Ecological design of outdoor gardens in oil companies in Basra Governorate, Southern Refineries Company

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Abstract: This study aims to develop an integrated framework for the design of open outdoor spaces in oil companies' sites in Basra Governorate, in order to improve the efficiency of these sites. These objectives come in response to the urgent need to design aesthetic and functional work spaces that take into account the environmental characteristics of the region, which contributes to enhancing the health and safety of workers and reducing the harmful environmental impacts resulting from oil operations. The study is based on an applied field methodology consisting of three main stages; the first stage begins with conducting a comprehensive field survey of the site, in the second stage, collecting information and documenting the current situation using photography, observations and spatial analysis techniques, and finally, in the third stage, proposed design models are prepared using the AutoCAD program. The results of this study show the importance of designing outdoor spaces in oil companies' sites and their direct impact on employee comfort and productivity. Employees expressed various preferences, including increasing green spaces, reducing environmental pollution, improving facility design, and providing a diverse and aesthetic environment, reflecting their desire to integrate nature into the work environment. These results reflect the need to rethink the design and planning of outdoor spaces in line with employee needs and enhance the quality of the work environment.

Keywords: Outdoor spaces, ecological design, oil companies' gardens, Basra Governorate.

Introduction:

In light of the environmental challenges facing oil companies, phytoremediation plays a pivotal role in achieving sustainability. It is important to note the importance of using plants to treat pollution and improve the environment surrounding oil company sites in Basra Governorate.

Phytoremediation is one of the modern biological techniques used in designing gardens for outdoor spaces, especially industrial areas, where natural plants are used to enhance the decomposition and removal of pollutants from the soil and purify the air on a large scale. The use of plants as a method of phytoremediation is a cost-effective element in large areas that suffer from high levels of pollution ((Roopa, et al., 2004)

Garden design is the organization of parts of the outer space in a complex artistic way to reach an organized form and thus obtain good coordination. It is a scientific artistic process that means coordinating and beautifying the environmental and living characteristics of a specific area. It is also one of the methods of visual and environmental balance that continues in its goal of maintaining the site in which it is established (Ingram, 2012).

Study aims:

1. Preparing innovative detailed plans for environmental designs that are an aesthetic attraction point that helps create a model environment to make sites healthy and safe in the service of all workers.

2. Determining the plant design treatments that will be employed to reduce the impact of pollutants resulting from within or near sites after analyzing the reality of the area of these spaces and choosing plants that have the ability to store pollutants in their leaves or treat pollution and reduce it as much as possible.

3. Establishing a fence for the entire site with trees and shrubs to reduce air pollution that works to capture fine and gaseous pollutants to provide a real environment for the area and protect it from the effects of wind and sand and to reduce carbon emissions as wind and dust have a strong effect as it is an isolated open land.

Ecological park concept.

An eco-park represents a group of industrial or agricultural facilities that cooperate with each other and with the local community to reduce the consumption of resources, waste, and emissions, and to increase production efficiency and economic, environmental, and social benefits. The environmental dimension of the eco-park is represented in the application of the principles of industrial ecology, which is the science that studies the relationships between industrial systems. And the natural

environment, and aims to transform industrial systems from linear to circular, so that they become able to reuse and recycle materials and energy between various processes and products. The agricultural dimension of the ecological park is the integration of agricultural activities with industrial activities, so that agriculture benefits from the materials and energy resulting from industry, and industry benefits from the materials and energy resulting from agriculture, thus achieving integration, diversity and balance between the two systems (Ibes, 2016).

Elements of environmental balance in the ecological park

• Vegetative cover: Authentic plant species that suit the local environment and climate of the site are selected, with diversity among trees and shrubs to achieve different levels of vegetation cover. Care is also taken to coordinate specific plant groups in specific places to create suitable habitats for some beneficial birds and insects.

• Paths and squares: They are arranged between the planted areas in a way that allows parts of them to be shaded during specific periods of the day, while providing open areas for visitors to gather, as well as providing dirt or gravel paths for rainwater to seep into the ground.

• Lakes: To attract some water birds and add an element of movement and visual and auditory beauty, while avoiding the waste of water as it is a precious and limited resource.

• Paths and squares: They are arranged between the planted areas in a way that allows parts of them to be shaded during specific periods of the day, while providing open areas for visitors to gather, as well as providing dirt or gravel paths for rainwater to seep into the ground.

• Educational and cultural attractions: such as informational and informative panels about plants and their environmental contributions, and holding environmental workshops and seminars periodically (Paudel and States, 2023).

Sustainable practices in planning and designing the ecological park for outdoor spaces

Practices are a set of ideas, methods and techniques that aim to achieve harmony and synergy between industrial, agricultural and natural systems, and improve the quality of the environment, society and the economy. Some of these practices are:

• Using available, renewable and local resources, energy and materials efficiently and responsibly, and reducing consumption, waste, emissions and pollution.

• Reusing, recycling and converting industrial, agricultural and household waste into new materials, energy and products with added value and economic and social benefits.

• Integrating agricultural activities with industrial activities so that materials, energy and products are exchanged between them, and increasing diversity, integration and balance between the two systems.

• Providing green and open spaces for entertainment, education, social communication and alleviating life stress, and improving public health, psychological and aesthetic comfort.

• Improving the characteristics, functions and services of the natural environment, such as soil, water, air, climate, plant and animal life and biodiversity.

• Promote the values, identity, culture, history, religion and ethics of outdoor spaces, and increase environmental awareness, responsibility and participation (Huang et al., 2018).

Elements and components of design in the ecological park

The elements of site coordination contribute to improving the efficiency of spaces by providing a suitable environment for a variety of activities, representing a comprehensive framework for natural and industrial resource management systems. At present, many studies and research have indicated air pollution and increased interest in this issue and the trend towards air purification sources and reducing pollution rates by moving towards ecological elements and the basis of their work using natural components, sustainability and recycling

Figure (1): Shows the design elements and components of the ecological park.

Natural components of the ecological park: Site coordination elements play a vital role in enriching the aesthetic and functional values of outdoor spaces through the use of natural elements that contribute to creating a comfortable and attractive environment that combines beauty and function, to achieve a sustainable and comfortable environment that meets the needs of individuals and enhances the quality of the environment. The role of natural elements such as plants and trees that provide shade and contribute to improving the general atmosphere is based on this. Trees, shrubs and green spaces are considered among the best means of controlling sunlight, as they reduce the temperature, moderate the atmosphere, improve the hot climate and provide shade (Noah, 2011). They also have a clear and essential role in removing and purifying the air from dust, because their leaves intercept and deposit tons of dust carried in the air. Most trees also lead to reducing and alleviating the concentration of toxic and polluting gases in the atmosphere, as they reduce the concentration of carbon dioxide resulting from fuel combustion, and during the process of photosynthesis, they increase the concentration of oxygen gas (Al- Qaiei, 1993).

Industrial components of the ecological park: The industrial elements of the ecological park focus on the principle of recycling and using supportive, environmentally friendly elements with few side effects to limit or reduce pollution, in addition to the psychological and aesthetic aspect, as the focus of designs on ecological industrial elements while ensuring the aesthetic aspect to provide a safe environment for workers on sites. For example, dedicated paths can be designed for pedestrians, ensuring the idea of recycling natural elements in their basic components, such as using natural stones in paving paths to facilitate movement and mobility within outdoor spaces. Walking is considered one of the most important means of transportation in outdoor spaces, and it requires providing comfortable and safe paths for pedestrians. These paths can include shaded areas, comfortable flooring materials, sitting and waiting are basic activities that require providing comfortable and safe places. This can be achieved by designing comfortable seating areas equipped with shaded wooden seats made from recycled tree wood or stone seats made from natural stones. These places can also be provided with aesthetic elements such as fountains to contribute to adding an aesthetic aspect (Zakaria, 2010). Integrating natural and man-made elements in the design of spaces is essential to achieving these goals, contributing to the development of integrated and balanced communities. While natural elements focus primarily on environmental aspects, it is also important to take aesthetic and functional considerations into account when designing and implementing green spaces in oil company sites. Combining these factors contributes to creating a healthy and comfortable working environment for employees, and enhancing the company's public image (Yassin, 2015).

Field Study

The field study included three main stages:

1. The first stage: Studying the field reality of the selected samples.

2. The second stage: Sample analysis through repeated field visits and field survey of sample sites within the selected sites.

3. The third stage: Proposing designs based on the field reality of the companies.

Southern Refineries Company

Location: Basra / about 600 km south of Iraq.

Establishment: 1969

Area: The total area is approximately 680 acres / including (20,500) m2 occupied by factories and administration.

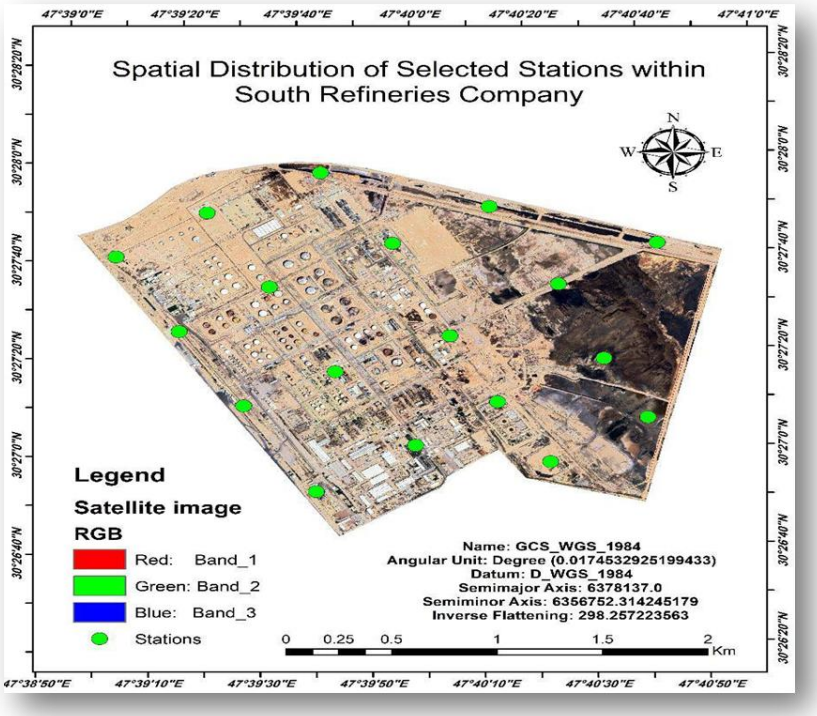

Figure (2) shows the location of the southern refineries using the (GIS) program / researcher's work

Historical background of the site

It is one of the formations of the Ministry of Oil, specializing in refining crude oil and producing gasoline, white oil, gas oil, diesel oil, fuel oil, marine fuel oil, liquid gas, jet fuel, and fat manufacturing, in addition to manufacturing plastic containers for filling fats of various sizes and manufacturing iron barrels.

It is one of the 16 companies affiliated with the Iraqi Ministry of Oil, and production actually began in 1974 with (the first refining unit). It is one of the largest transformation companies in the country, as it produces petroleum derivatives using the latest scientific and technological methods developed in production, which are comparable in quality to foreign products and meet consumer requirements. The company continues to expand, diversify its products and improve their quality, as

a second refining unit was established in 1976, and work is currently underway to qualify the company to obtain the ISO quality performance certificate.

Site Analysis

Site analysis is one of the important basics in determining the strengths and weaknesses of the selected samples:

1. External spaces

The external spaces of the site were distributed in different areas and spread around the existing urban distribution in the site, as most of these areas are allocated in the future for service investment and because they are oil lands, and therefore the site requires a comprehensive understanding of the nature of these areas.

2. Entrance Analysis

The site contains two entrances

The main entrance is preceded by a long road and then a security control to inspect and verify visitors to the site and maintain safety, and in it private and public cars are prohibited from entering for all visitors and only entry is for the site's transport vehicles and personal cars for administrative figures only.

As for the second entrance, it is designated for the entry of large vehicles and work, maintenance and construction tools, and transport vehicles and personal cars are not allowed to pass through it.

3. The facade

It is the first attraction of the site, as it is the first image that suggests the importance of the place. It was noted during the field visit that there was no element of attraction or interest in the facade of the site. It was only an arched canopy headed by the site's security protection employees and a side building concerned with inspection and security permits for entry.

4. Movement paths and pedestrian roads

The pedestrian roads were distributed within the external space of the site in an organized manner in the form of a network of paths connecting the external gates and administrative buildings. This

network included a number of secondary branching paths. The pedestrian roads were coordinated with the movement paths within the external spaces surrounding the urban facilities and were covered with muqarnas stone.

As for the movement paths, they were covered with tiles and had an organized pattern and coordinated dimensions. The main path was a straight axial path extending from the main gate to the end of the site, and secondary paths branched from it to the ends and were between the production units of the site to represent a network of continuous and branching paths.

5. Parking

There are a number of parking spaces on site as follows:

The first parking space is close to the first security control of the site and is accessible to all employees and workers as well as visitors. It is a dirt area of land surrounded by a fence to define its area.

The second parking space is designated for workers' cars and transport vehicles and is located near the main gate of the site. It has been given attention and a number of canopies have been allocated to provide shade for cars. The ground has also been covered with an asphalt layer to get rid of dust.

As for the third parking space, it is located inside the site near the administration building and includes a number of units designated for parking cars and has been equipped with shading.

6. Natural and structural components

* Natural components. Plants:

The presence of the plant element was noted when conducting a field survey of the vegetation cover to a small degree in terms of density and field expansion compared to the total area of the site and also in terms of urban expansion and the number of workers on the site. There was a garden near the main gate and it was the largest and most attractive among the green spaces on the site with an area of approximately 5000 m2, but it lacked coordination and attention. The dominance was primarily for Conocarpus erectus trees and secondarily for Phoenix dactylifera palm trees and natural turf, rose flowers, shrubby myna, bougainvillea, dahlia, oleander, petunia, and local jasmine. These flowers were planted during field visits in the fall.

* Structural components:

The field visit to the site noted that the outdoor spaces were devoid of seats or benches of all shapes, whether stone or plastic. It was also noted that there were no umbrellas to provide shade while waiting or resting, which is useful in protecting against the sun's rays and high temperatures in the summer.

A large display screen was seen near the main gate of the site, through which new instructions are launched on the site to inform all workers on the site or to display the general idea of the site.

There was a model on the site in the outdoor space of the site that represented or suggested the idea that indicates the nature of the site and its importance.

• The design idea of the site:

Two sites were identified to propose the formative designs within the company's outdoor space, as follows:

The first site A: near the company's main administration, which was a garden and a clock, but it lacked the aesthetic and environmental aspect in terms of interest and coordination, as it was planted with cynocarpus palm trees randomly and spread throughout the garden area.

The design proposal was to design the space in an engineering style, where the space was divided into two symmetrical sides in terms of arrangement and plant content, divided by a main corridor extending along the space. The proposed plants in the design were distributed between trees, palms, shrubs, annual flowers and lawn plants, so that the space would be covered in green as a basic color, and the plant colors of the flowers would be distributed in a coordinated manner on both sides of the proposed design. The second site B: In the back area of the administration, the area was deserted and contained industrial waste and garbage, and was devoid of plant presence in the place. The design proposal followed was in a modern style, and the paths were distributed in a curved and straight manner within the proposed design.

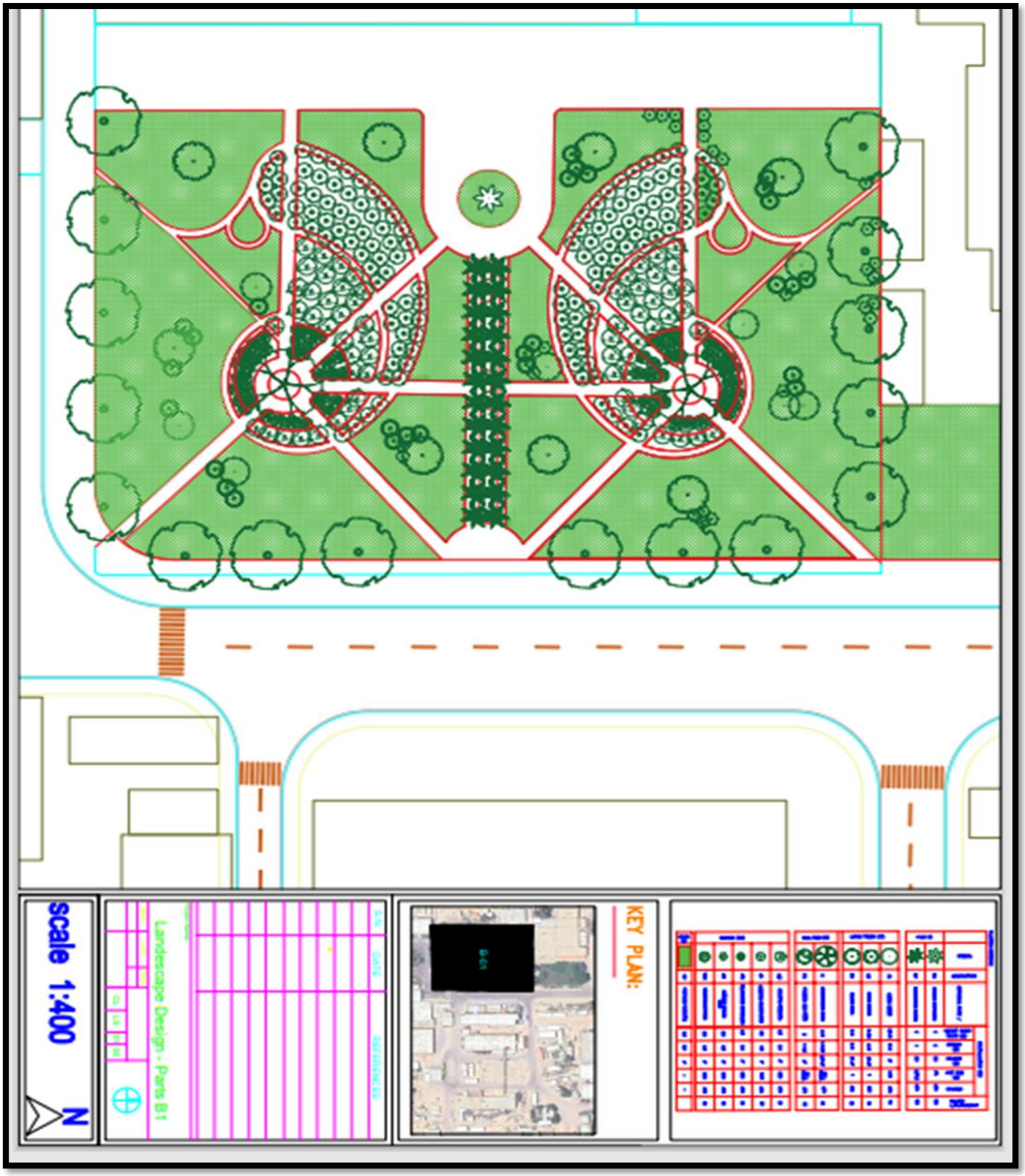

Figure (3) shows the design plan of the Southern Refineries Company / A1 / 2D AUTOCADE

Figure (4) shows the design plan of the Southern Refineries Company / A2 / 3D AUTOCADE

Figure (5) shows the design plan of the Southern Refineries Company / A3 / 3D AUTOCADE

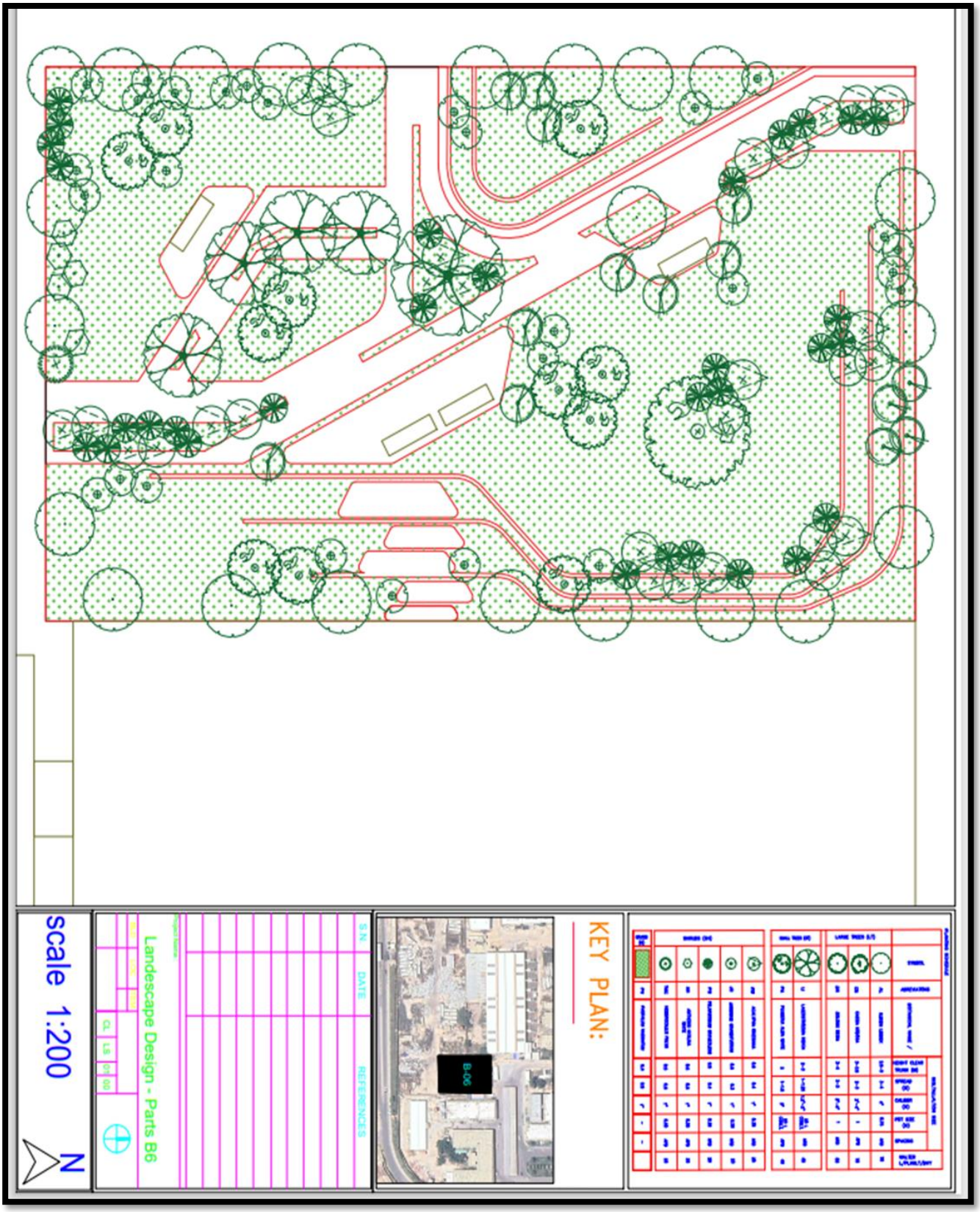
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Figure (6) shows the design plan of the Southern Refineries Company / B1 / 2D AUTOCADE

Figure (7) shows the design plan of the Southern Refineries Company / B2 / 3D AUTOCADE

Figure (8) shows the design plan of the Southern Refineries Company / B3 / 3D AUTOCADE

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