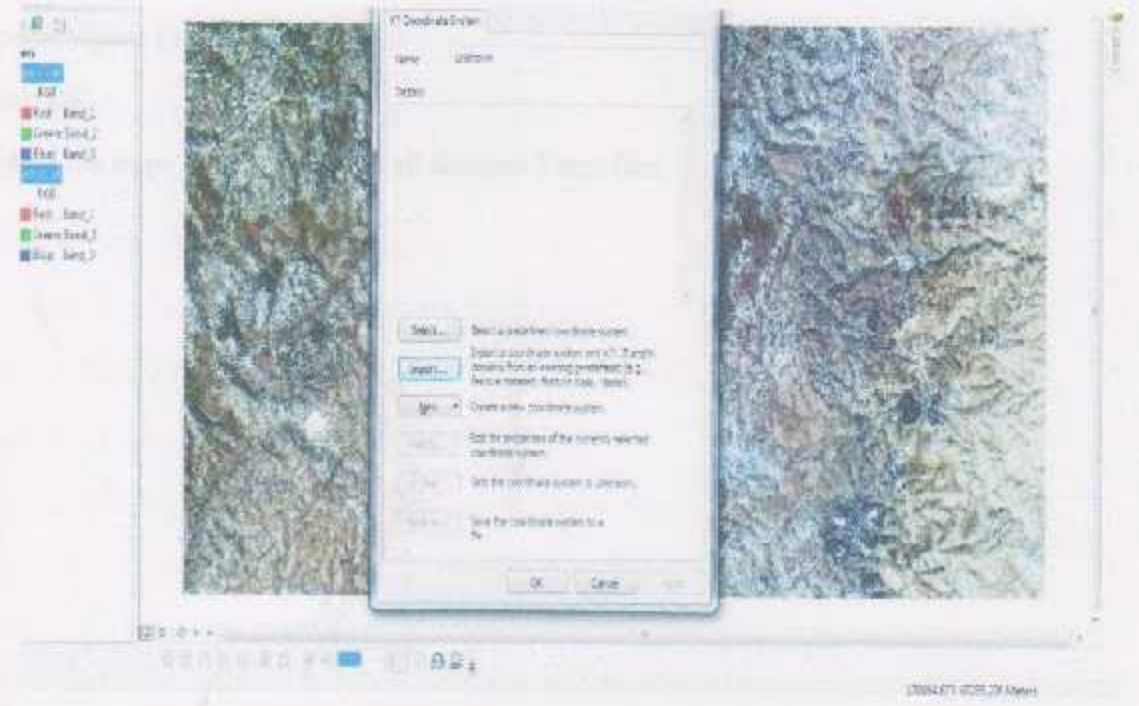


Figure (3.7) : Selection the Projection of Shapefile

3.3.3 Adding Attributes

ArcCatalog lets you modify the structure of Shapefiles by adding and deleting attribute columns. The name and data type of an existing column cannot be modified; instead, you must add a new column with the appropriate name and data type. A column's name must be no more than 10 characters in length; additional characters will be truncated.

A Shapefile's FID and Shape columns and a dbase table's ID column cannot be deleted. The ID column is a virtual column created by ArcGIS software when accessing the table's contents; it guarantees that each record in the table has at least one unique value. Shapefiles and dBase tables must have at least one attribute

Column in addition to the FID and Shape columns or the OID column. After adding attributes, you must start an edit session in Arc Map to define their values.

Adding an Attribute to Schools Shapefile

1. Click the Add Data button on the Standard toolbar to add the schools Shapefile from ArcCatalog to ArcMap.
2. Click the schools File menu and click Open Attributes Table.
3. Click in the options to add field name, location, level of school, number of student, number of classes, number of teachers, and street of school and type as Figure (3.8).
4. Click OK.
5. Repeat the steps 1,2,3,4 to create all features Shapefiles.

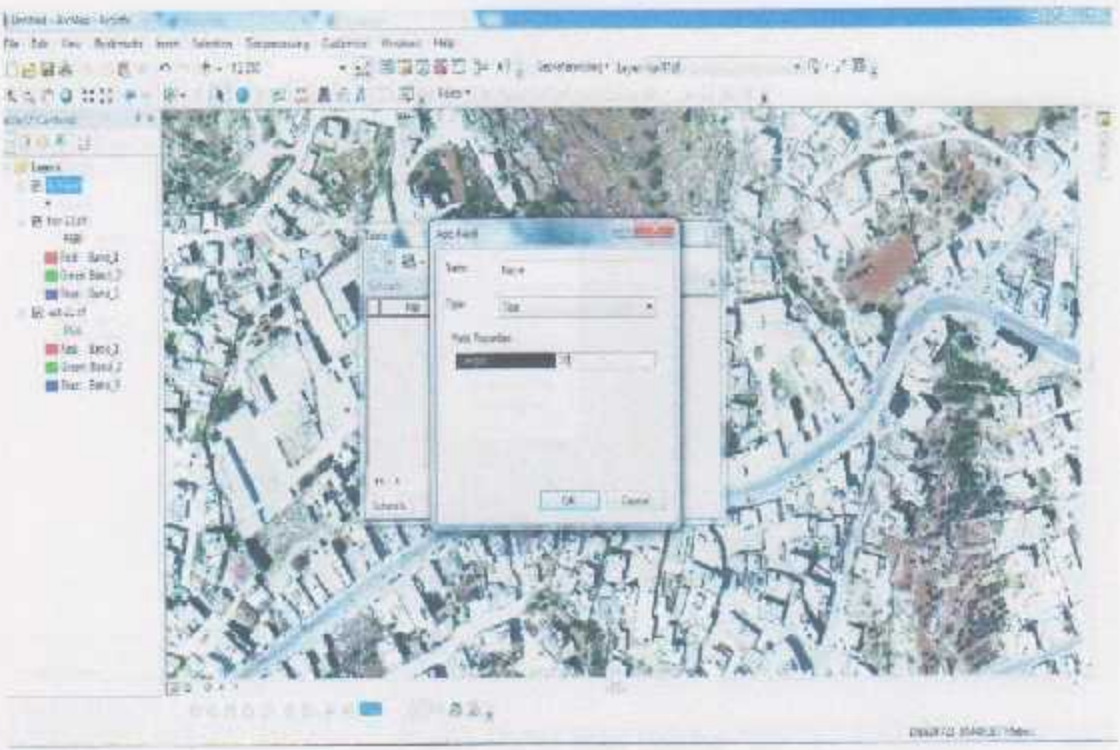


Figure (3.8) : Add Fields for Schools Shapefiles

3.3.4 Digitizing Features and Editing Text in Records

1. Click Editor on the Editor Toolbar and click Start Editing.
2. Click the Edit tool .
3. Select in task tab Create New Feature.
4. Click the layer school that contains the features.
5. Use the sketch tool to digitize the schools points locations.
6. Click the Attributes button .
7. Click on the map of the feature on the schools layer to put data in the attribute data, Figure (3.9).

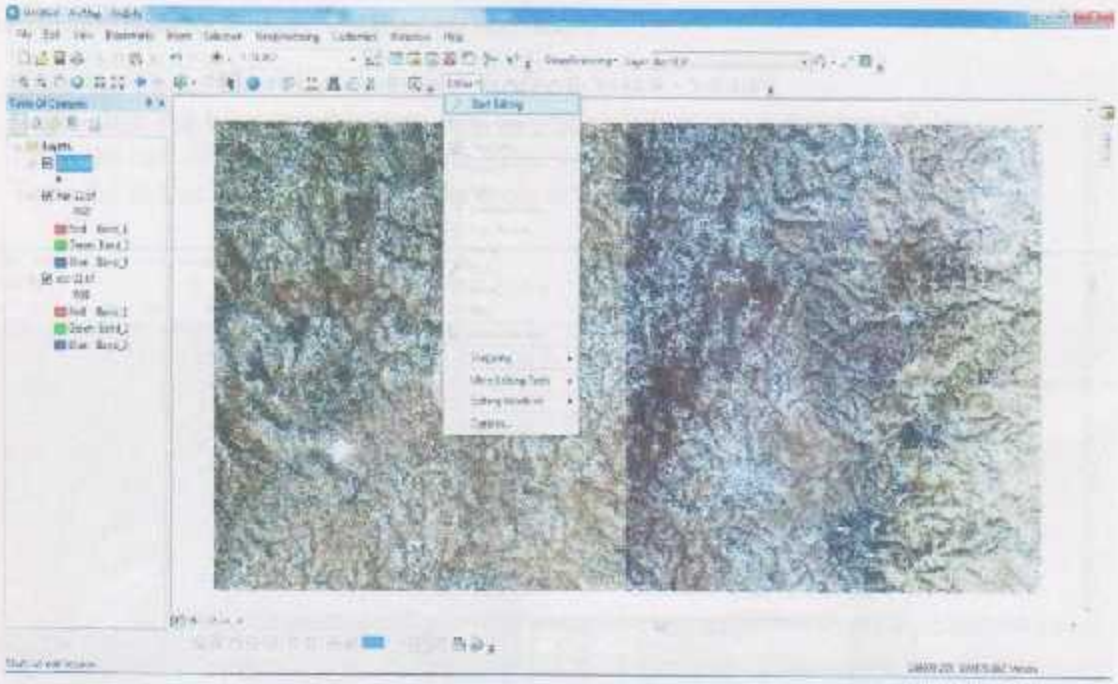


Figure (3.9) : Start Editing

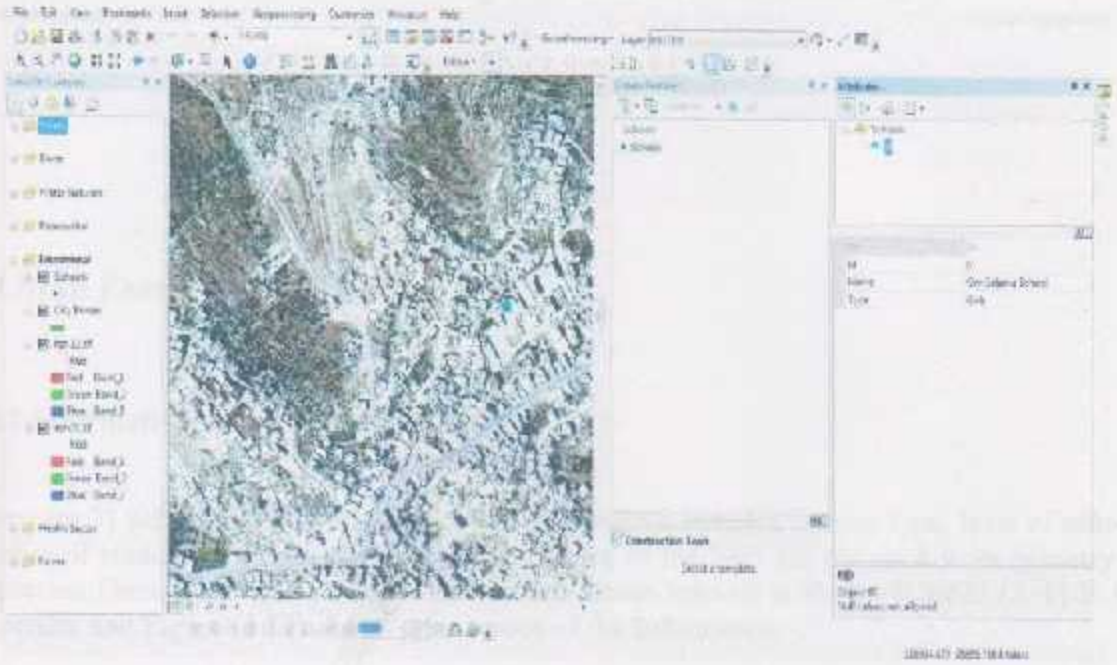


Figure (3.10) : Digitizing The School Feature

8. Repeat the steps 1,2,3,4,5,6 to create all features attribute data , Figure (3.10).

The corresponding feature Flashes on the map:

1. Click the Close button to close the dialog box.
2. Right-click the layer or table you want to edit and click Open Attribute Table.
3. Click the cell containing the attribute value you want to change.
4. Type the values and press Enter. The table is updated. Figure (3.11)

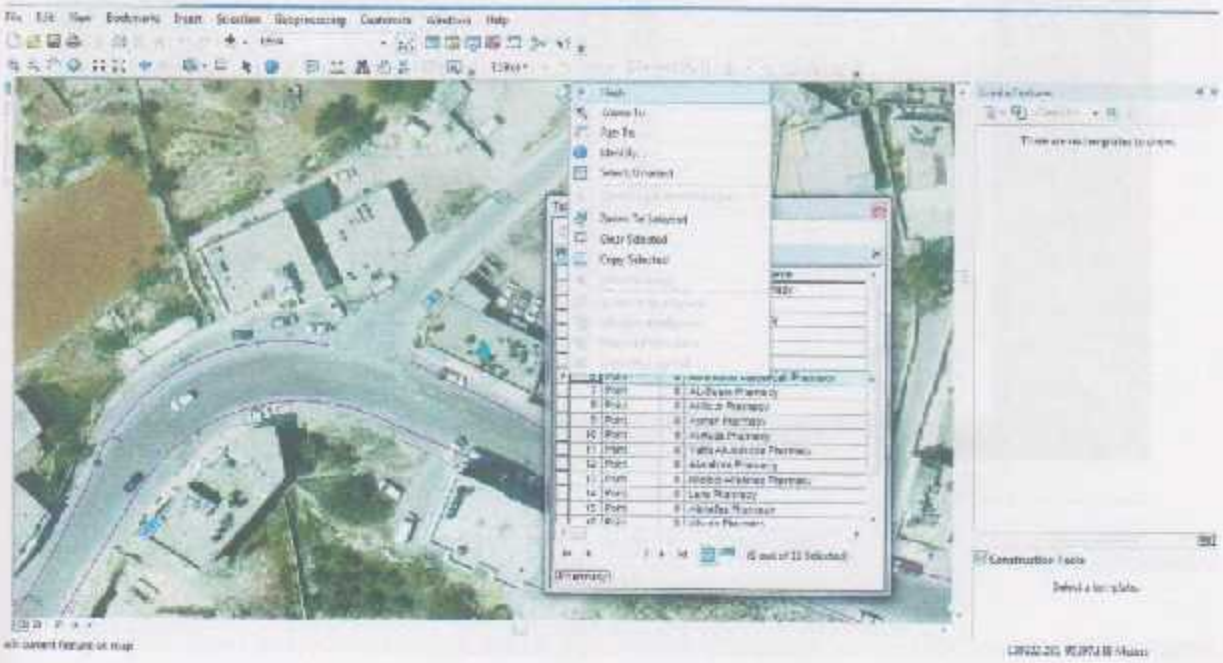


Figure (3.11) : Feature Flash

3.4 Map Features Information

3.4.1 Information about Schools

There are 31 school within Yarta city , these information includes : name, type, level of school, number of students, number of classes, and number of teachers are obtained from Ministry of Education Directorate at Yatta city. Information about schools is shown in table (A-1) in the Appendix and Figure (3.12) shows print screen of the Information.

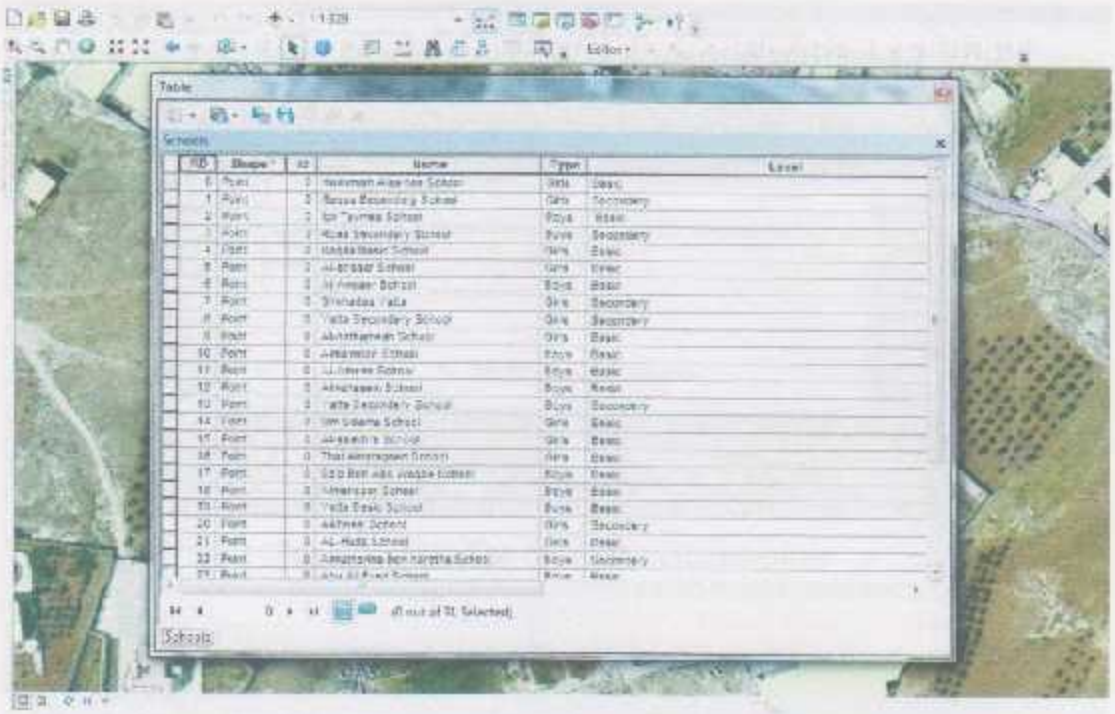


Figure (3.12) : The Attribute of the school

3.4.2 Information about Hospitals

There are three hospitals within Yatta city , these information include the name of each hospital. Information about hospitals is shown in table (A-2) in the Appendix and Figure (3.13) shows print screen of the Information.

The three hospitals are :

1) Abu Al-Hasan AL-qasem

2) Al-I'temad Hospital

3) Mohammad Nser Hospital

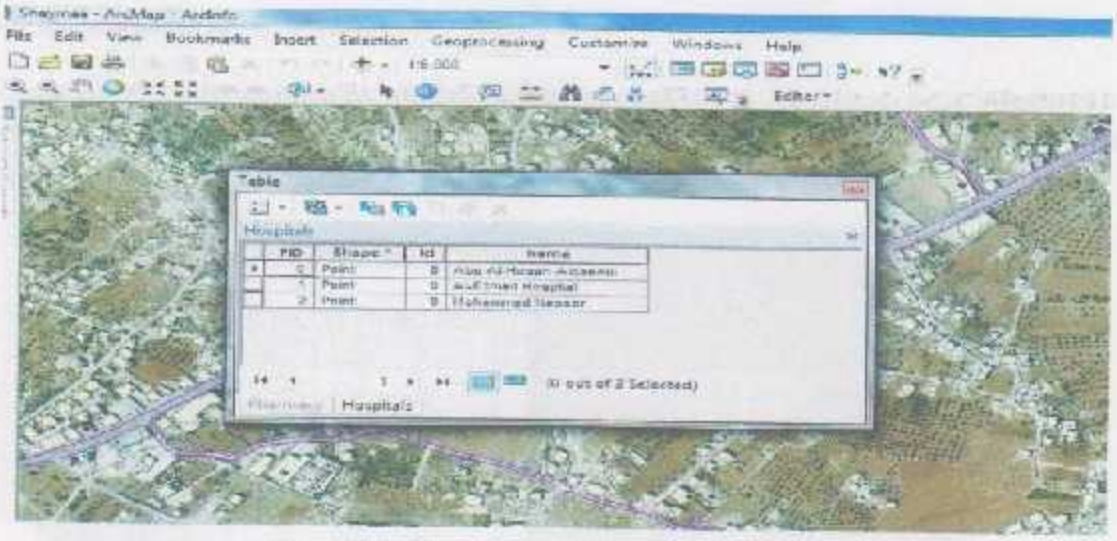


Figure (3.13) : The Attribute of the hospitals

3.4.3 Information about Pharmacies

There are 19 pharmacy within Yatta city, these information include the name and the owner of each pharmacy. Information about pharmacies is shown in table (A-3) in the Appendix and Figure (3.14) shows print screen of the Information.

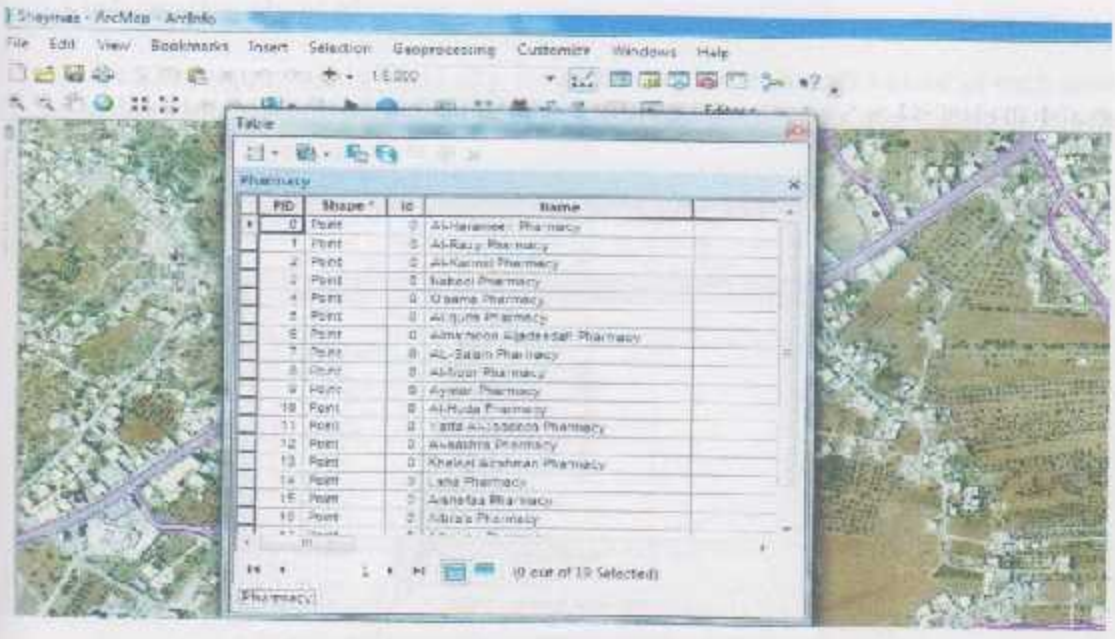


Figure (3.14) : The Attribute of the pharmacies

3.4.4 Information about Roads

Information about roads such as width and type of each street, sample of these Information is shown in table (A-4) in the Appendix and Figure (3.15) shows print screen of these Information..

Figure (3.15) : The Attribute of roads

3.4.5 Information about Mosques

There are 22 mosques within Yatta city, these information include the name of each mosque. Information about mosques is shown in table (A-5) in the Appendix and Figure (3.16) shows print screen of the Information.

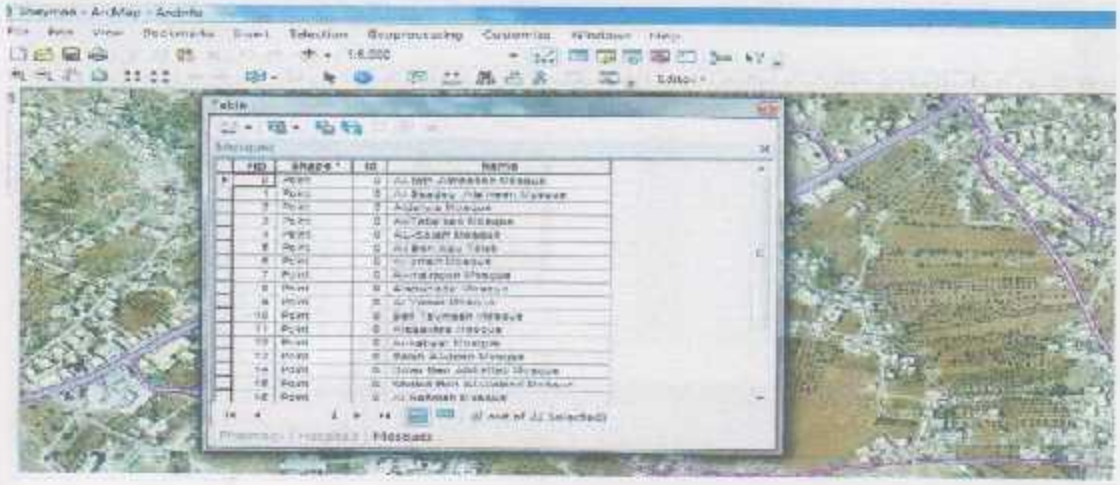


Figure (3.16) : The Attribute of the mosques

3.4.6 Information about houses

There are no information about houses more than coordinates. Figure (3.17) presents the attribute of houses.

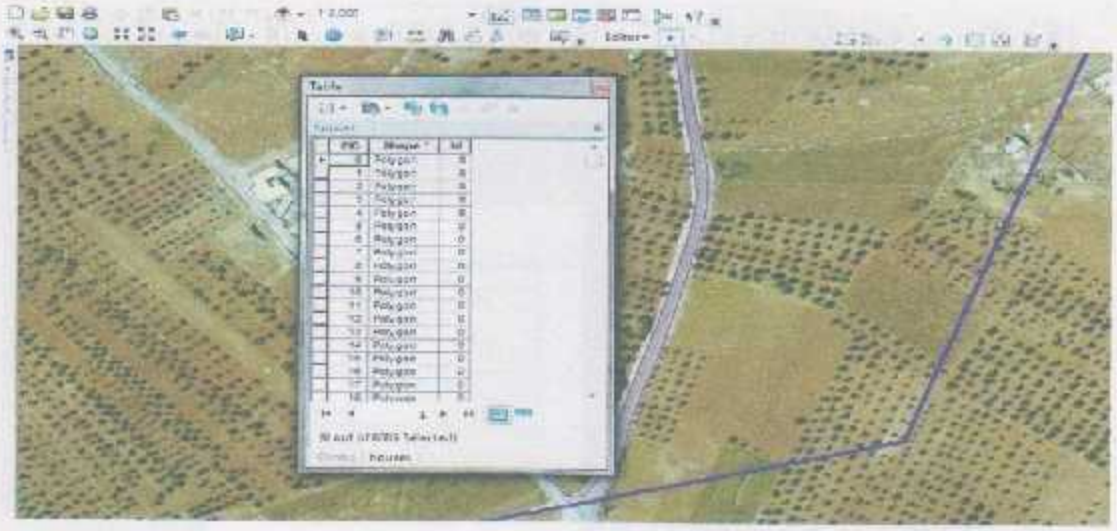


Figure (3.17) : The Attribute of houses

3.4.7 Information about clinics

There are 22 clinics within Yatta city, these information include the name and type of each clinic. Information about clinics is shown in table (A-6) in the Appendix and Figure (3.18) shows print screen of the Information.

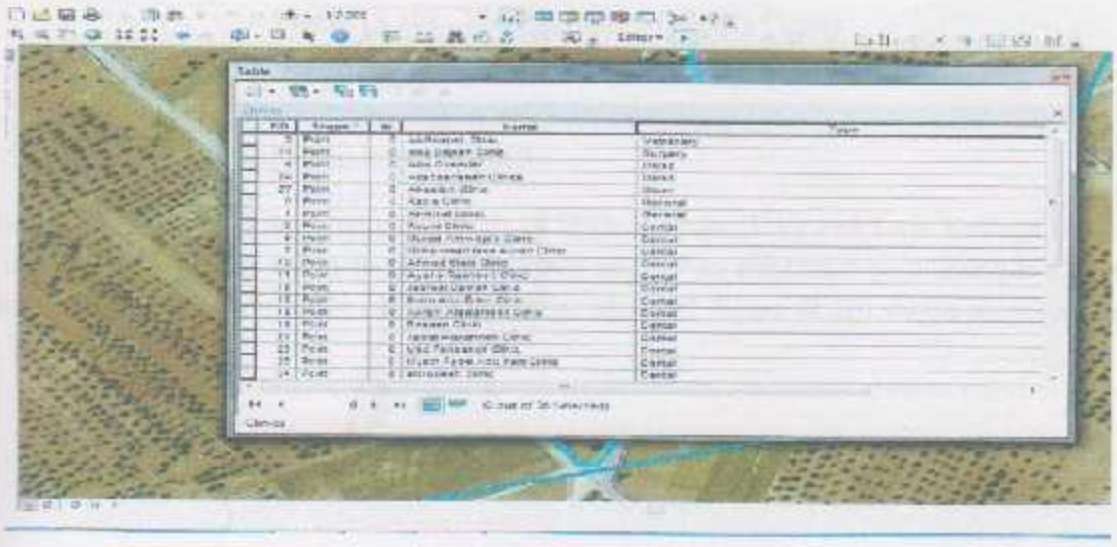


Figure (3.18) : The Attribute of clinics

3.4.8 Information about health centers

There are 5 health centers within Yatta city, Information about health centers is shown in table (A-7) in the Appendix and Figure (3.19) shows print screen of the Information.

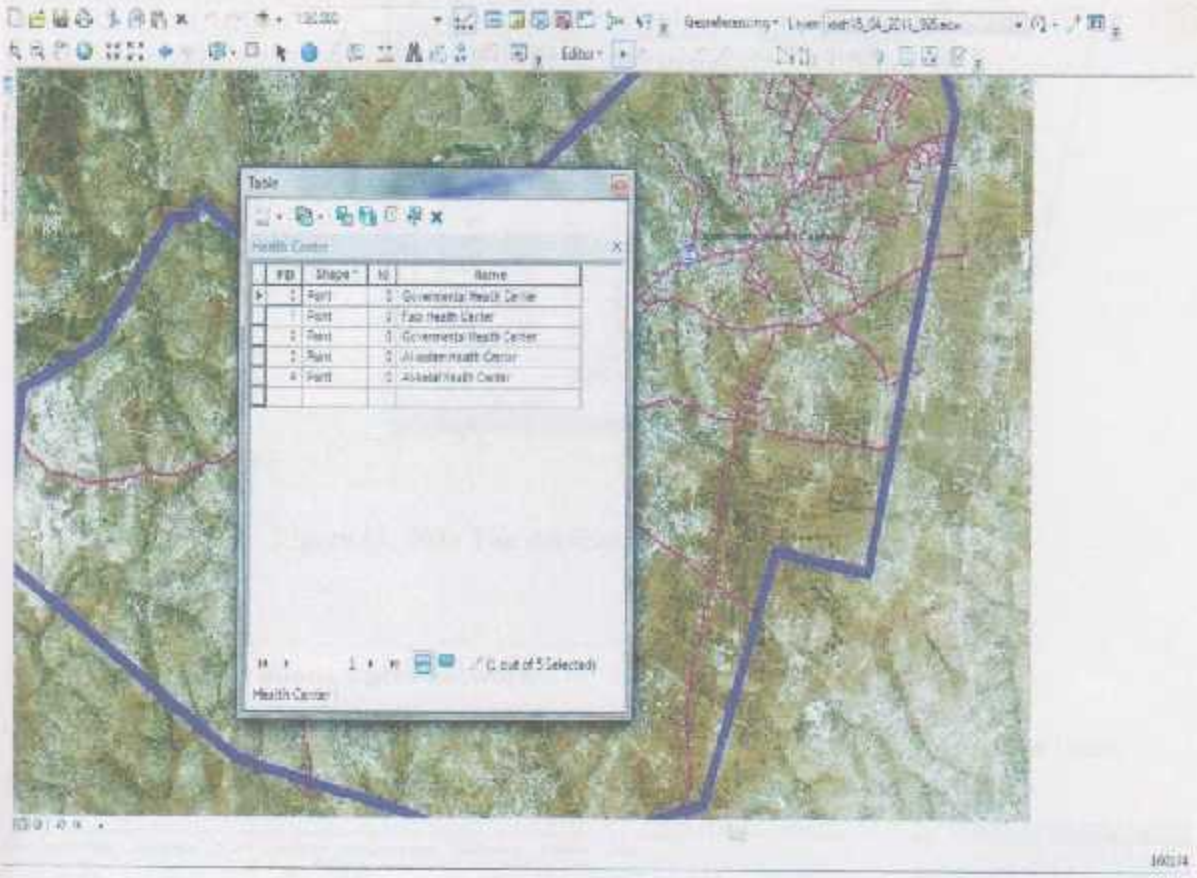


Figure (3.19) : The Attribute of Health Center

3.4.9 Information about electricity network

Information about electricity network such as High Voltage (HV) and Low Voltage (LV). It should be noted that D refers to the transformer and EP to electronic pole. Sample of these Information are shown in table (A-8) in the Appendix and Figure (3.20) shows print screen of the Information.

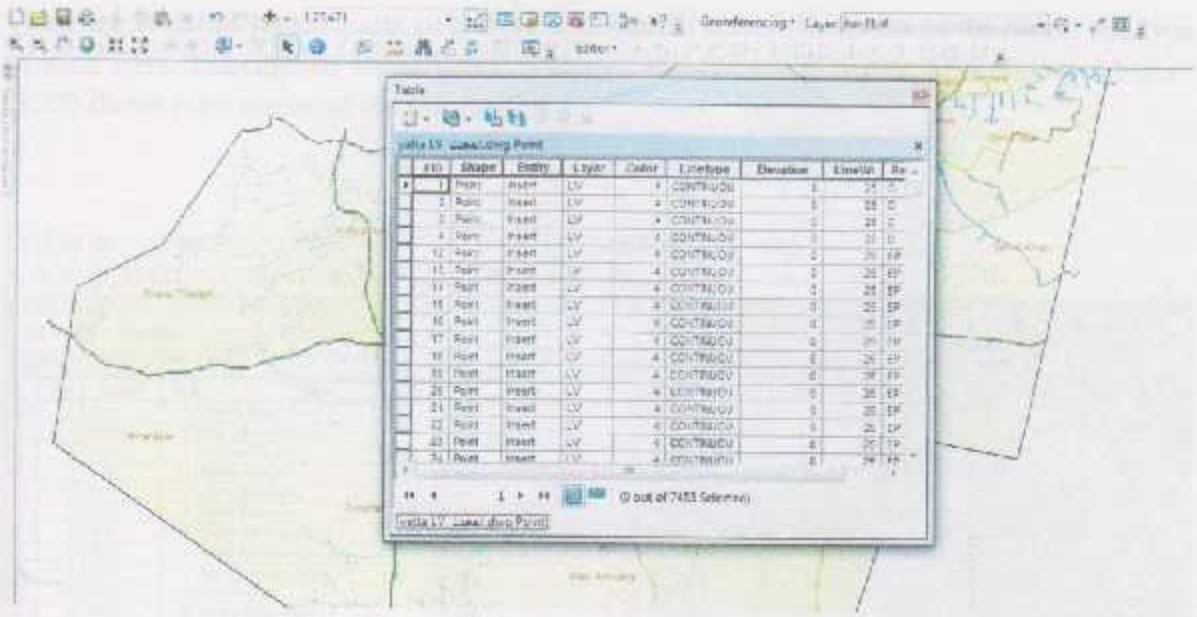


Figure (3. 20) : The Attribute of Electricity Network

3.4.10 Information about water network

This layer has been created based on a set of elements such as: main lines, sub main lines, pumps and valves. Figure (3.21) shows print screen of these Information.

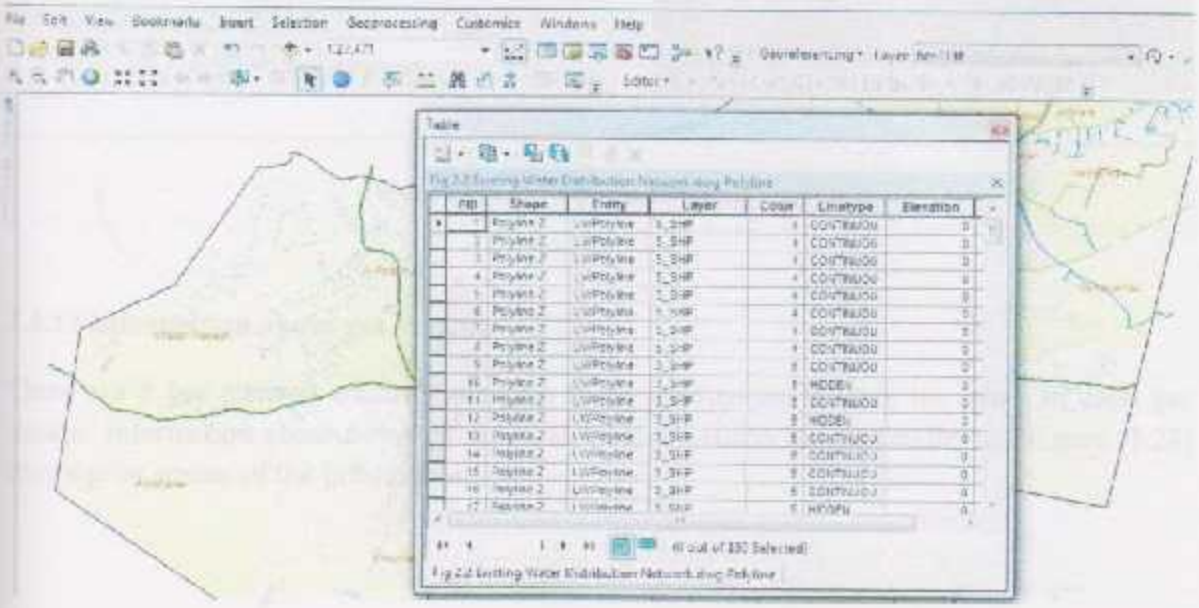


Figure (3. 21) : The Attribute of Water Network

3.4.11 Information about farms

There are 39 farms within Yatta city, these information include the name of the owner and type of each farm. Information about farms is shown in table (A-9) in the Appendix and Figure (3.22) shows print screen of the Information.

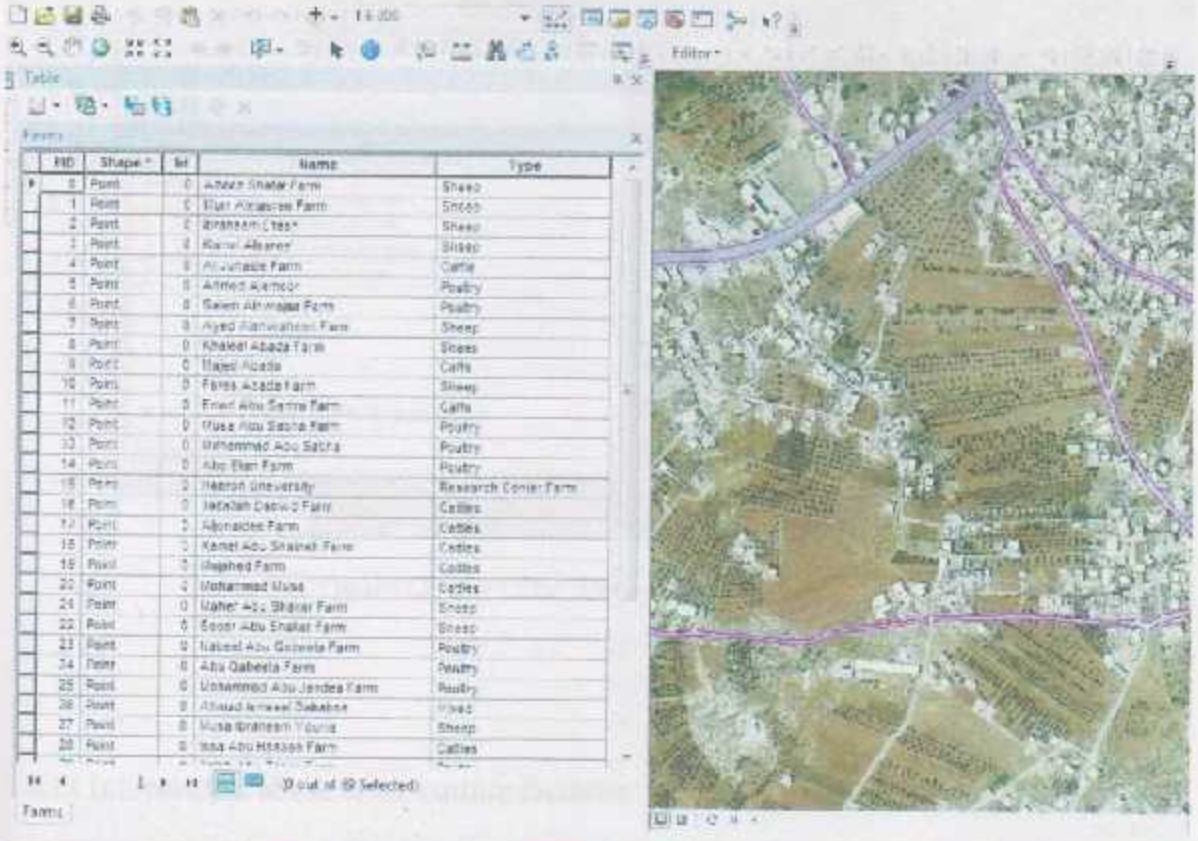


Figure (3. 22) : The Attribute of Farms

3.4.12 Information about gas stations

There are 5 gas stations within Yatta city, these information include the name of each gas station. Information about farms is shown in table (A-10) in the Appendix and Figure (3.23) shows print screen of the Information.

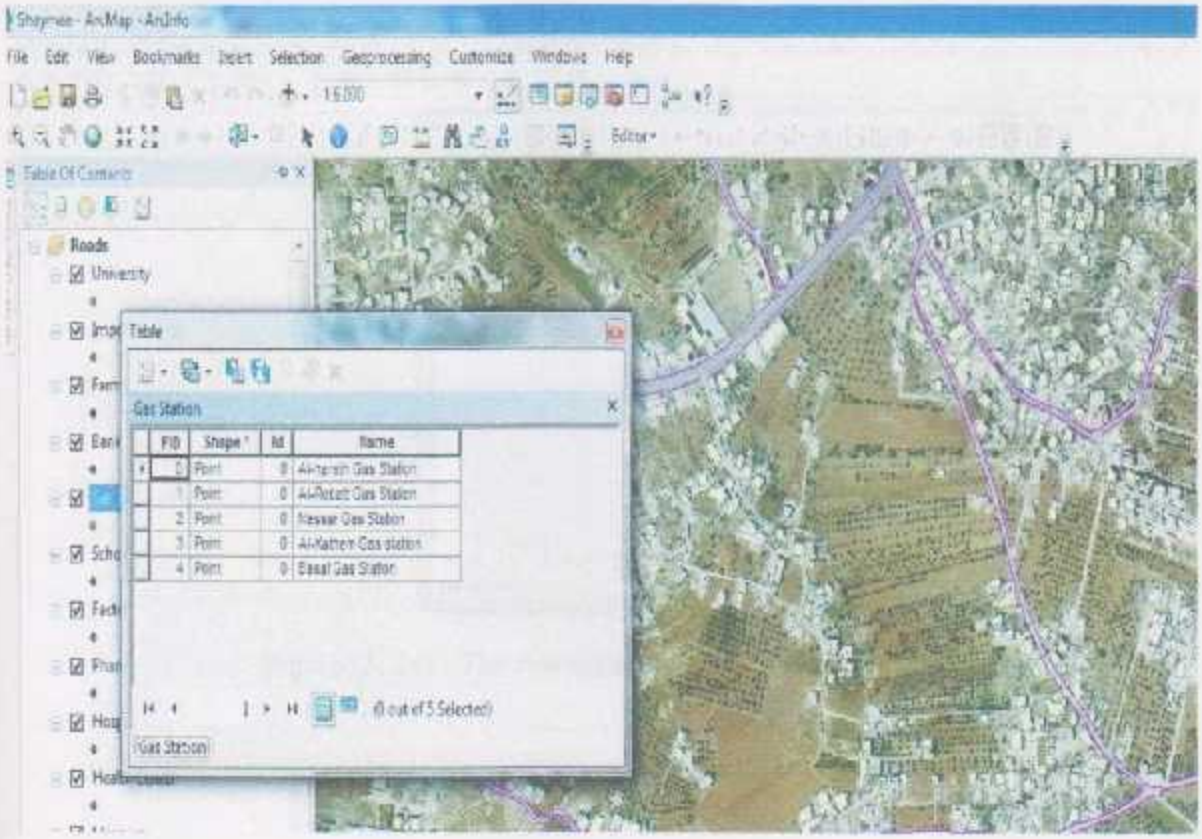


Figure (3. 23) : The Attribute of Gas Stations

3.4.13 Information about stone cutting facilities

There are two stone cutting facilities within Yatta city. Information about stone cutting facilities is shown in table (A-11) in the Appendix and Figure (3.24) shows print screen of the Information, and these stone cutting facilities should be removed out of the city center to avoid contamination of land and air.

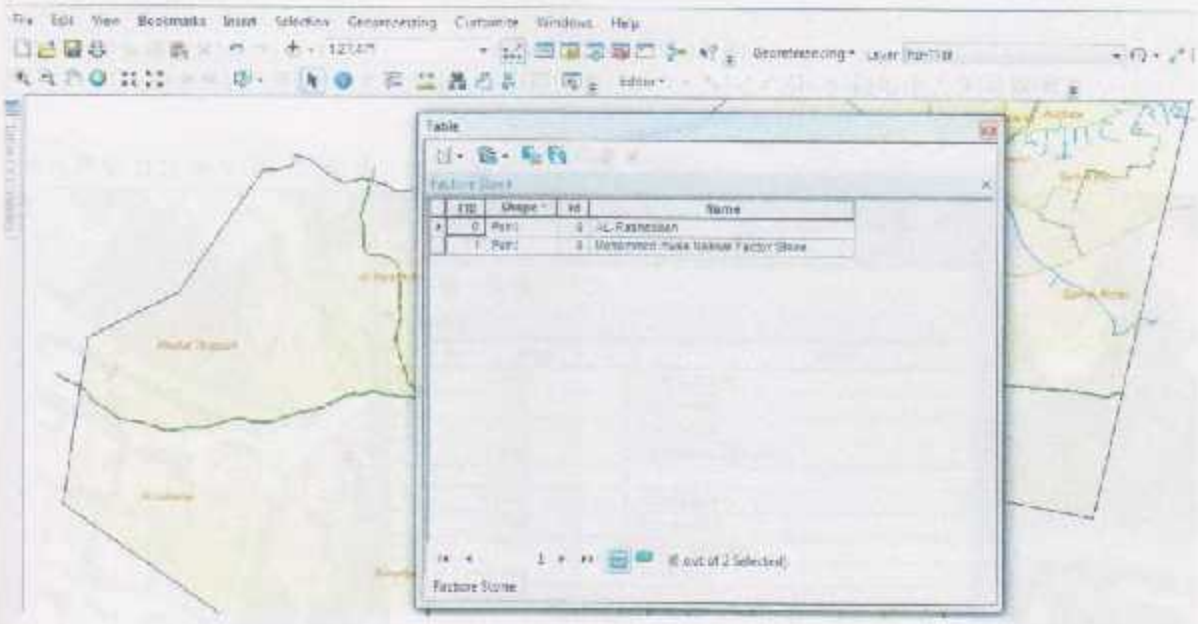


Figure (3. 24) : The Attribute of Stone cutting facilities

3.4.14 Information about historical and important sites

There are four important sites in Yatta city, there are: Yatta Municipality, Al-karmel Park, Police Station, Civil Defence Department and four banks, there are: Housing bank, Palestine bank, Arabic-Islamic bank and Jordan bank. Information about historical and important sites is shown in table (A-12) in the Appendix and Figure (3.25) shows print screen of the Information.

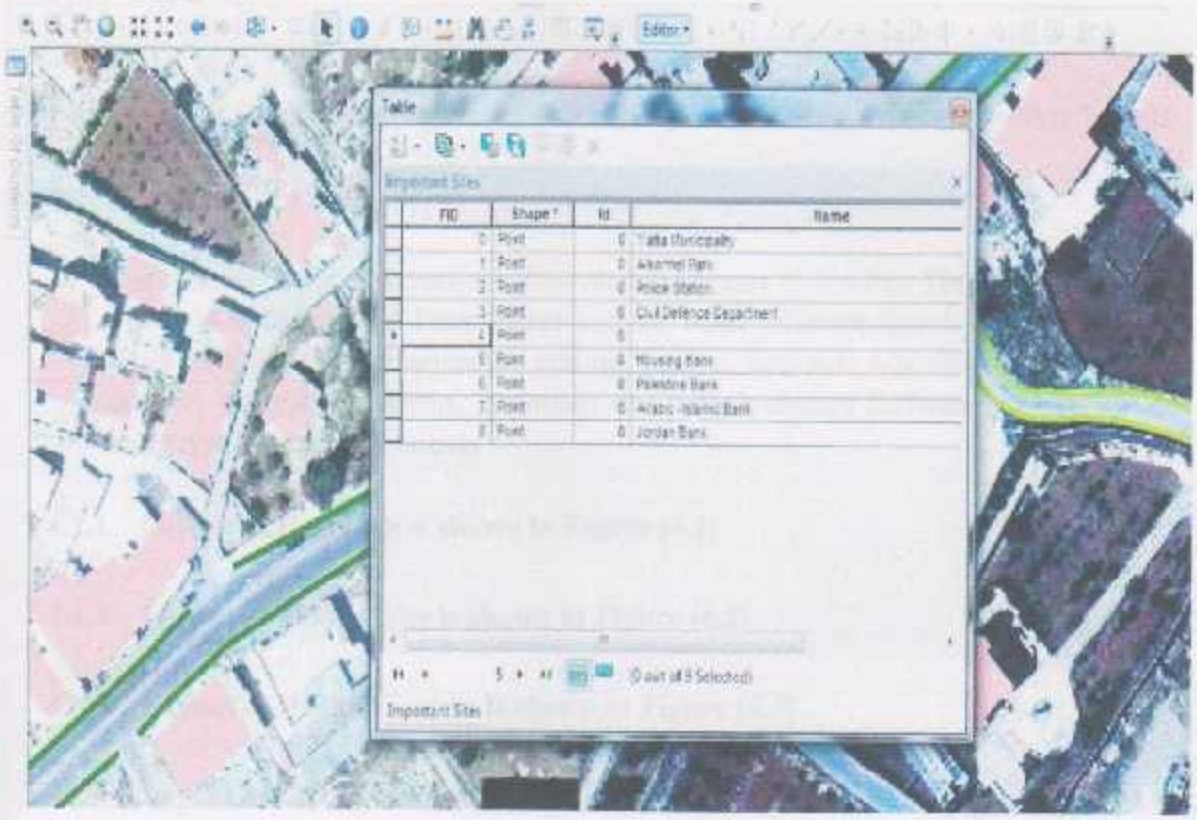


Figure (3. 25) : The Attribute of Historical and Important sites

Chapter 4

Presentation Of Map

The results of the work in this project are fourteen layers , presented by the following layouts

4.1 The Layout of the Map

Layout of maps for all layers are presented in Figures (4.1-4.14). The layouts show the street and houses as the basic layers and the other different layers such as mosques, clinics, health centers, pharmacies, schools, houses, hospitals, electricity network, water network, gas stations, farms, important sites, stone cutting facilities are overlaid the basic layer of street and houses.

4.1.1 Layout of Hospitals is shown in Figure (4.1)

4.1.2 Layout of Pharmacies is shown in Figure (4.2)

4.1.3 Layout of Health Centers is shown in Figure (4.3)

4.1.4 Layout of Clinics is shown in Figure (4.4)

4.1.5 Layout of Schools is shown in Figure (4.5)

4.1.6 Layout of Mosques is shown in Figure (4.6)

4.1.7 Layout of Houses is shown in Figure (4.7)

4.1.8 Layout of Roads is shown in Figure (4.8)

4.1.9 Layout of Electricity Network is shown in Figure (4.9)

4.1.10 Layout of Water Network is shown in Figure (4.10)

4.1.11 Layout of Farms is shown in Figure (4.11)

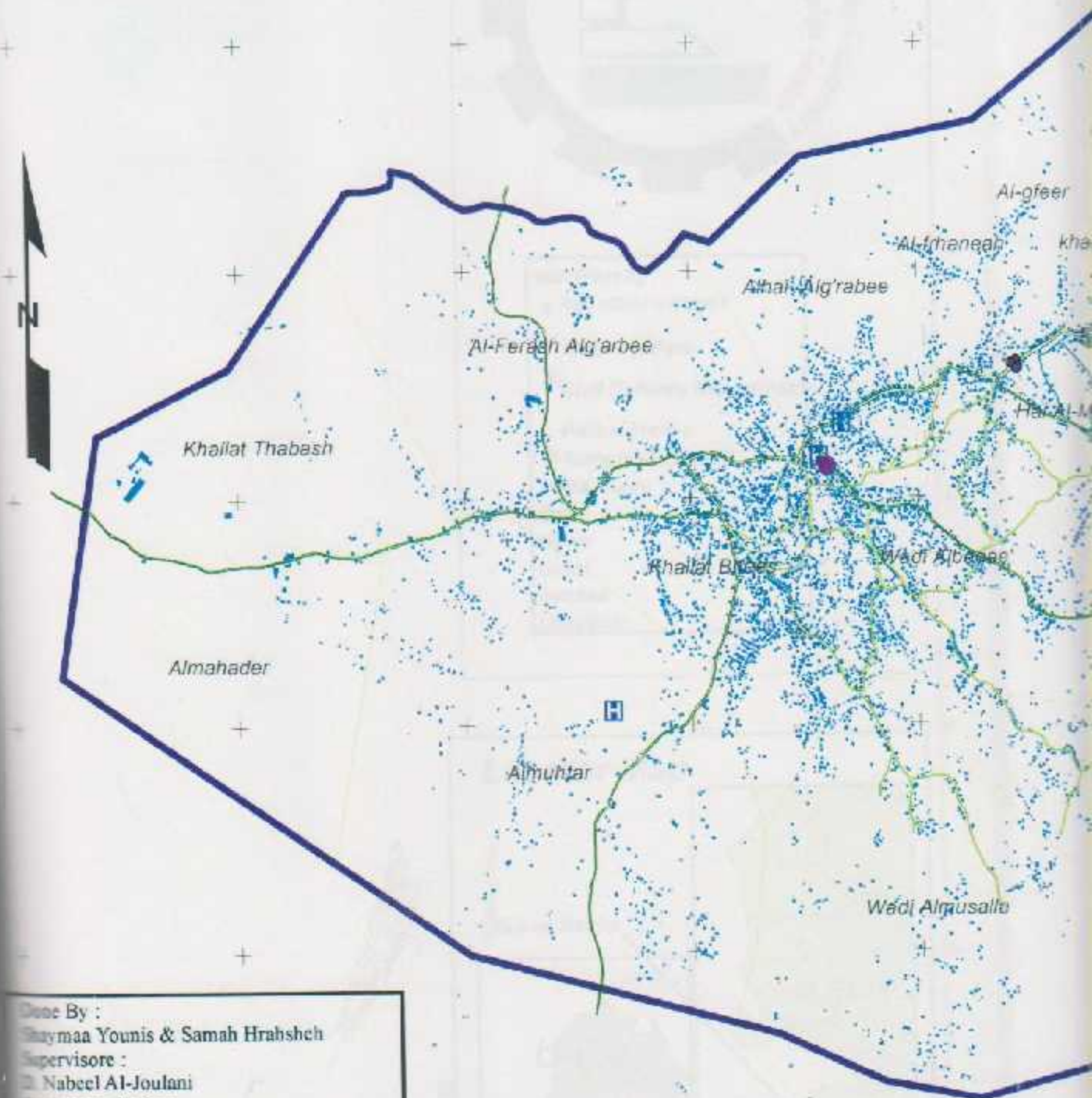
4.1.12 Layout of Gas Stations is shown in Figure (4.12)

4.1.13 Layout of Stone Factor Facilities is shown in Figure (4.13)

4.1.14 Layout of Important Sites is shown in Figure (4.14)

An A2 printed map attached in this project, this map represent the final electronic map which shows all layers.

Hospitals of Yatta City



Done By :
Shaymaa Younis & Samah Hrahsheh
Supervisore :
Dr. Nabeel Al-Joulani
Graduation Project
Done to make a Geospatial Electronic Map for Yatta city , wich the people can use it to know the exact posiotion of the places.
The informations from Yatta Muncipality
Projection: Casseni
Coordinate System: Palestine Grid 1923
False Easting:170251.555
False Naorthing:126867.909

1:25

0 1

v , Figure (4.1)

25000

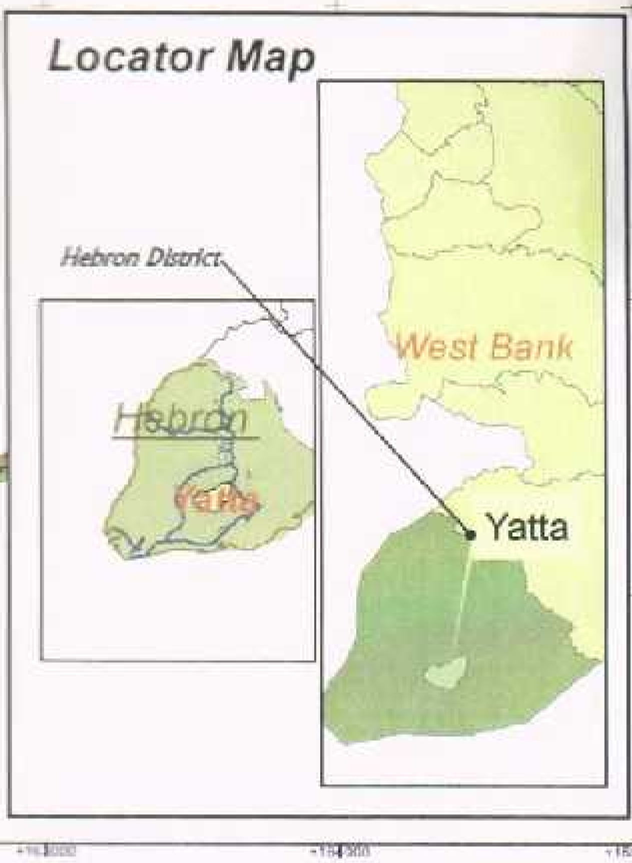
2 3 Km

Pharmacies of Yatta City , Fi

Done By :
Haymaa Younis & Samah Hrahshch
Supervisore :
Dr. Nabeel Al-Joulani
Graduation Project
Done to make a Geospatial Electronic Map for Yatta city , wich the people can use it to know the exact posiotion of the places.
The informations from Yatta Muncipality
Projection: Cassini
Coordinate System: Palestine Grid 1923
False Easting:170251.555
False Northing:126867.909

ty , Figure (4.2)

Albeela
Almermalah
Alshawamreh
Qarnet Alrras
Fatooh
Fatooh
Sahl Abu Theeab
5000
2
3
Km
University
<all other values>
Alkarmel Park
Civil Defence Department
Police Station
Yatta Municipality
Pharmacy
Major
Minor
Local
houses
Locatins

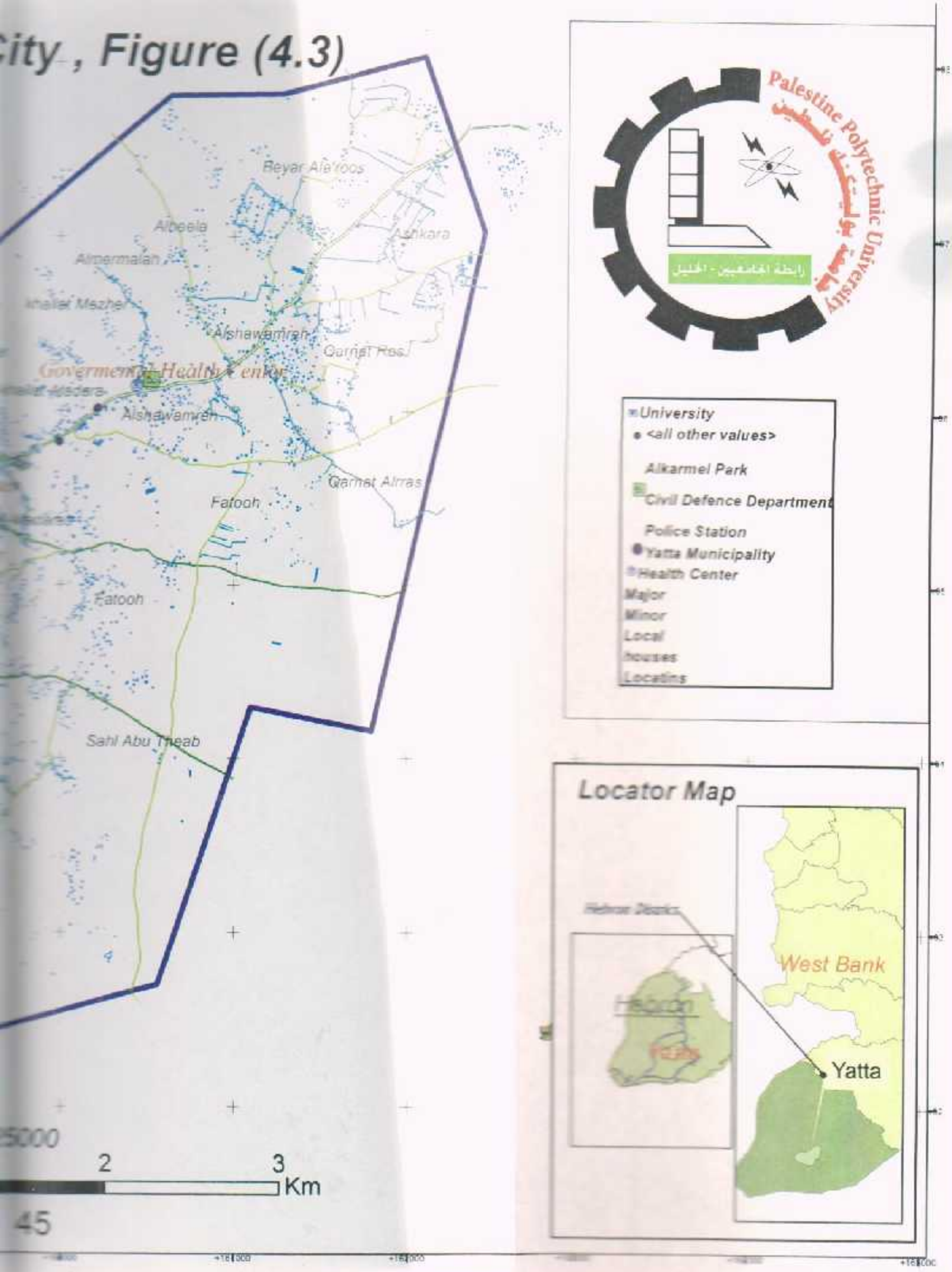


Locator Map
Hebron District
West Bank
Hebron
Yatta

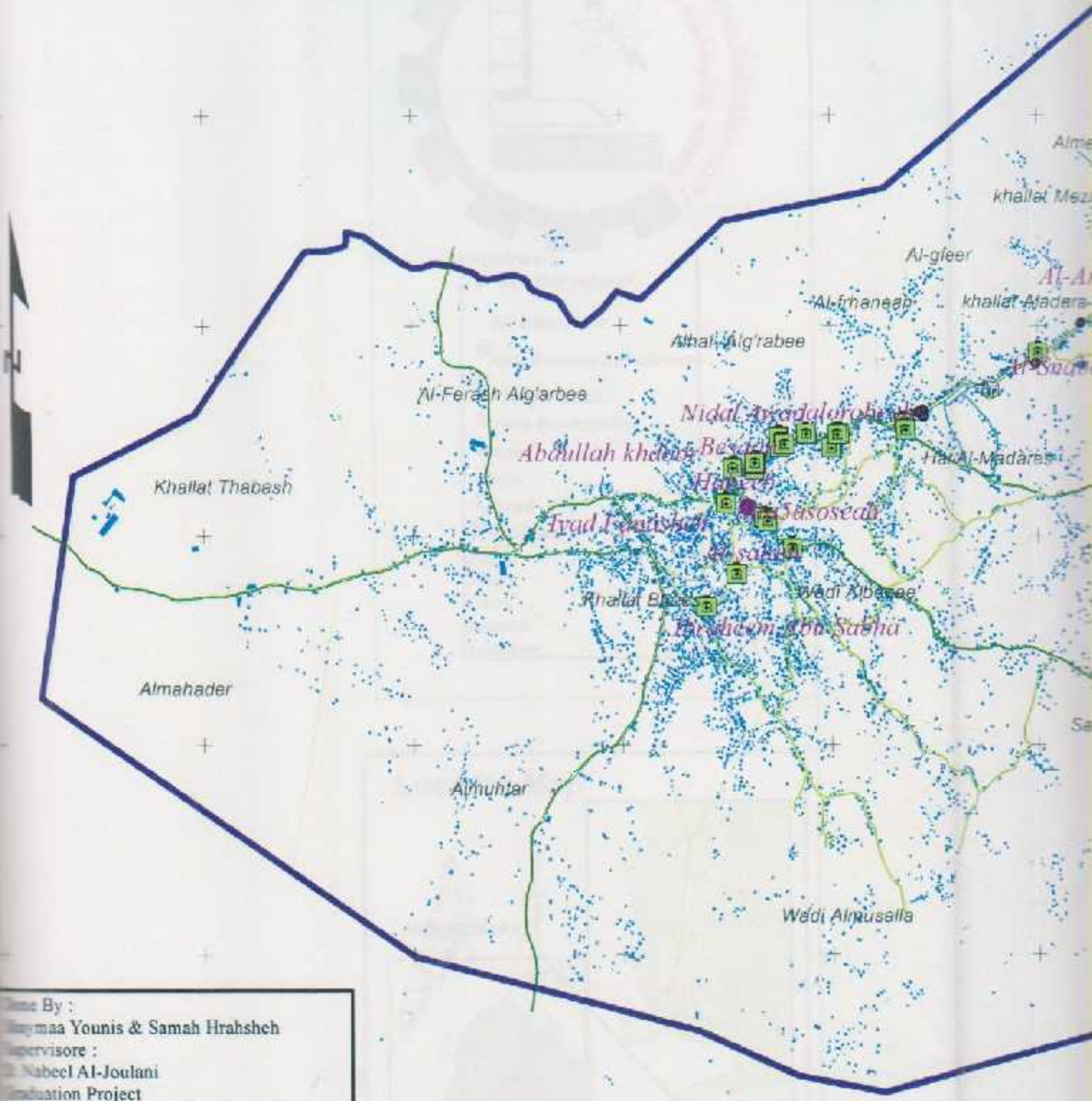
Health Center of Yatta City , Fi

Done By :
Maysmaa Younis & Samah Hrahsheh
Supervisore :
Dr. Nabeel Al-Joulani
Graduation Project
Aime to make a Geospatial Electronic
Map for Yatta city , wich the people can
use it to know the exact posiotion of the
places.
The informations from Yatta Muncipality
Projection: Casseni
Coordinate System: Palestine Grid 1923
Value Easting:170251.555
Value Nsorthing:126867.909

City , Figure (4.3)



Clinics of Yatta City , Figu



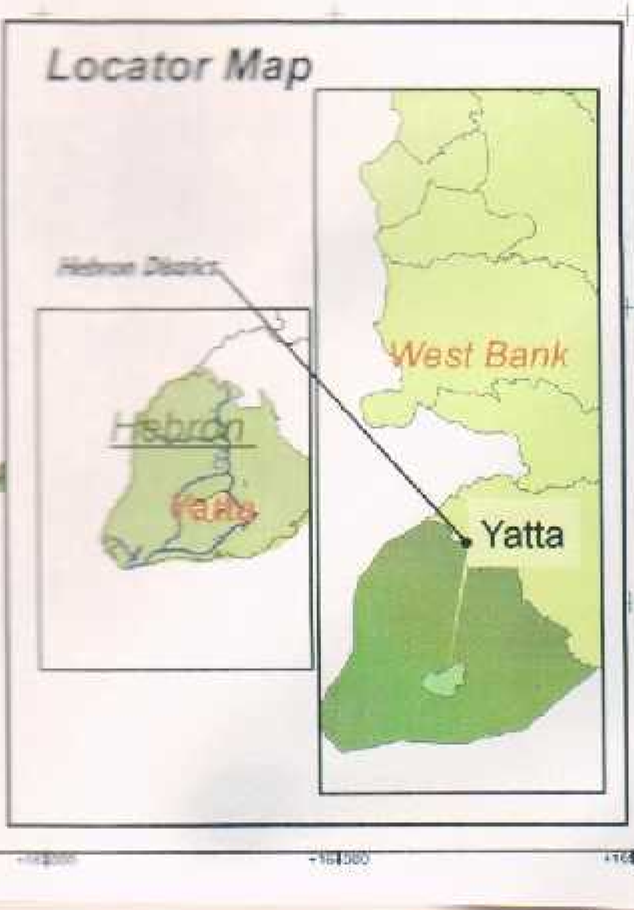
Done By :
Haymaa Younis & Samah Hrahsheh
Supervisore :
Dr. Nabeel Al-Joulani
Graduation Project
Aime to make a Geospatial Electronic
Map for Yatta city , wich the people can
use it to know the exact posiotion of the
places.
The informations from Yatta Muncipality
Projection: Cassini
Coordinate System: Palestine Grid 1923
False Easting:170251.555
False Northing:126867.909

1:25000

0 1

, Figure (4.4)

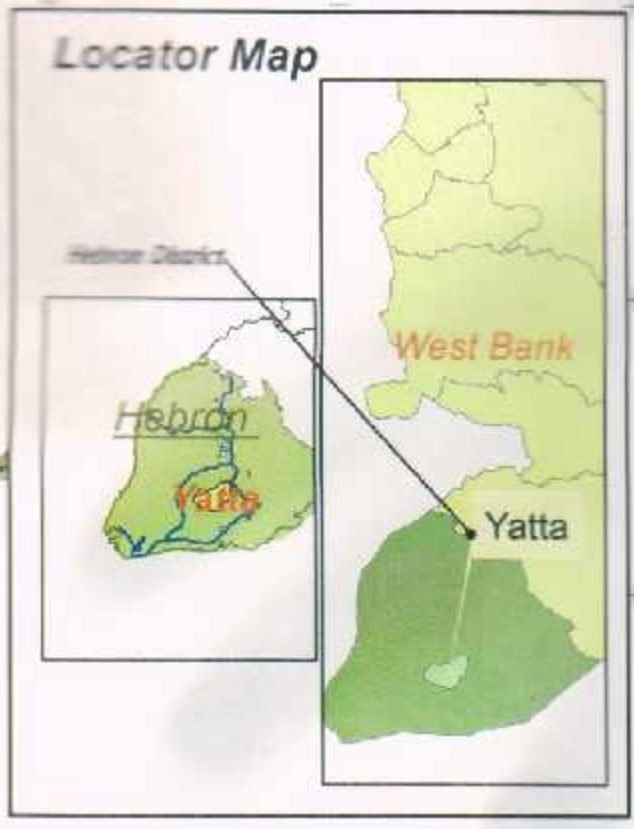

Beyar Ala'ras
Alhoola
Almermalah
Ashkara
khallat Mezher
Alshawamreh
Qarnet Ras
Al-Amal
Raqia
khallat Madera
Alshawamreh
Qarnet Alras
Fatooh
Madares
Fatooh
Sahl Abu Theab
25000
2
3
Km
University
<all other values>
Alkarmel Park
Civil Defence Department
Police Station
Yatta Municipality
Clinics
Major
Minor
Local
houses
Locatins


Locator Map
Hebron District
West Bank
Hebron
Yatta

Schools of Yatta City , Figur

Done By :
Maymaa Younis & Samah Hrahsheh
Supervisore :
Dr. Nabeel Al-Joulani
Graduation Project
Done to make a Geospatial Electronic Map for Yatta city , wich the people can use it to know the exact posiotion of the places.
The informations from Yatta Muncipality
Projection: Cassini
Coordinate System: Palestine Grid 1923
False Easting:170251.555
False Northing:126867.909

, Figure (4.5)



25000

2 3 Km

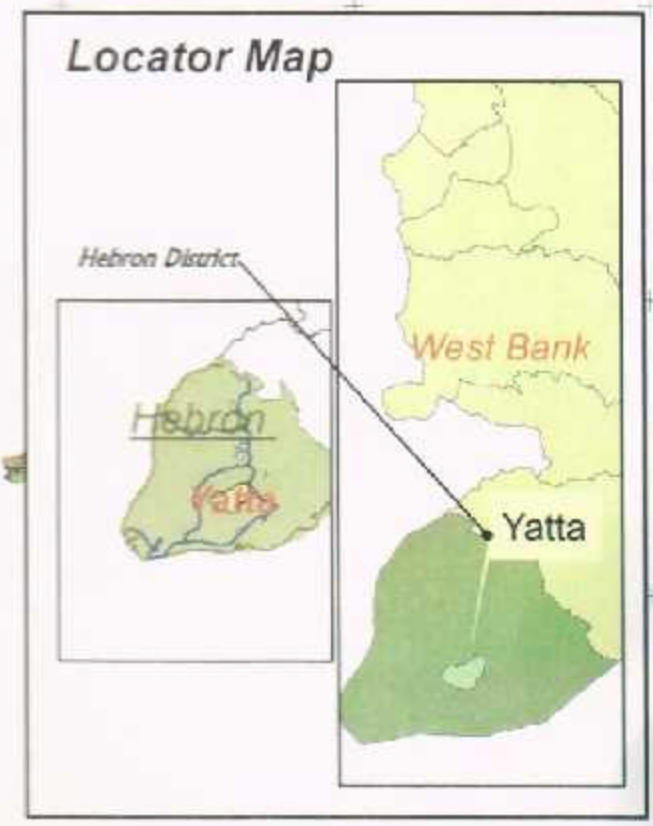
Mosques of Yatta City , Figu

By :
maa Younis & Samah Hrahsheh
pervisore :
Nabeel Al-Joulani
duation Project
to make a Geospatial Electronic
for Yatta city , wich the people can
it to know the exact posiotion of the
.
informations from Yatta Muncipality
ion: Cassini
dinate System: Palestine Grid 1923
Easting:170251.555
Northing:126867.909

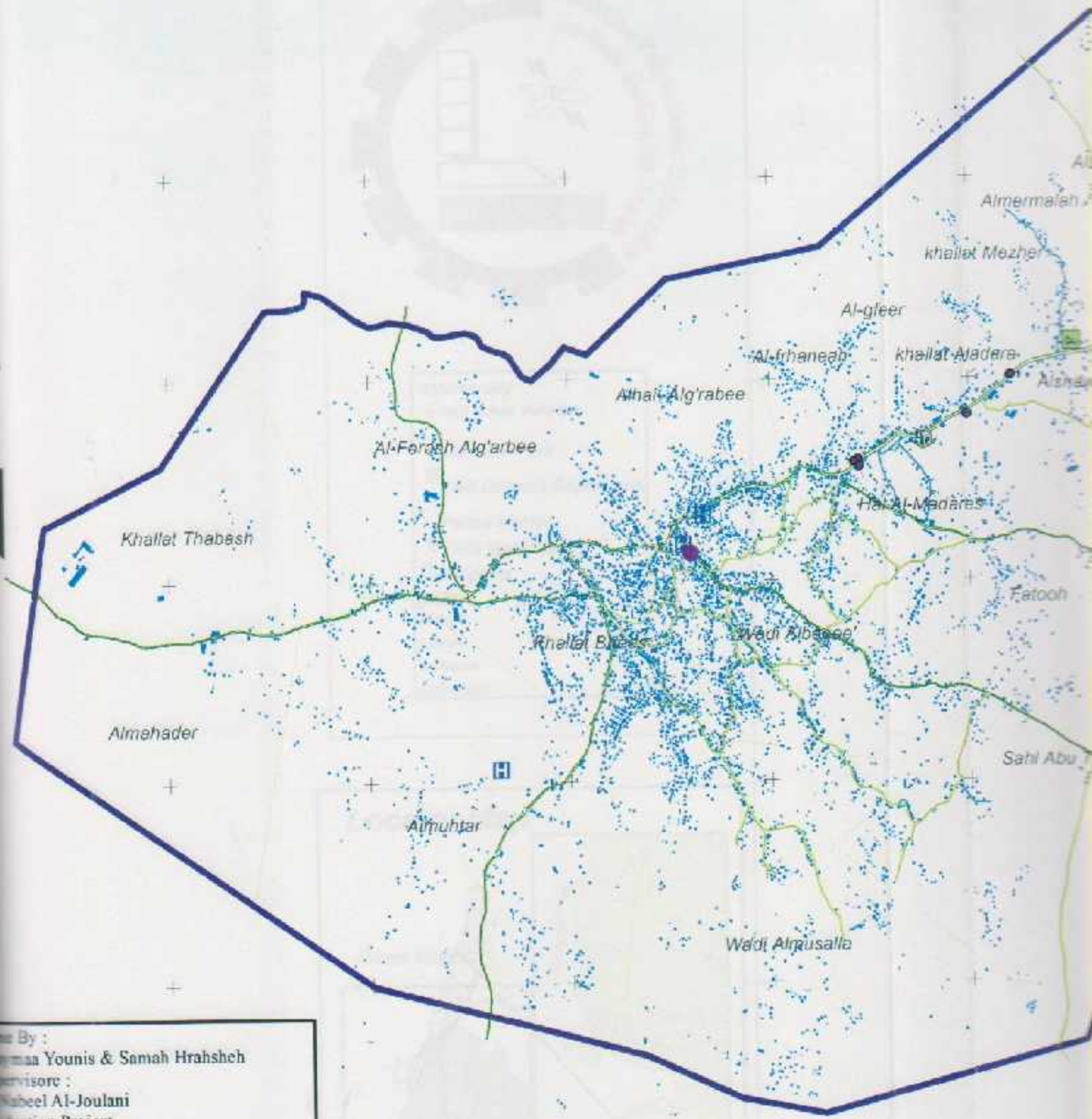
, Figure (4.6)

Palestine Polytechnic University
جامعة بوليتكنك فلسطين

University
<all other values>
Alkarmel Park
Civil Defence Department
Police Station
Yatta Municipality
Hospitals
Mosques
Major
Minor
Local
houses
Locatins



Houses of Yatta City , Figure



By :
na Younis & Samah Hrahsheh
rvisore :
Nabeel Al-Joulani
duation Project
to make a Geospatial Electronic
for Yatta city , wich the people can
it to know the exact posiotion of the
ects.
informations from Yatta Muncipality
ction: Cassini
dinate System: Palestine Grid 1923
Easting:170251.555
Northing:126867.909

1:25000

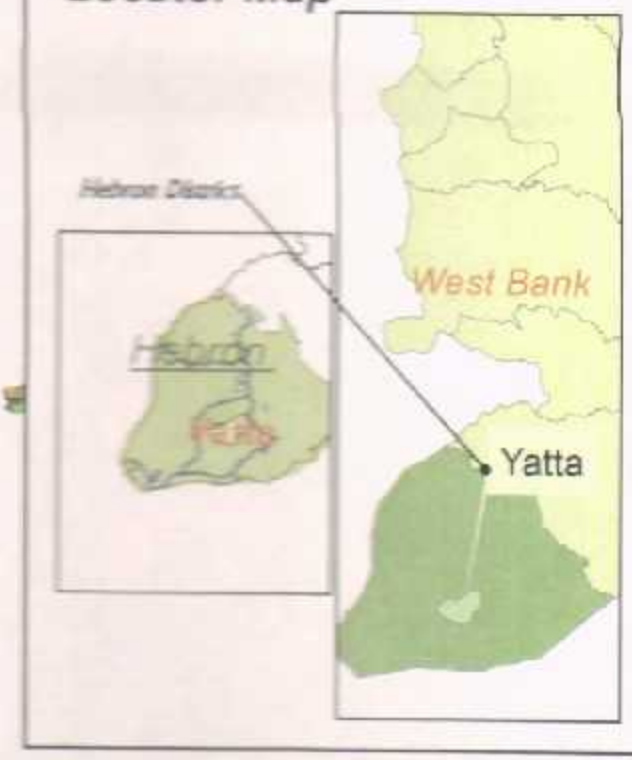
0 1 2

, Figure (4.7)

Palestine Polytechnic University

University
<all other values>
Alkarmel Park
Civil Defence Department
Police Station
Yatta Municipality
Hospitals
Major
Minor
Local
houses
Locatins

Locator Map



5000

2 3 Km

Roads of Yatta City , Fig

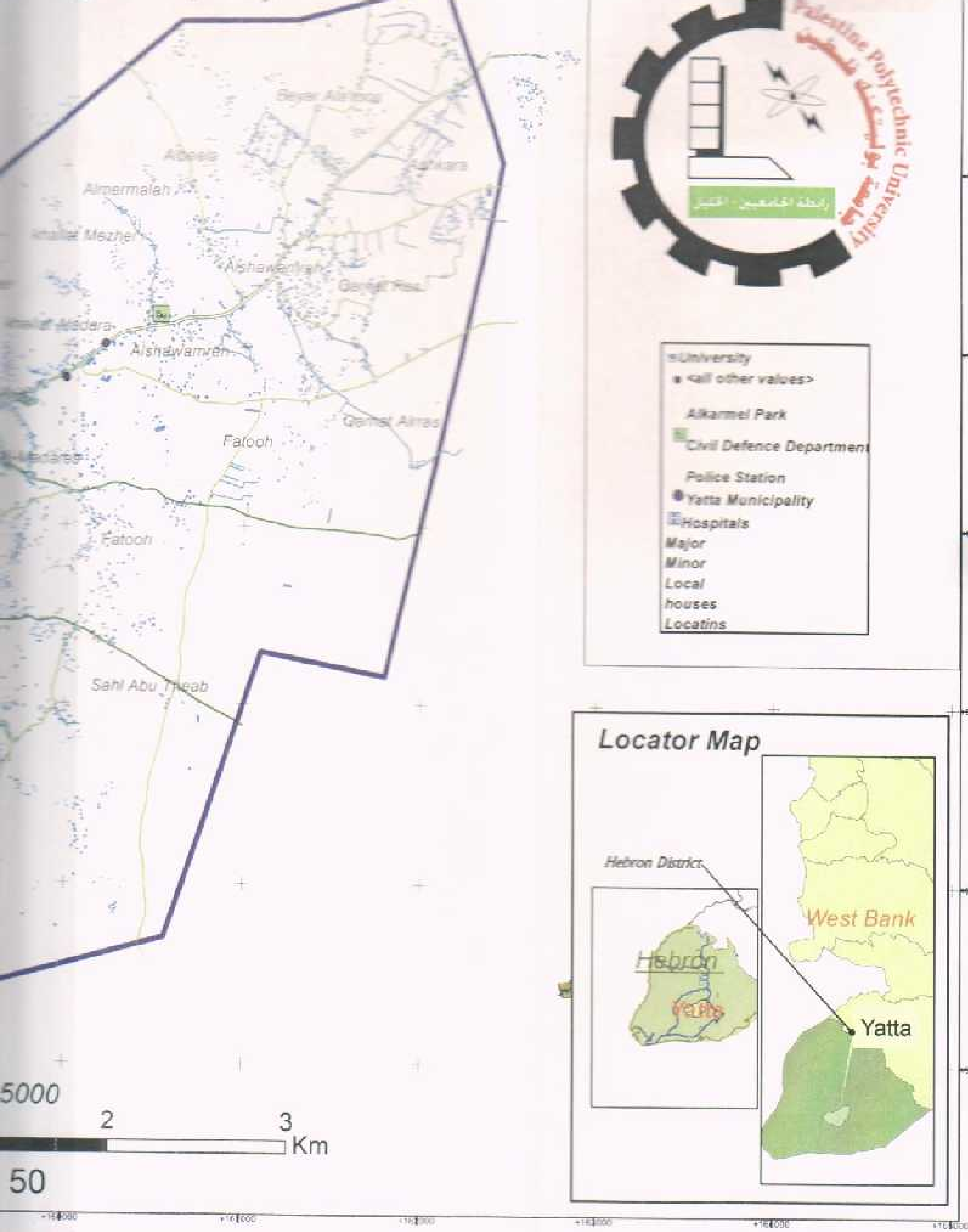
Done By :
Shaymaa Younis & Samah Hrahsheh
Supervisore :
Dr. Nabeel Al-Joulani
Graduation Project
Done to make a Geospatial Electronic Map for Yatta city , wich the people can use it to know the exact posiotion of the places.
The informations from Yatta Muncipality
Projection: Cassini
Coordinate System: Palestine Grid 1923
False Easting:170251.555
False Nsoothing:126867.909

1:25000

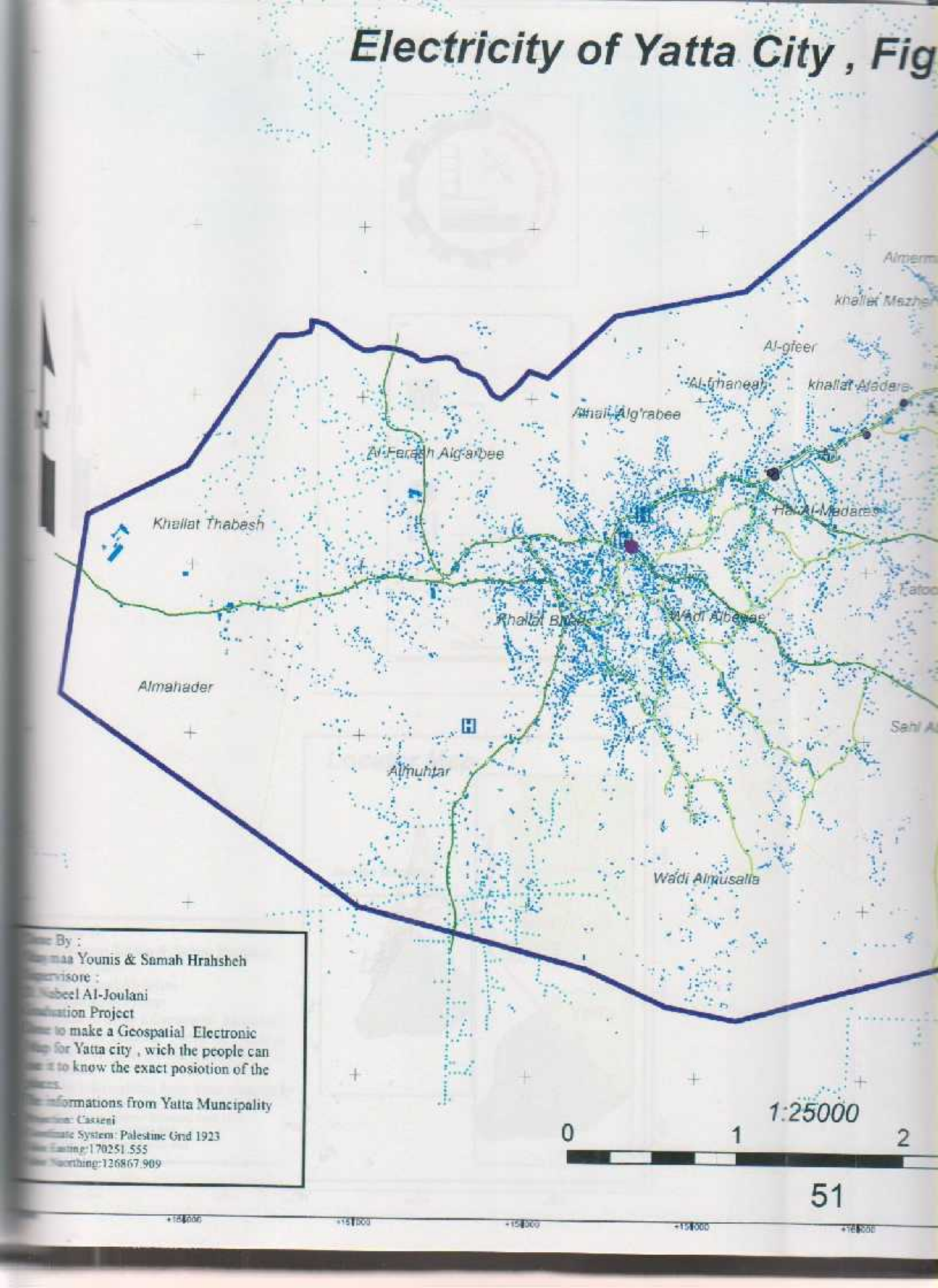
0 1

50

, Figure (4.8)


Almermalah
Alshawarneh
Falooh
Fatooh
Sahl Abu Theab
Palestine Polytechnic University
University
<all other values>
Alkarmel Park
Civil Defence Department
Police Station
Yatta Municipality
Hospitals
Major
Minor
Local
houses
Locatins
Locator Map
Hebron District
West Bank
Hebron
Yatta
5000
2
3
Km

Electricity of Yatta City , Fig

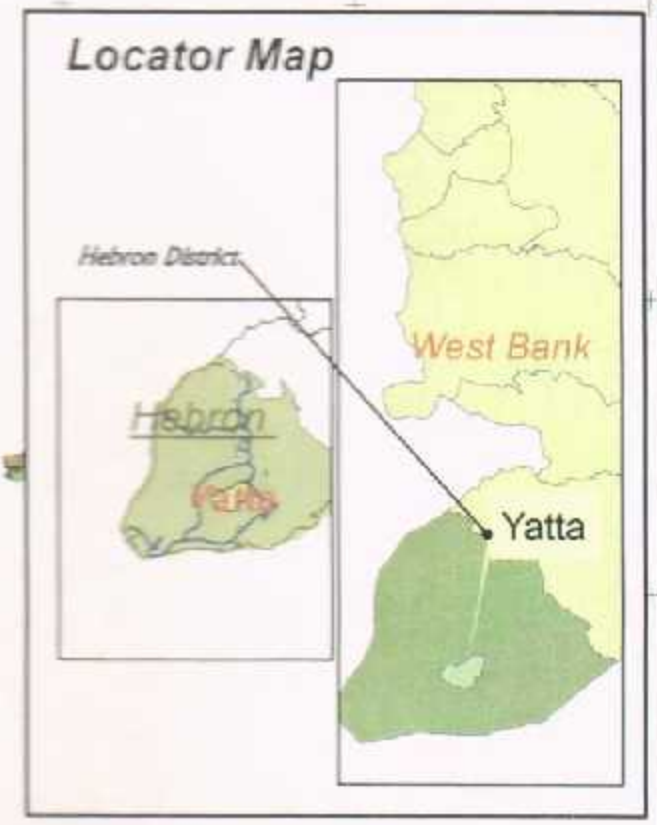


By :
maa Younis & Samah Hrahsheh
rvisore :
Nabeel Al-Joulani
duation Project
to make a Geospatial Electronic
for Yatta city , wich the people can
it to know the exact posiotion of the
ces.
informations from Yatta Muncipality
ction: Cassini
ordinate System: Palestine Grid 1923
Easting:170251.555
Northing:126867.909

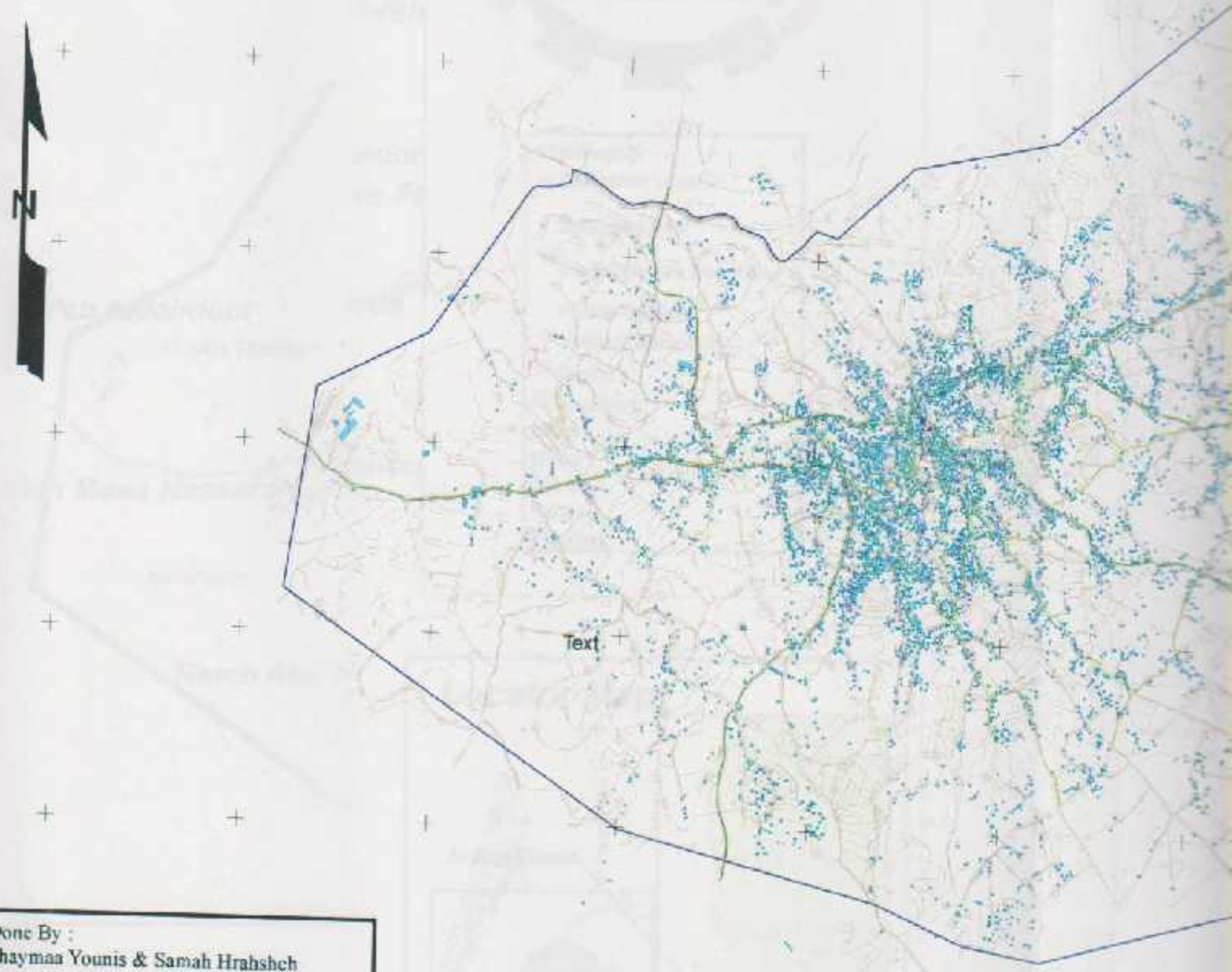
y , Figure (4.9)

5000

2 3 Km



Water Network of Yatta City ,



Done By :
Shaymaa Younis & Samah Hrahsheh
Supervisore :
Dr. Nabeel Al-Julani
Graduation Project
Done to make a Geospatial Electronic Map for Yatta city , wich the people can use it to know the exact posiotion of the places.
The informations from Yatta Muncipality
Projection: Cassini
Coordinate System: Palestine Grid 1923
False Easting:170251.555
False Nacrthing:126867.909

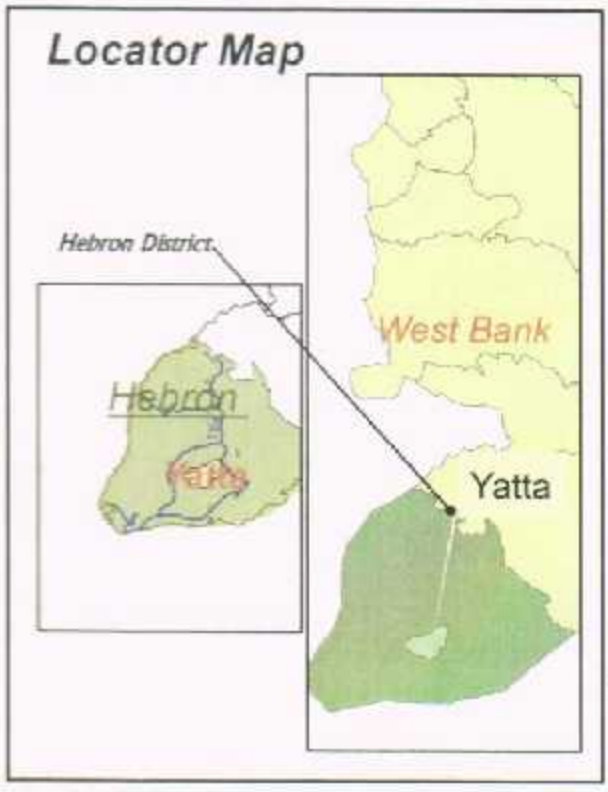
1:25000

0 1 2

City , Figure (4.10)

2 3 Km

Locator Map



Farms of Yatta City , Figure

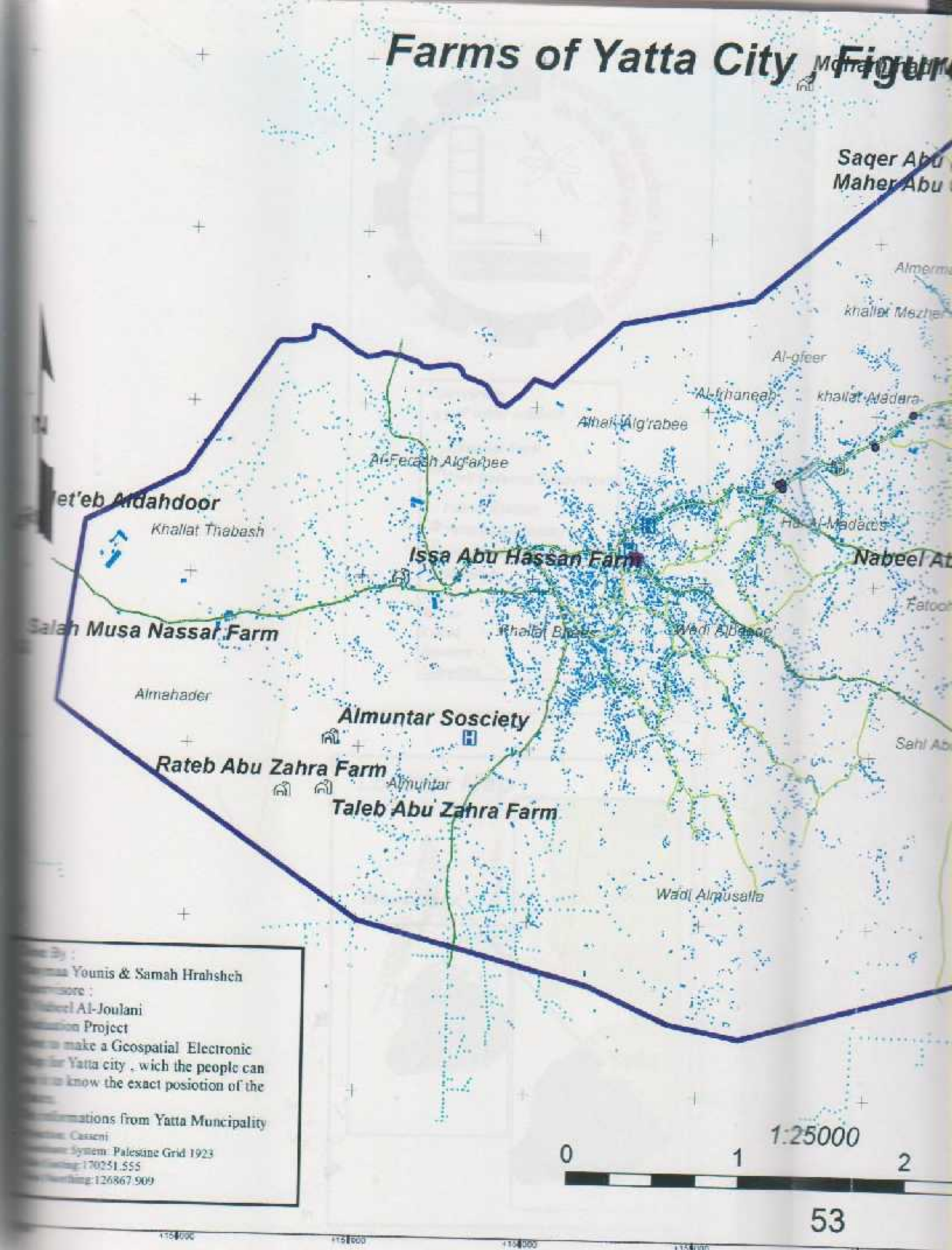
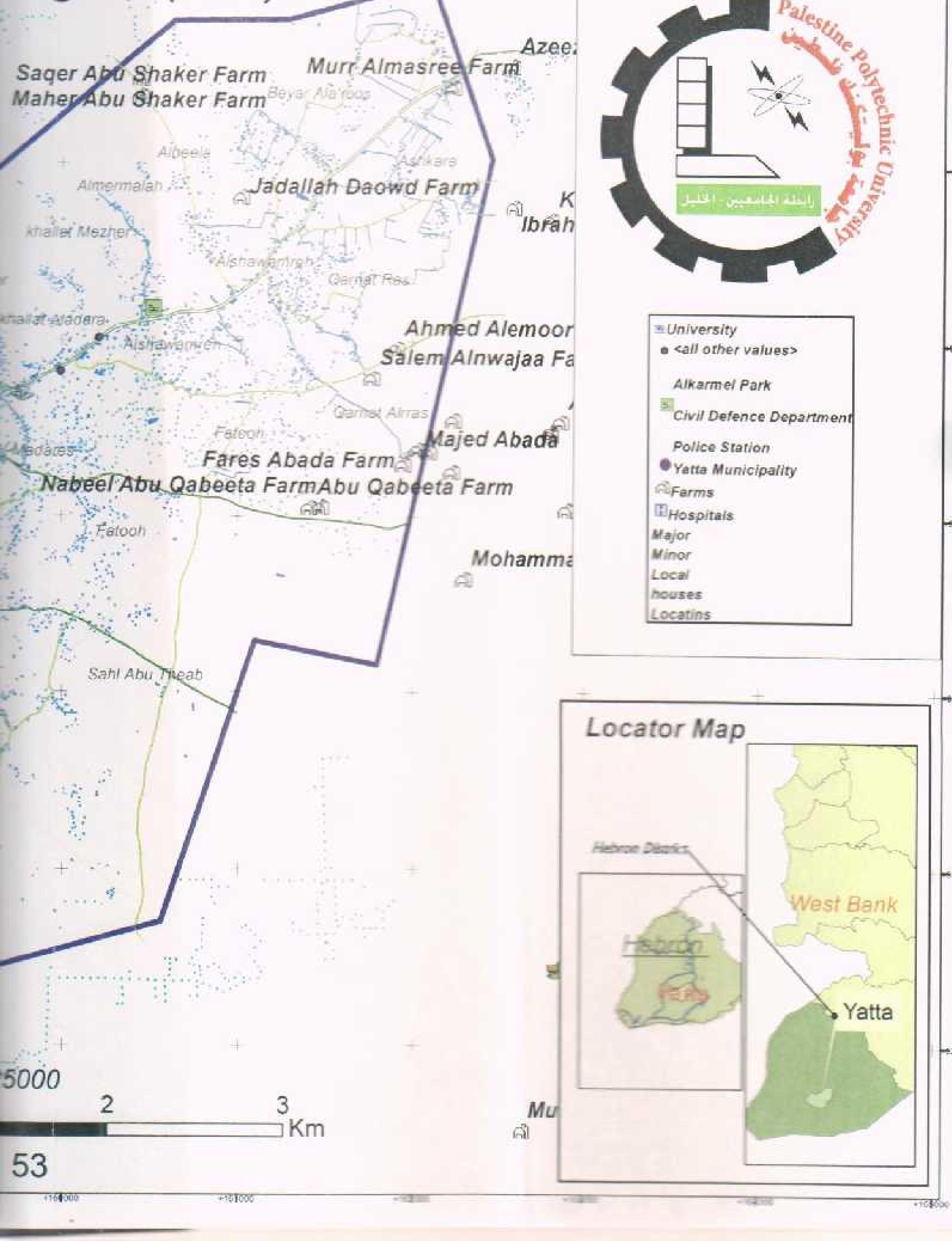
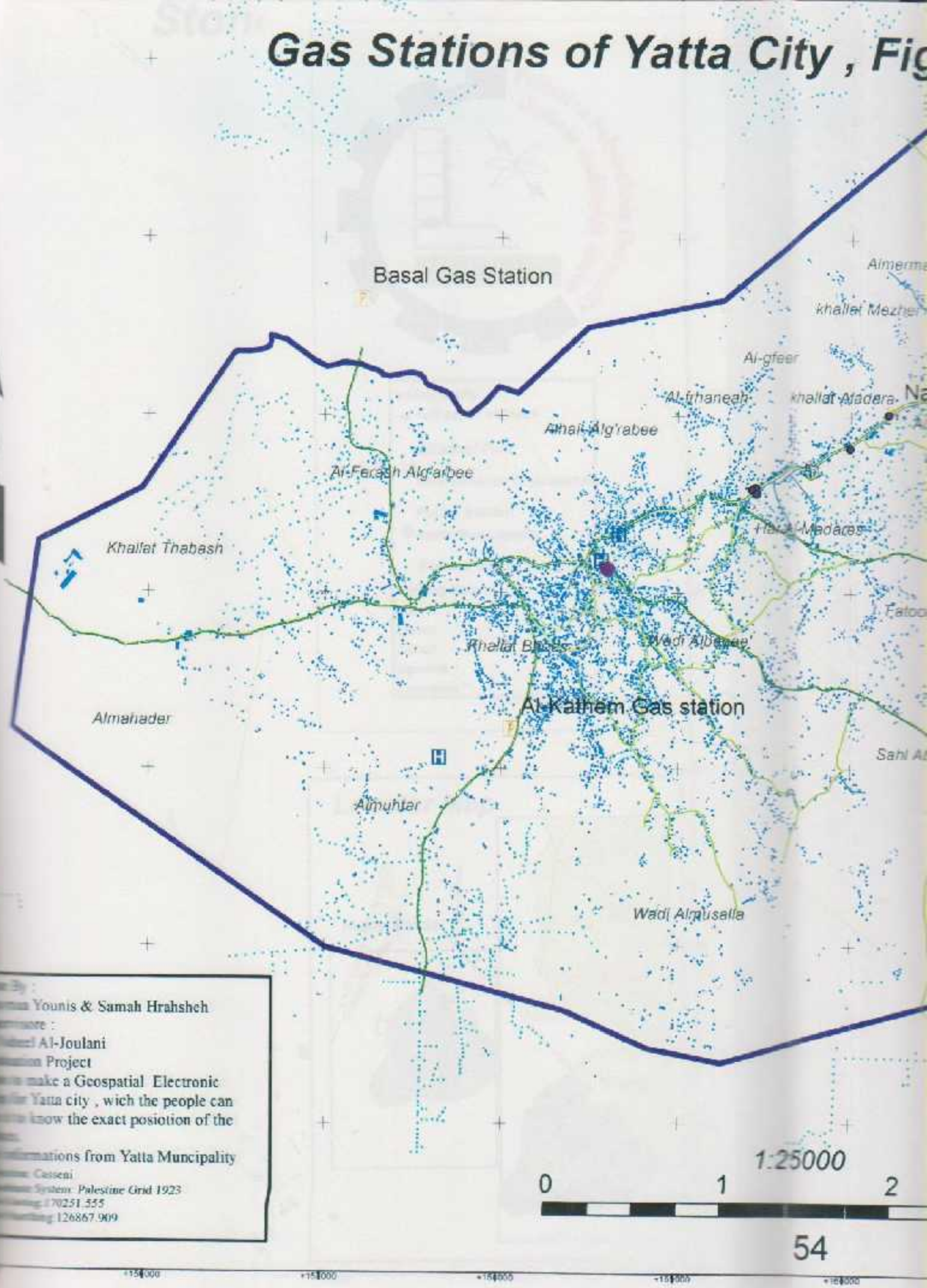


Figure (4.11)


Saqer Abu Shaker Farm
Maher Abu Shaker Farm
Murr Almasree Farm
Azee
Beyar Ala'roos
Albeele
Ashkara
Almermalah
Jadallah Daowd Farm
khallet Mezher
Ibrah
Alshawawreh
Qamat Res
khallat Aladera
Ahmed Alemoor
Salem Alnwajaa Fa
Qamat Alrras
Fatooh
Majed Abada
Fares Abada Farm
Nabeel Abu Qabeeta FarmAbu Qabeeta Farm
Mohamma
Sahl Abu Theab
Mu
Palestine Polytechnic University
University
<all other values>
Alkarmel Park
Civil Defence Department
Police Station
Yatta Municipality
Farms
Hospitals
Major
Minor
Local
houses
Locatins
Locator Map
Hebron District
Hebron
West Bank
Yatta
5000
2
3
Km

Gas Stations of Yatta City , Fig



Younis & Samah Hrahsheh

Al-Joulani

Project

make a Geospatial Electronic

Yatta city , wich the people can

know the exact posiotion of the

nformations from Yatta Muncipality

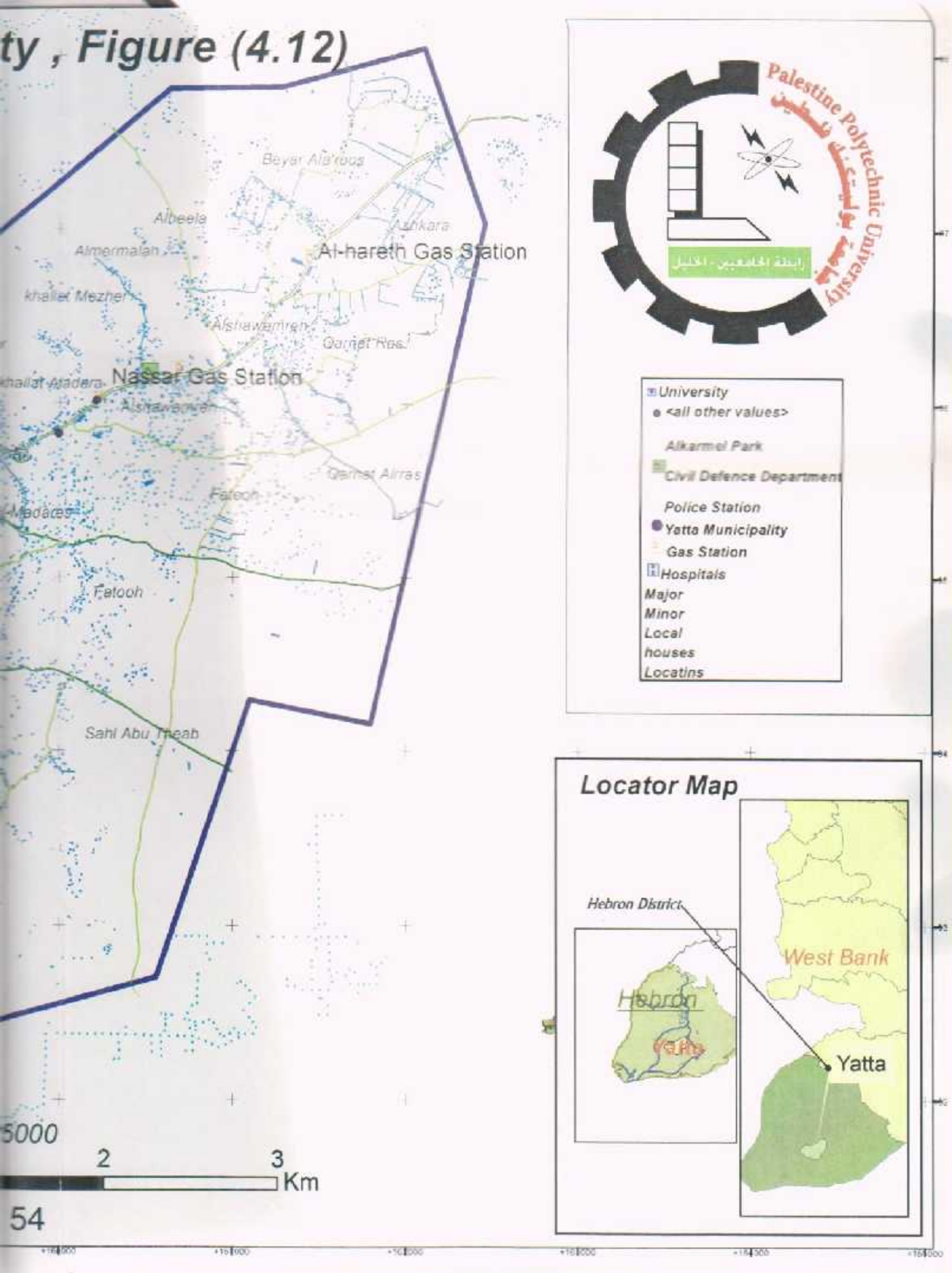
Cassini

System: Palestine Grid 1923

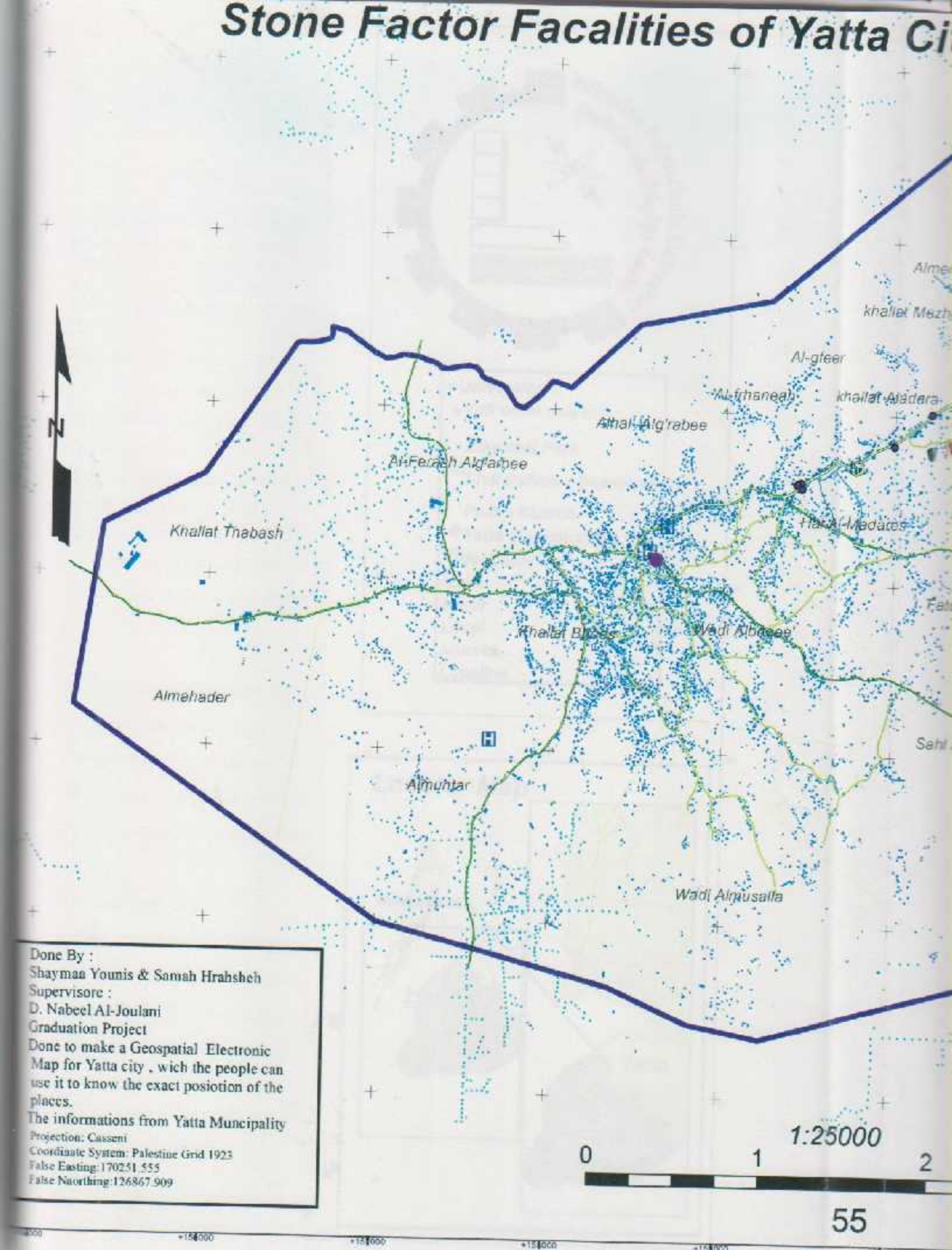
170251.555

126867.909

ty , Figure (4.12)



Stone Factor Facalities of Yatta Ci

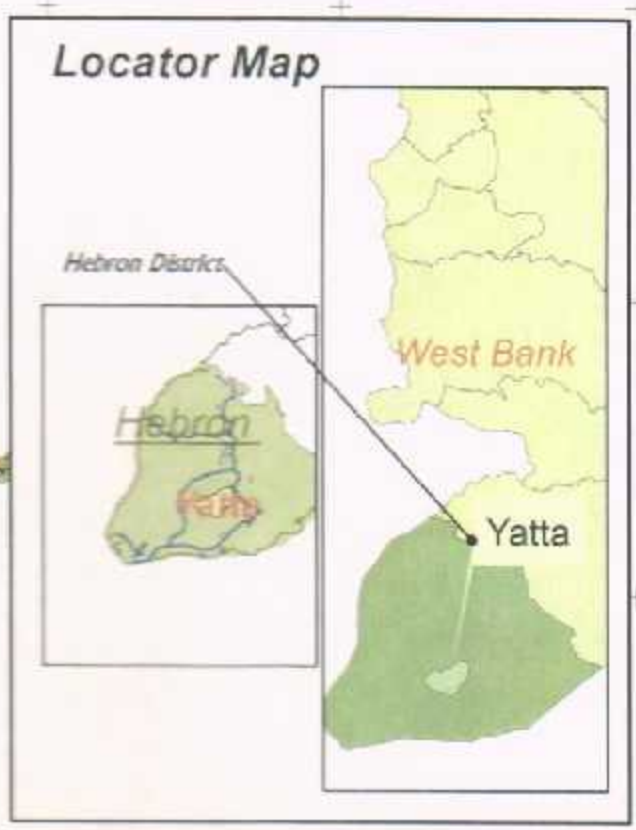


Done By :
Shaymaa Younis & Samah Hrahsheh
Supervisore :
D. Nabeel Al-Joulani
Graduation Project
Done to make a Geospatial Electronic Map for Yatta city , wich the people can use it to know the exact posiotion of the places.
The informations from Yatta Muncipality
Projection: Cassini
Coordinate System: Palestine Grid 1923
False Easting: 170251.555
False Naorthing: 126867.909

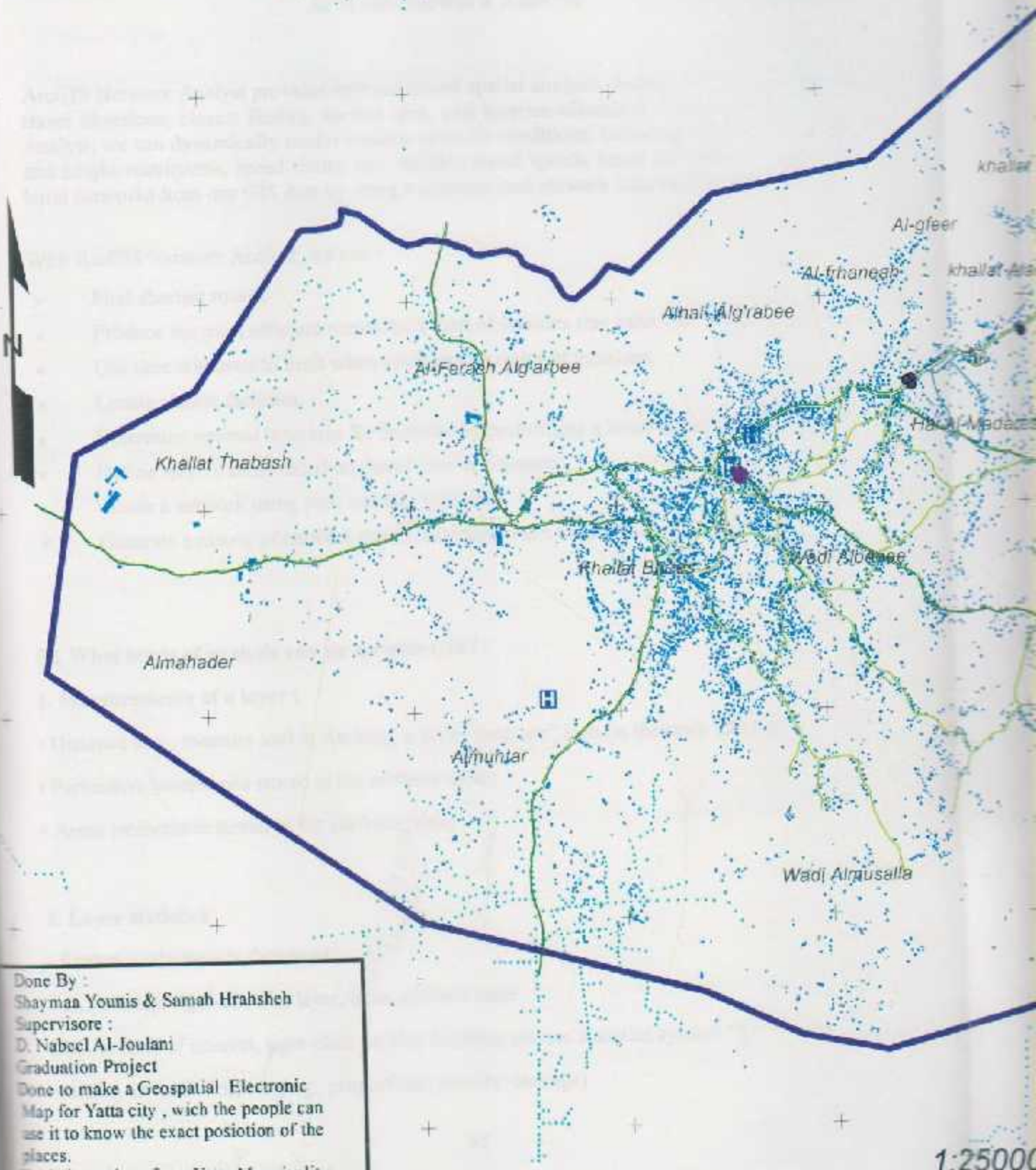
tta City , Figure (4.13)

Palestine Polytechnic University
جامعة بوليتكنك فلسطين
رابطة الخامعيين - الخليل

- University
- <all other values>
- Alkarmel Park
- Civil Defence Department
- Police Station
- Yatta Municipality
- Factore Stone
- Hospitals
- Major
- Minor
- Local
- houses
- Locatins

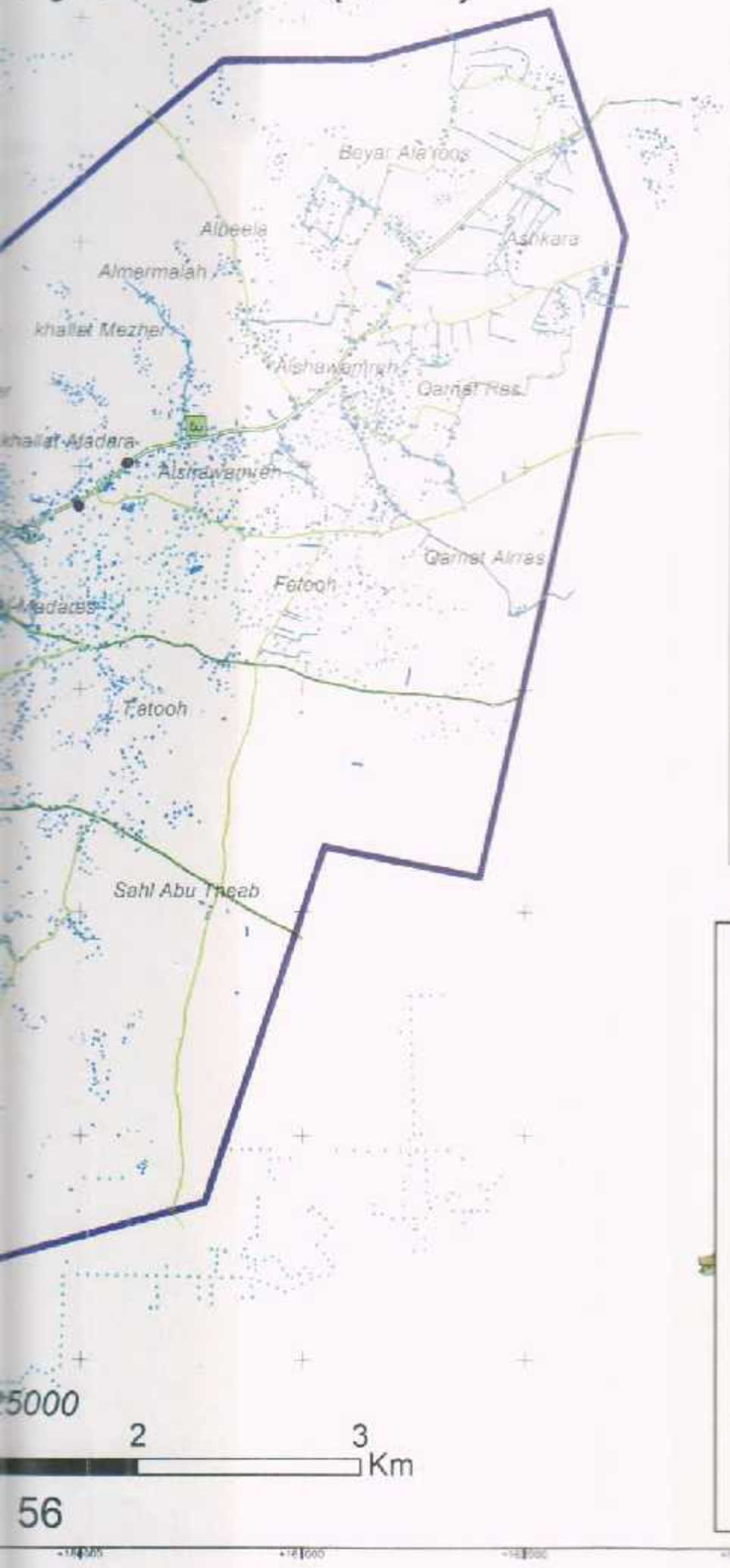


Important Sites of Yatta City



Done By :
Shaymaa Younis & Samah Hrahsheh
Supervisore :
D. Nabeel Al-Joulani
Graduation Project
Done to make a Geospatial Electronic Map for Yatta city , wich the people can use it to know the exact posiotion of the places.
The informations from Yatta Muncipality
Projection: Cassini
Coordinate System: Palestine Grid 1923
False Easting:170251.555
False Nacorthing:126867.909

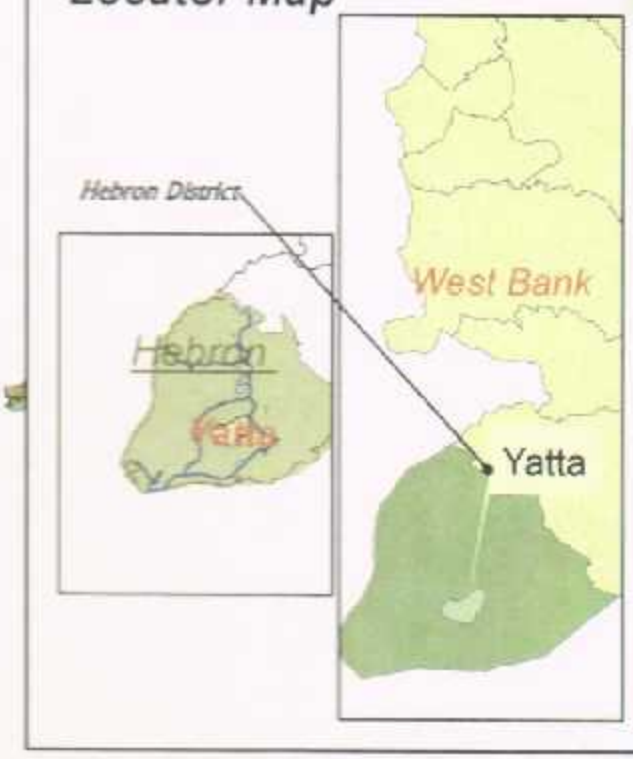
City , Figure (4.14)



Palestine Polytechnic University
جامعة بوليتكنك فلسطين
رابطة الخامعيين - الخليل

- University
- <all other values>
- Alkarmel Park
- Civil Defence Department
- Police Station
- Yatta Municipality
- Hospitals
- Major
- Minor
- Local
- houses
- Locatins

Locator Map



5000

2 3 Km

Chapter 5

ArcGIS Network Analyst

ArcGIS Network Analyst provides network-based spatial analysis, such as routing, fleet routing, travel directions, closest facility, service area, and location-allocation. Using ArcGIS Network Analyst, we can dynamically model realistic network conditions, including one-way streets, turn and height restrictions, speed limits, and variable travel speeds based on traffic. we can easily build networks from our GIS data by using a sophisticated network data model.

With ArcGIS Network Analyst, we can :

- Find shortest routes.
- Produce the most efficient routes for a fleet of vehicles that must visit many locations.
- Use time windows to limit when vehicles can arrive at locations.
- Locate closest facilities.
- Determine optimal locations for facilities by performing a location-allocation analysis.
- Define service areas based on travel time or distance.
- Create a network using your existing GIS data.
- Generate a matrix of network travel costs from each origin to all destinations.

5.1 What kinds of analysis can we do with GIS?

1. Measurements of a layer :

• Distance (e.g., measure tool in ArcMap, a little "measure" icon on the main tool bar)

• Perimeters (sometimes stored in the attribute table)

• Areas (sometimes stored in the attribute table)

2. Layer statistics

• Statistics of a layer's "attribute"

– In ArcMap, right-click on layer, open attribute table.

Choose field of interest, right-click on blue heading, choose statistics symbol "∑"

• Ratios of some attribute (e.g., proportions, density, average)

• Geostatistics

– Histogram

– Trend analysis

– Semivariograms (Variance based on nearby samples: a check for spatial autocorrelation)

– In ArcMap,

• Customize menu, Extensions, Geostatistical analyst extension

• Customize, toolbars, geostatistical analyst

• Geostatistical analyst, explore data option

3. Queries

• Select queries on the layer's attribute table

– ArcMap – selection menu, "select by attribute" queries

• Neighborhood analysis (queries)

– What's adjacent and what's nearby?

(In ArcMap – selection menu, "select by location" queries)

• Sampling (select some features and create a new layer based on the selected features)

4. Buffering (vector); Proximity (raster)

a. Buffering (Vector)

• Buffer at a specified distance; At a distance from an attribute field; and As multiple rings at a defined increment.

• In ArcMap: Geoprocessing, buffer; In ArcToolbox: Analysis tools, Proximity, Buffer.

b. Proximity (Raster)

• Concentric equidistant zones established around a starting point

• Uses one raster layer, result is another raster layer where the attribute of each cell is a measure of distance.

• In ArcMap ,Spatial Analyst Tool, distance, allocation (ArcTools refers to this as "Euclidian allocation)

5. Filtering (raster)

• Value of a cell are changed based on attribute values of other cells

• Different approaches min value, max, mean, modal

• Often used to "smooth" noisy data (e.g., seams between two digital elevation models)

6. Map overlay (layer on layer selections)

• Point-in-Polygon is used to find out the polygon in which a point falls

• Line-in-Polygon: Used to find out what polygons a line falls within

•Vector Overlays: Polygon on Polygon

• ArcToolbox , Available Functions:

– Union.

– Intersect.

– Clip (cookie cutting).

– Merge , appends two or more layers together to create a new layer

– Dissolve, reduces number of features by merging adjacent features with the same attribute value. Creates a new layer

In ArcMap , all under Geoprocessing menu.

7. Transformations

• Functions to transform a layer of one feature type to another.

Some examples:

– Point to line: interpolation (contour mapping)

– Point to polygon: buffering

– Polygon to polygon: dissolve/merge

• Raster to vector conversion

– In ArcMap, 3-D analyst extension, convert, raster to features. OR ArcToolbox, 3-d Analyst Tools, Conversion, from raster

• Vector to raster conversion

– In ArcMap, ArcToolbox, Conversion Tools, to Raster

• Raster to Triangular Irregular Network (TIN)

– In ArcMap, 3-D analyst extension, conversion, raster to TIN

• Resampling a raster grid – convert one cell size to another cell size

8. Reclassification

• Converting attribute table field values to some new field and values

• Can be done in vector or raster

• In ArcMap :

1)- edit the layer using the editor toolbar

2)- Open its attribute table

3)- options, add new field

4)- right click on new field heading, choose field calculator– Raster – either: Spatial analyst, reclassify or raster calculator options; or in 3-D analyst "Reclassify".

5.2 Network analysis in this project

It should be noted that network analysis for pharmacies, health centers and stone cutting facilities are conducted in this research to indicate the best and short paths to reach these facilities in case of emergency.

In this project :

1)- We use shortest route for Abu AL-Hasan AL-qasem governmental hospital, this route start from Zif (Entrance to the city) to the hospital as shown in figure (5.1).

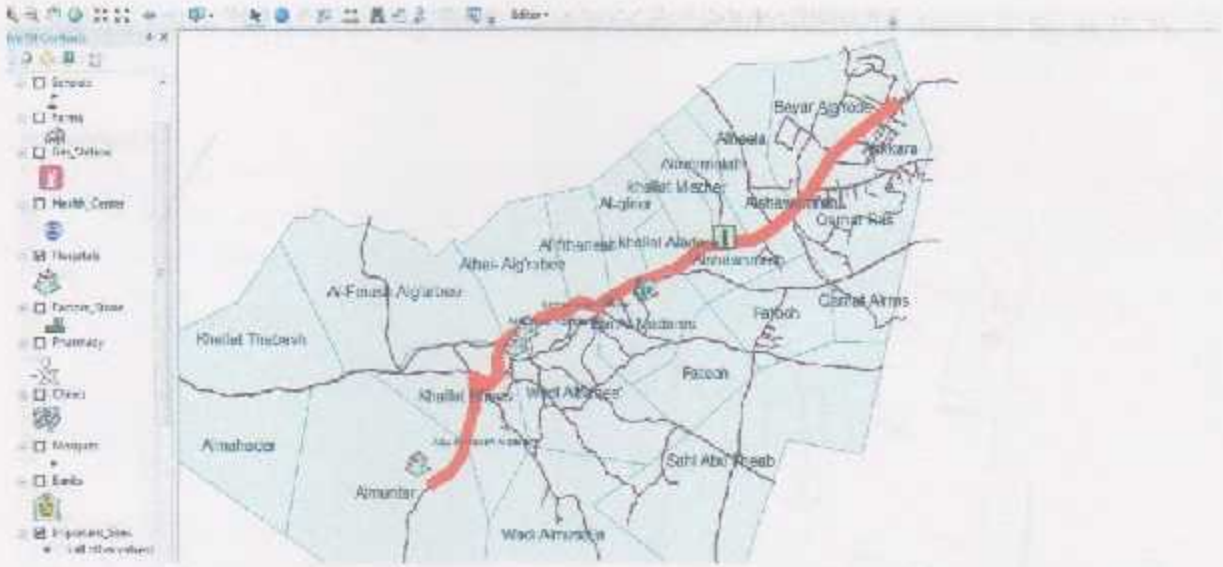


Figure (5.1): Shortest route for Abu Al-Hasan AL-qasem hospital

2)- We use buffer for Pharmacies at distance of 100 meters as shown in figure (5.2).

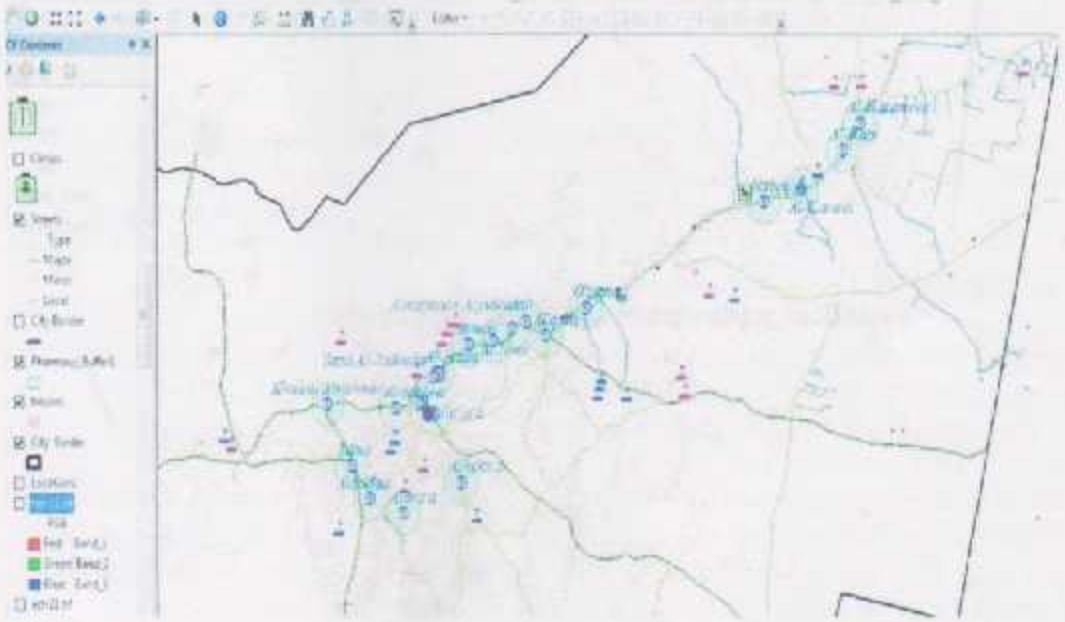


Figure (5.2): Buffer for Pharmacies

3)- we use buffer for stone cutting facilities at distance of 200 meters as shown in figure (5.3).

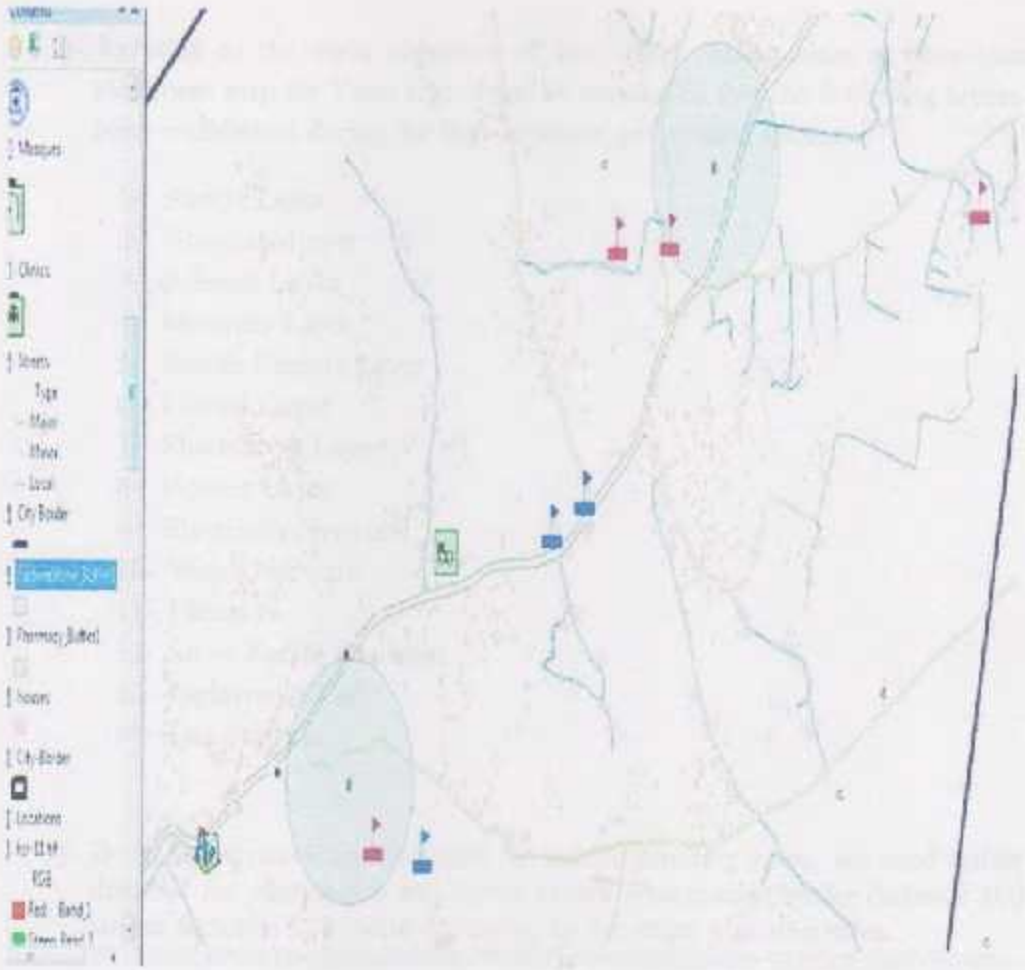


Figure (5.3): Buffer for stone cutting facilities

Conclusion

1)- Refering to the main objective of this study, which aims at developing a geospatial electronic map for Yatta city, it can be concluded that the following layers of the map has been established during the first semester and second semester:

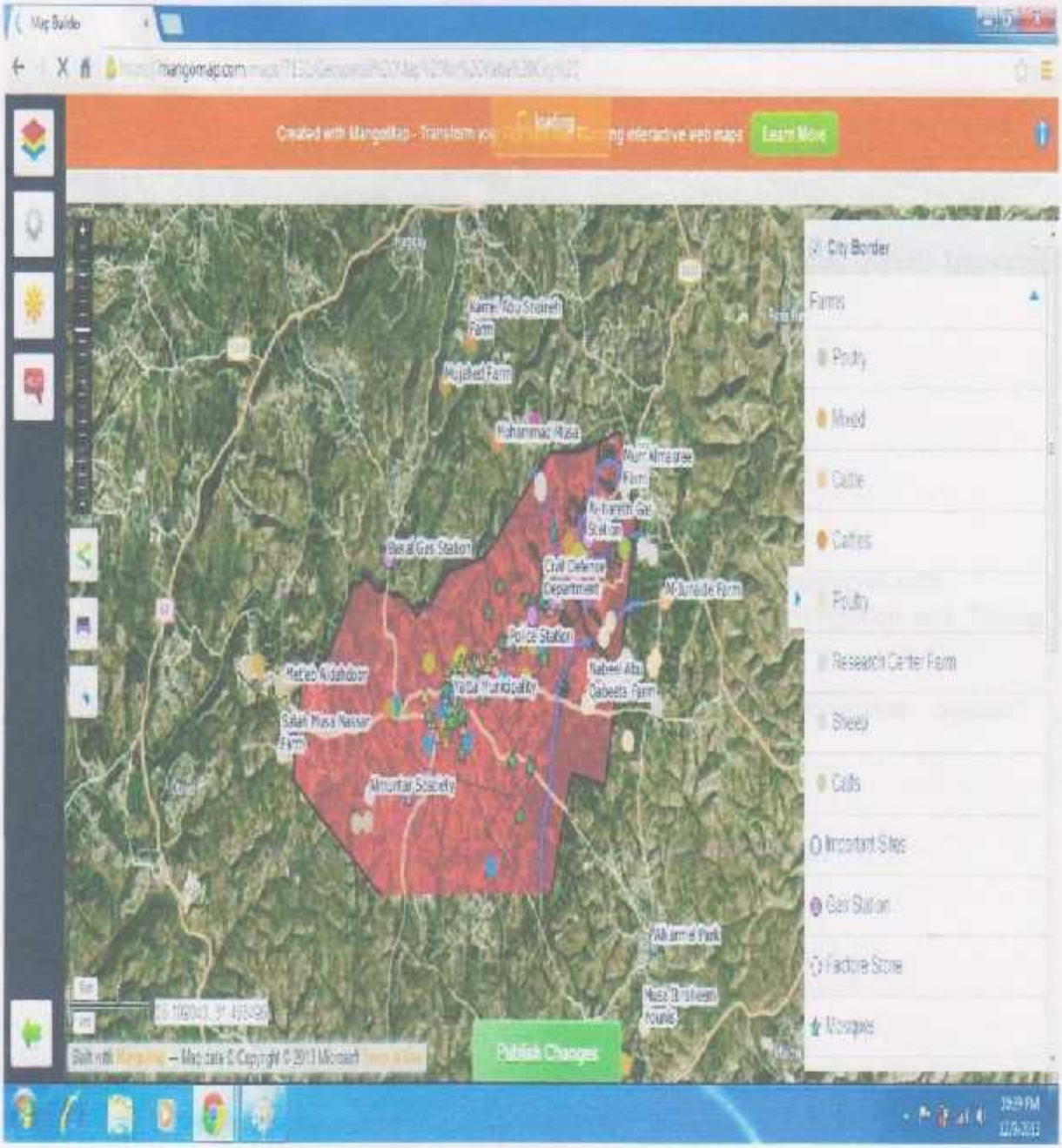
1- Streets Layer
2- Hospitals Layer
3- Schools Layer
4- Mosques Layer
5- Health Centers Layer
6- Clinics Layer
7- Pharmacies Layer
8- Houses Layer
9- Electricity Network
10- Water Network
11- Farms
12- Stone Factor Facilities
13- Important Sites
14- Gas Stations

2)- By using network analysis and the urban planning rules, we used buffer at a specified distance for pharmacies and factor stones. Pharmacies buffer distance 100 meter and for stones factories 200 meter according to the urban planning rules.

It has been noticed that at the center of the city there was overcrowding in pharmacies result from overlap of buffers of each pharmacy and the tow stone factories which located within the city border. It should be pointed that a buffer zone of 200 meters diameter of land contamination surrounding each stone factor, there for according to Authority of Environment affairs, these factories should be removed out of the city.

3)- The geospatial electronic map for Yatta city was linked and uploaded to the internet by using Mango Map which is the fast, simple and affordable way to publish impressive interactive web maps and makes it easy to transform our GIS data into web map applications that can be shared publicly or privately, 14 layers uploaded on Mango Map with several files : shp file , dbf file , shx file and prj file.

Finally the shape of the Map has been created and the link is http://bit.ly/K9HRfn.



Geospatial Electronic Map for Yatta City

References

1. Yatta Municipality, Planning and Engineering department, personal communication, 2013.
2. The Applied Research Institute-Jerusalem (ARIJ), 2007.
3. Bylinsky, Gene, "Managing with electronic maps," Fortune, April, Important popular review of GIS as a decision tool, 1989
4. GIS Course, Maher owawi , 2011.
5. Cartography Course, Ghadi Zakarneh , 2013 .

The websites references:

1. Supergeo Technologies Inc (2001) , GIS Applications , www.supergeotek.com
2. National Coordination Office for Space-Based Positioning , Navigation and Timing , (2012) , GPS Applications , www.gps.gov
3. USGS Eastern Region PSC4 ,(2007), "Geographic Information System" , http://egsc.usgs.gov
4. Wikimapia 2013, http://wikimapia.org
5. IT Department GIS , Hebron Manucipality , http://gis.hebron-city.ps

Appendix

Schools Information:

Table (A-1) : Schools Information

Name	Type	Level	Number of Classes	Number_of Workers
Ali Eyad School	Boys	Basic	15	26
meen School	Boys	Basic	18	26
nsaar School	Boys	Basic	11	25
saar School	Girls	Basic	9	11
ra' School	Girls	Basic	12	18
eela School	Mixed	Basic	9	14
Huda School	Girls	Basic	18	30
thameah School	Girls	Basic	13	25
akhra School	Girls	Basic	15	22
sa' School	Girls	Secondery	17	32
'moon School	Boys	Basic	18	32
nsoor School	Boys	Basic	20	29
'tasem School	Boys	Basic	14	23
thanna Ben haretha School	Boys	Secondery	16	29
Ben Al-A'zwer School	Boys	Basic	19	29
z School	Mixed	Basic	14	23
mah Alsa'dea School,	Girls	Basic	11	18
' School	Girls	Secondery	17	30
aymea School	Boys	Basic	22	32
l Al-Sare' School	Mixed	Basic	18	28
Salama School	Girls	Basic,	17	26
Basic School	Girls	Basic	21	30
Secondery School	Girls	Secondery	15	28
Secondery School	Boys	Secondery	18	35
Ben Abe Waqas School	Boys	Basic	17	28
adaa Yatta	Girls	Secondery	15	24
Al-Somoud	Girls	Basic	20	32
Alnetaqeen School	Girls	Basic	16	25
Basic School	Boys	Basic	12	20
Secondery School	Boys	Secondery	15	29
Secondery School	Girls	Secondery	17	28

Hospitals Informaion

Table (A-2) : Hospitals Information

Abu Al-Hasan Alqasem
Al-E'tmad Hospital
Mohammad Nasser

Pharmacies Information

Table (A-3) : Pharmacies Information

Name
Al-Harameen Pharmacy
Al-Huda Pharmacy
Al-Karmel Pharmacy
Al-Ilo'lo'a Pharmacy
Al-Noor Pharmacy
Al-Razy Pharmacy
Al-sakhra Pharmacy
AL-Salam Pharmacy
Albra'a Pharmacy
Alhekma Pharmacy
Alma'moon Aljadeedah Pharmacy
ALquds Pharmacy
Alshefaa Pharmacy
Ayman Pharmacy
Khaleel Alrahman Pharmacy
Lana Pharmacy
Nabeel Pharmacy
O'sama Pharmacy
Yatta Al-Jadeeda Pharmacy

Roads Information

Table (A-4) : Sample of Roads Information

FID	Type	Width
0	Major	16
1	Major	16
2	Major	16
3	Major	16
4	Major	16
5	Major	16
6	Major	16
7	Major	16
8	Major	16
9	Major	16
10	Major	16
11	Major	16
12	Major	16
13	Major	16
14	Major	16
15	Major	16
16	Major	16
17	Major	16
18	Major	16
19	Major	16
20	Major	16
21	Major	16
22	Major	16
23	Major	16
24	Major	16
25	Major	16
26	Major	16
27	Major	16
28	Major	16
29	Major	16
30	Major	16
31	Major	16
32	Major	16
33	Major	16
34	Major	16
35	Major	16
36	Major	16

Mosques Information

Table (A-5) : Mosques Information

Name
Abu Huraira Mosque
Al-fath Almobeen Mosque
Al-kabeer Mosque
Al-ma'moon Mosque
Al-Noor Mosque
Al-omari Mosque
Al-Rahmah Mosque
AL-Salam Mosque
Al-Ssadeq Ala'meen Mosque
Al-Tabe'een Mosque
Al Yaser Mosque
Alda'wa Mosque
Ali Ben Abu Taleb
Alshuhada' Mosque
Alssahabah Mosque
Alssakhra Mosque
Ammar Ben Yaser
Ben Taymeah Mosque
Ebad Al Rahmaan Mosque
Khaled Ben Al-Waleed Mosque
Omer Ben Alkhattab Mosque
Salah Al-deen Mosque

Clinics Information

Table (A-6) : Clinics Information

Name	Type
Abdullah khdoor	General
Abu Queeder	Mixed
Ahmed Etaia Clinic	Dental
Akram Alsalameen Clinic	Dental
Al-Amal Clinic	General
Al-salam Clinic	Mixed
Al-Snabel Clinic	Vetrenary

alorobeah Clinic	Dental
Alta5asoseah Clinics	Mixed
Aysha Rasheed Clinic	Dental
Besaan Clinic	Dental
Habeeb Clinic	Mixed
Ibraheem Abu Sabha Clinic	Children
Ilham Abu Eram Clinic	Dental
Issa Dajneh Clinic	Surgery
Iyad Fanasheh Clinic	Dental
Jamal Alsrahneh Clinic	Dental
Jebreel Dajneh Clinic	Dental
Mohammad Ismaeel Jbour	Children
Mohammad Issa Awad Clinic	Dental
Muath Fadel Abu Iram Clinic	Dental
Murad Alnwaja'a Clinic	Dental

Health Center Information

Table (A-7) : Health Center Information

Health Center
Govermental Health Center
Fadi Health Center
Govermental Health Center
Al-salam Health Center
Al-helal Health Center

Electricity Network Information

Table (A-8) : Sample of Electricity Network Information

Layer	Entity	RefName
LV	Insert	D
LV	Insert	D
LV	Insert	D
LV	Insert	EP
LV	Insert	EP
LV	Insert	EP

LV	Insert	EP
LV	Insert	EP
LV	Insert	EP
LV	Insert	EP
LV	Insert	EP
LV	Insert	EP
LV	Insert	EP
LV	Insert	EP
LV	Insert	EP

Farms Information

Table (A-9) : Farms Information

Name	Type
Abdullah Aldahdoor Farm	Calfs
Abed Hammad Ed'ees Farm	Calfs
Abo Elian Farm	Poultry
Abu Qabeeta Farm	Poultry
Ahmad Ismaeel Dababse	Mixed
Ahmed Alemoor	Poultry
Al-Junaide Farm	Cattle
AlJonaidee Farm	Cattles
Almuntar Sosciety	Sheep
Ayed Alshwaheen Farm	Sheep
Azeez Shatat Farm	Sheep
Emad Abu Samra Farm	Calfs
Fares Abada Farm	Sheep
Hebron Uneversity	Research Center Farm
Ibraheem Aldahdoor Farm	Sheep
Ibraheem E'teah	Sheep
Issa Abu Hassan Farm	Cattles
Jadallah Daowd Farm	Cattles
Kamel Abu Snaineh Farm	Cattles
Kamel Alsaree'	Sheep
Khaleel Abada Farm	Sheep
Maher Abu Shaker Farm	Sheep
Majed Abada	Calfs
Met'eb Aldahdoor	Mixed

Mohammad Abu Jandea Farm	Poultry
Mohammad Abu Sabha	Poultry
Mohammad Hammad Ed'ees Farm	Sheep
Mohammad Musa	Catties
Mujahed Farm	Catties
Murr Almasree Farm	Sheep
Musa Abu Sabha Farm	Poultry
Musa Ibraheem Younis	Sheep
Nabeel Abu Qabeeta Farm	Poultry
Omar Isaa Ed'ees Farm	Mixed
Rateb Abu Zahra Farm	Poutry
Salah Musa Nassar Farm	Sheep
Salem Alnwajaa Farm	Poultry
Saqer Abu Shaker Farm	Sheep
Taleb Abu Zahra Farm	Poutry

Gas Stations Information

Table (A-10) : Gas Stations Information

Al-hareth Gas Station
Al-Rebatt Gas Station
Nassar Gas Station
Al-Kathem Gas station
Basal Gas Station

Stone Cutting facilities Information

Table (A-11) : Stone Cutting Facilities Information

Al-rashdeen Factor
Muhammad Musa Nassar Factor

Historical and important sites Information

Table (A-12) : Historical and Important sites Information

Name
Yatta Municipality
Alkarmel Park
Police Station
Housing Bank
Palestine Bank
Arabic-Islamic Bank
Jordan Bank
Civil Defence Department