THE GARDEN
RESIDENCE

ENVIRONMENTAL IMPACT ASSESSMENT

OF

THE GARDEN RESIDENCE PROJECT, PLOT NO. 8, 10TH AVENUE, OPPOSITE F-9 PARK, SECTOR F-10 MARKAZ, ISLAMABAD

Final Report

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Executive Summary

Title of the Project

This report presents the findings of "Environmental Impact Assessment (EIA) of The Garden Residence Project, 10th Avenue, Sector F-10 Markaz, Islamabad".

The EIA study aims to identify the possible environmental and social impacts of the proposed project on its immediate surroundings on both short and long-term basis, suggesting mitigation measures and identifying responsible agencies to implement those measures.

Location of the Project

The project site is located on Plot # 8, Service Road East, Opposite F-9 Park, Sector F-10 Markaz, Islamabad, on land measuring 105,750 sq. ft. (225'x470'). The project site can be accessed from Nazim-ud-din Road and Ibn-e-Sina Road from the south, through Service Road East in the West, and through Jinnah Avenue from the north side of the project site. The coordinates of the project site are 33°41'24.4212" N, 73°1'0.3468" E.

Name of Proponent and Organization preparing the Report

M/s FG Investments, Islamabad is the proponent of the project.

M/s Project Procurement International, an Environmental and Management Consultancy Firm, Islamabad has prepared the Environmental Impact Assessment of The Garden Residence Project.

Outline of the Project

"The Garden Residence" is a project of M/s FG Investments at F-10 Markaz, along Nazimmuddin Road and Service Road East, and across the F-9 park.

The project consists of 2 towers. Tower A/B is a 28-storey residential building (3 basements + Ground + 24 Floors+ 2 Service Floors), with a height of approximately 318 ft. Towers A/B will cover an area of 10,390 sq. ft. Tower C is a 37-storey residential building (3 basements + Ground + 33 Floors+ 3 Service Floors) with a height of approximately 438 ft. Tower C will cover an area of 13,273.74 sq. ft. The project will be constructed on land measuring 21 kanals or 105,750 sq. ft (225'x470').

The Garden Residence Project will comprise of housing units of different sizes. The 3 basements will be used for residents' parking and the ground floor will be used for visitors' parking, with the facility of charging stations for electric vehicles. The covered area of the building is 1,030,623.84 sq. ft and it will be an exclusively residential building.

There will be total 328 housing units in the Garden Residence Project (188 in Tower A/B, and 140 in Tower C). The estimated occupnacy of the Garden Residence will be 1,968.

The total water requirement is approximately 415 cubic meter/day considering all the units while the total electricity load of the building will be 1.5 MW. The source of water will be CDA supply line and ground water will be used as an auxillary water source, IESCO will provide the electricity connection.

The total cost of the project is Rs. 5 billion and will be expected to be completed in 4 years.

Environmental Baseline Conditions

To assess and evaluate the impacts and related mitigation measures, in the project area, existing conditions of physical, biological and the socio-economic environment were studied as under:

Physical Environment

Topography: The topography of Islamabad consists of plains and mountains. The northern part of the metropolitan area comprises the mountains terrain of the Margalla Hills. Rawal

Lake lies in the northeast just below the hills. The southern portion of this city is an undulating plain drained by Korang River followed by its tributaries. Towards the east is a relatively flat area with bare soil and settlements.

The project site is a plain land bound by Nazim-ud-din Road and Ibn-e-Sina Road from the south, Service Road East in the West, and Jinnah Avenue at the north side of the project.

Geology and Soil: The Potohar region has a complex geological history of mountain formation, alluvial-loessic depositions, and erosion cycles. Limestone is the characteristic rock of Margalla range. In age, it ranges from the Jurassic to Triassic. It is usually reddish or bluish-white, mixed or alternating with its beds of red or bluish clay or shades or sandstones. Adiala, Dhamial-Loibher forests are situated over alluvial deposits. The deposits contain small-sized rounded pebbles of sandstone, quartzite or granite and sand mixed or alternating with clayey deposits. They have been described as alluvial deposits, but it is equally probable that they have a glacial origin.

The project area's soil is composed of clay/silt formed of alluvial deposits laid by the past and present river system in varying thickness.

Surface Water: The Soan and Kurang Rivers are the main streams draining the area. Their primary tributaries are the Ling River, draining north-westward into the Soan; Gumreh Kas, draining westward into the Kurang from the area between the Kurang and Soan; and Lei Nala, draining southward into the Soan from the mountain front and urban areas.

The Kurang and Soan Rivers are dammed at Rawal and Sambli Lakes, respectively, to supply water for the urban area. Extensive forest reserves in the Kurang and Soan Rivers' headwaters benefit the quality and quantity of water supply.

There is no nullah or other surface water resource in the vicinity of the project site.

Ground Water: The groundwater depth in the project area varies from 400 – 500 ft.

Land Use: The project site can be classified as non-agriculture land.

Seismic Risk: Islamabad region can be divided into three major structural zones. The mountainous north, including Margalla Hills, is complexly folded and thrust along the Hazara Fault Zone. Southwards the mountains are a sloping piedmont bench that is truncated in sandstone and shale. The Soan River flows along the axis of Soan syncline. Islamabad lies just at the edge of Hazara Fault Zone, consisting of an arc of thrusted and folded rocks about 25km wide and 150 km long that is convex to the south and extends west-southward away from the Himalayan syntaxis. There are many thrust sheets in the Islamabad area. Some of these thrust faults are in front of Margalla Hills which extends north of Fatehjang and form Kala Chita Range.

Climate: Islamabad has distinct seasons marked by the wide variation in temperature. The climate remains very salubrious from April to October, but the winters get very cold due to snowfall. The coldest months are December, January and February. The hottest months are June and July. Rainfall in April and May is occasional, but the heaviest rain is in July and August.

The temperature of capital territory Islamabad ranges between -1 ^{0}C to 46 ^{0}C. The coldest month is January when the mean maximum temperature is 18.3 ^{0}C, and the mean minimum is 3.8 ^{0}C.

From February to May the temperature rises at the rate of 5.0 ^{0}C per month. The highest temperature reached in May when the mean maximum temperature remains 39.1 ^{0}C.

Air Quality: The ambient air and noise level monitoring was conducted on 26th February 2023 to 27th February 2023 for 24 hours at the project site.

The ambient air quality and noise monitoring was carried out by Pak - EPA Certified laboratory. The concentrations of SO_2, CO, NO, NO_2, O_3, PM_{10}, and $PM_{2.5}$, concentrations (i.e., 12.571

µg/m^3, 0.893 mg/m^3, 7.259 µg/m^3, 15.820 µg/m^3, 6.526 µg/m^3, 125.512 µg/m^3, 239 µg/m^3 and 32.982 µg/m^3) meet the NEQS limits (i.e., 120 µg/m^3, 5 mg/m^3, 40 µg/m^3, 80 µg/m^3, 130 µg/m^3, 150 µg/m^3, 35 µg/m^3).

Noise and Vibration: The averaged noise level during daytime was 66 dB and 59 dB during night time. Both values were exceeding the NEQs limits. The spike in noise levels can be attributed to the traffic on Service Road East and Jinnah Avenue. During the construction of the project, special care will be taken for noise and vibration.

Ecological Environment

Flora

The vegetation of Islamabad is a representative of Dry Subtropical Scrub Forest which is dominated by *Acacia modesta* (Phulai), *Ziziphus mauritiana* (Ber); *Ziziphus nummularia* (Mullah), etc. Other associates existing in varying proportions include *Prosopis cineraria* (Jand), *Melia azadirachta* (Dharek); *Morus alba* (Mulberry-Shahtoot); *Dalbergia sissoo* (Tahli-Shisham); *Acacia nilotica* (Kiker). In the undergrowth *Cannabis sativa* (Bhang), *Calotropis procera* (Desi Ak), *Parthenium hysterophorous* (Gandi Booti) and *Ocimum bacilicum* (Niazbo) are predominant.

Presently, the plot area does not have any tree.

Fauna

In its original form, the Dry Subtropical Scrub Forest constituted the habitat of wild fauna consisting of a host of animals and birds. As the disturbance increased to a maximum level with complete inhabitation, wildlife abundance and diversity decreased to a minimum. Mammals commonly found in the project area are Rat, Wild boar and Pocupine. Birds include Asian Koel, House Sparrow, Mynah and House Crow and reptiles common in Monitor Lizard, and Spin Tailed Lizard.

Socio-Economic and Cultural Environment

The socio-cultural and socio-economic conditions of Islamabad has been described in the report. This area may get direct positive or negative impacts from the construction of The Garden Rsidence Project.

Public Consultation

During the public and stakeholder consultation, meetings were held with the concern officials Proponent and the project's design team, CDA Environment Wing, Pakistan Environmental Protection Agency, Pakistan Metrological Department, Allama Iqbal Open University, environmental practitioners, the management of Silver Oaks, Real Estate Dealers and business owners and community living around the project site. The project activities that could impact the physical, biological, and socio-economic environment of the project area were highlighted to them. Stakeholders concerns regarding various aspect, existing environment, and impacts of the project were noted, and mitigation measures are proposed in the EIA report.

Much of the public consultation process has revolved around concerns for the mitigation of construction stage and operational stage impacts. The information obtained from the community was used to identify concerns and issues that have been subsequently mentioned and addressed in the EIA report.

Major Impacts and Recommended Mitigation Measures

Physical Environment

Impacts: Soil-related issues include soil erosion, slope stability, and soil contamination. The land clearing, levelling and grading, excavation and filling, construction activities, and equipment/vehicles maintenance may cause these issues. The soil quality would be affected, as soil contamination would occur because of the disposal of untreated wastewater or direct

disposal of chemical and onsite preparation of materials. Oils, chemical spills, and waste from the construction site may also deteriorate the soil's quality.

Dumping of construction wastes/excavated material in the surrounding area may limit land use in the project area. The solid waste may be generated due to different construction activities. It will mainly include surplus excavated and construction material.

Land-use change is expected during the construction phase, one at the burrow areas and others where the spoil or mucking material will be disposed of.

Construction machinery and project vehicles will release exhaust emissions, containing Carbon Monoxide (CO), Oxides of Sulfur (SO_x), Oxides of Nitrogen (NO_x), and Particulate Matter (PM). Also, various burning activities involved in roads construction will cause air pollution. These emissions can deteriorate the ambient air quality in the immediate vicinity of the project site. Furthermore, construction activities such as excavation, land levelling, filling and vehicular movement on unpaved tracks may also cause fugitive dust emissions.

Noise and vibration will be generated by construction machinery and vehicles.

During the deep excavation, the aquifer may be hit, and water quality will be depleted. Because of the preparation of construction material on-site, leachate may be produced and percolated through the soil. It may then reach the water table and contaminate the water.

The Garden Residence project is being developed in an area with a residential and commercial setting. There is very limited vegetation on the project site. However, still, there is a need to maintain much of its existing landscape and vegetation.

Mitigations: Soil erosion can be minimized by appropriate land clearing, levelling and grading. Excavated slopes will not be left untreated/unattended for long durations, and appropriate slope stabilization measures will be taken as per the design.

For the domestic sewage from the contractor's office, a septic tank with a soaking pit will be constructed having adequate capacity. Waste oils will be collected in drums and sold to the recycling contractor.

The recyclable waste from the project site (such as cardboard, drums, broken/used parts, etc.) will be reused or recycled or sold to recycling contractor. The hazardous waste will be kept separate and handled according to the nature of the waste. While storing, hazardous waste will be marked. Shade-loving plants will be planted to reduce the impacts of the shadows on the plants.

Ecological Environment

Impacts: The project area has a limited natural vegetation cover**.** The site preparation and construction activities may necessitate the removal of natural vegetation. Damage and/or loss of vegetation and clearing of other indigenous and introduced species and undergrowth species comprising bushes, grass, etc., may also be impacted.

Mitigations: Endeavors will be made to compensate for the loss by enhancing the environment, through a plantation of trees and ornamental plants. A plantation plan for The Garden Residence Project has been prepared. The plan has a mix of appropriate trees/bushes raised within the available open spaces at The Garden Residence Project. All preventive measures will be adopted to control the spill-over of chemicals and other effluents on the ground to protect soil fauna and ensure microbial activity according to the NEQS. A record will be maintained for any tree cutting.

Environmental Management Plan and Proposed Monitoring

The Environmental Mitigation Plan (EMP) aims to minimize the potential environmental impacts due to the project. The EMP reflects the commitment of The Garden Residence Project to safeguard the environment and the surrounding population. The EMP provides a

delivery mechanism to address the adverse environmental impacts, enhance the project's benefits, and introduce standards of best practices to be adopted for all project phases.

The contractor will prepare a Quarterly Environmental Monitoring Report of project activities carried out during the project's construction phase. These reports will be submitted to the Pakistan Environmental Protection Agency for their review and consideration. The total Environmental Mitigation & Monitoring Cost is **Rs. 24.34 million.**

Conclusion and Recommendations

Based on the overall impact assessment, more specifically, nature and magnitude of the residual environmental impacts identified during the present EIA, it is concluded that The Garden Residence Project is likely to cause environmental impacts during its constructional phase. However, these impacts can be mitigated. As mentioned in the report, the proposed project activities will be carried out, and the mitigation measures included in this report will be completely and effectively implemented.

There are no remaining issues that warrant further investigation. This EIA is considered adequate for the environmental and social justification of the project.

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List of Abbreviations

BOD	Biological Oxygen Demand
CO	Carbon Mono Oxide
COD	Chemical Oxygen Demand
E	East
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
Govt.	Government
GPD	Gallons per Day
HSE	Health, Safety and Environment
IEE	Initial Environmental Examination
N	North
NCS	National Conservation Strategy
NE	North-East
NEQS	National Environment Quality Standards
NOC	No Objection Certificate
Nos	Numbers
NO_x	Nitrogen Oxides
Pak-EPA	Pakistan Environmental Protection Agency
PEPA	Pakistan Environmental Protection Act 1997
PEPC	Pakistan Environmental Protection Council
PM	Particulate Matter
PPI	Project Procurement International
Pvt.	Private
SO_x	Sulphur Oxides
Sr. No.	Serial Number
SW	South-West
TDS	Total Dissolved Solids
TSS	Total Suspended Solids
UNEP	United Nations Environment Program
W	West
WHO	World Health Organization
MCI	Metropolitan Corporation Islamabad

List of Units

%	Percent (age)
^{o}C	Degree centigrade
cm	Centimeter
dB (A)	Decibel
ft^2	Square foot
ft^3	Cubic foot
km	Kilometre
km/h	Kilometer/hour
m	Meter
m^2	Square meter
m^3	Cubic meter
MT	Metric Ton
Rft	Running Feet
Rpm	Revolutions per Minute

1 Introduction

1.1 Project Background and Overview

Urbanization in Pakistan is rising exponentially. Studies by the Planning Commission of Pakistan show that by 2030, about half of the population shall be living in cities and other urban settlements.[1]

The Capital Development Authority (CDA) was established to develop a modern city at the foot of the Margalla Hills, with all facilities to serve as the new capital of Pakistan. However, the CDA cannot meet the rapid demand for residential and commercial spaces to the capital's growing population. The private sector was associated with the development efforts of the CDA to solve the housing problem.[2]

Over time commercial importance of the Islamabad has also been increased manifold. Many local and international companies want to invest in the capital city. The initiative of China Pakistan Economic Corridor (CPEC) has also attracted various business-oriented companies to invest in Pakistan, so there is a need for more residential space of good standard in Islamabad to fulfil the housing needs in the city, as residential space in Islamabad is already less, a fact which is attested by the high rental rates. The country's economy will be boosted by more local and foreign investment in the country in various ways if provided with quality infrastructure for living services.

The project's residencial significance is enhanced because it is situated in the heart of the city in F-10 Markaz, which has facilities like shops, commercial areas, medical facilities and parks etc. in close vicinity.

With the cost of land increasing rapidly in cities in Pakistan, high rise buildings and apartments are becoming more feasible. The **vertical expansion** means cities can **accommodate more** residential/commercial **space per square meter** of the ground floor than single-story buildings that take up more ground floor or land. They are suitable for highly populated or overpopulated cities where there is a shortage of land. The overall cost of land, preliminaries, foundations, and roofing is much lower for high-rise buildings than single-story horizontal developments of the same magnitude. High rise buildings offer much better security to tenants than a ground-level development that provides multiple access points for intruders. More security is often required for a single-story complex.

High rise residential complexes are the way forward keeping in mind the growing housing crisis and shortage of available land.

Given the commercially suitable investment climate, construction of the proposed The Garden Residence Project would be appropriate. A residential project will provide safe and sustainable residential space to the local community.

1.2 The Project

FG Investments is constructing “The Garden Residence” Project in Sector F-10 Markaz, along 10th Avenue and across the F-9 park. The key location map of the project is shown in **Figure 1.1**.

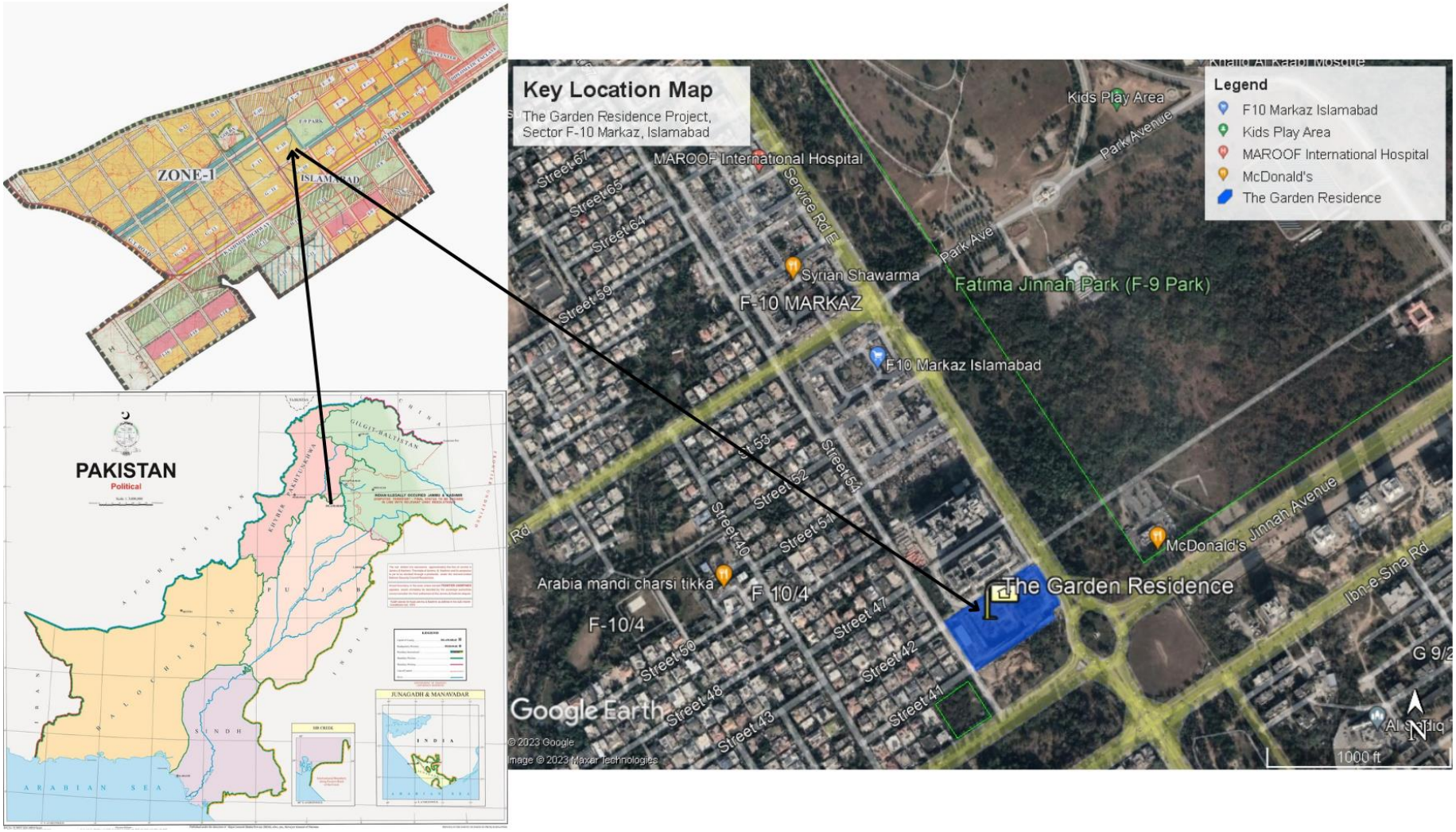
1.3 The Proponent

M/s FG Investments is the proponent of the project.

M/s FG Investements has many experiences in developing mid-rise to Highrise building projects in Islamabad and Rawalpindi. The flagship projects include SEE 3 developments that are located in the New Blue Area of the Islamabad.

[1] https://www.dawn.com/news/1129681
[2] https://www.dawn.com/news/1234612

Figure 1.1: Key Location of the Project Site



1.4 Name of the Organisation Preparing the Report

M/s Project Procurement International, an Environmental and Management Consultancy Firm, Islamabad has prepared an Environmental Impact Assessment of The Garden Residence Project.

Project Procurement International was established in 2004 and has conducted more than 400 environmental studies all over Pakistan. The list of names, qualification and roles of team members carrying out the EIA has been attached in **Annexure-1**.

1.5 Contact Persons

The authorized representative of M/s FG Investments and PPI is the following:

Proponent Representative	Environmental Consultant
Mr. Ahmed Naeem Qamar Chief Executive Officer M/s FG Investments Plot #8, Sector F – 10 Markaz adjacent to Silver Oaks Building, Islamabad. Mobile: +92 331-7779982 Tel: +92 51 -2809533 Email: info@thegarden.com.pk	**Mr. Ali Abdullah,** Environmental Engineer Project Procurement International 26, 2nd Floor, Silver City Plaza, G 11 Markaz, Islamabad Tel: +051 2363624 Cel: 0300 9110245 Email: projectpi@gmail.com Website: www.projectpi.pk

1.6 Environmental Impact Assessment

According to the Pakistan Environmental Protection Agency (Review of IEE/EIA), Regulations 2000.

"No proponent of a project shall commence construction or operation unless he has filed with the Provincial Agency an initial environmental examination or where the project is likely to cause an adverse environmental effect, an environmental impact assessment, and has obtained from the Federal Agency approval in respect thereof".

1.7 Purpose of Environmental Impact Assessment Report

The Environmental Impact Assessment (EIA) is the assessment of the environmental consequences (positive and negative) of a plan, policy, program, or actual projects before the decision to move forward with the proposed action.

The EIA is the process of identifying, predicting, evaluating, and mitigating the biophysical, social, and other relevant effects of development project prior to major decisions being taken and commitments made. Furthermore, the report will enable M/s FG Investments to obtain environmental approval of the construction of The Garden Residence Project from the Pakistan Environmental Protection Agency (Pak-EPA) Islamabad.

The EIA's purpose is to ensure that decision-maker consider the environmental impacts when deciding whether to proceed with a project.

1.8 Screening

The project is to construct a high rise luxurious multi-storeyed residential building in sector F-10 Markaz, along Service Road East and the proposed 10th Avenue and across F-9 park, Islamabad.

EIA is mandatory according to section 12 of the Pakistan Environmental Protection Act, 1997 for all the development interventions. According to Pakistan EPA (Review of IEE EIA Regulations, 2000), the proposed projects fall under **Category J (Other Projects)** of Schedule II, which states that "Any other project for which filing of an EIA is required by the Federal Agency under sub-regulation (2) of Regulation 5 and any other project likely to cause an adverse environmental effect" require the EIA study.

Pakistan EPA through Letter No. 19(76)/2023-TGR-DD(EIA/Mont) dated 3rd March 2023 conveyed to M/s FG Investments to submit Environmental Impact Assessment Report of the project according to the Section 12 of the Pakistan Environmental Protection Act, 1997. The proposed project falls under Schedule II.

1.9 Scoping

A scoping exercise was undertaken to identify the potential issues that are to be considered in the environmental impact assessment. The scoping exercise includes the following indispensable tasks.

Spatial and Temporal Boundaries of the Project: The project site is located along Service Road East, Sector F-10 Markaz, Islamabad. The project site is located on Plot number 8, Sector F-10 Markaz, Islamabad, on a piece of land measuring 105,750 sq. ft. The proposed project will be completed in four years and the impacts of the construction phase will be short term. Similarly, the magnitude of impacts will also be high in nature due to the construction phase requiring heavy machinery.

The spatial and temporal boundary during the operational phase of the project will be long term as the project is to construct a high rise residential building on Plot # 8, Sector F-10 Markaz, Islamabad.

Stakeholder Consultation: A stakeholder consultation was undertaken to document the concerns of the local community and other stakeholders and to identify issues that may require additional assessment to address these concerns. Stakeholder consultation was conducted during the survey with the following objectives:

- To inform the Stakeholders, Communities and Project Affected Persons about the project.
- To gather feedback from the primary and secondary stakeholders of the project
- To identify relevant potential issues, including the socio-economic impact of the project and corresponding mitigation measures.

During the stakeholder consultation process for the project, the following key aspects were highlighted by stakeholders:

- Incorporation of green building features
- Use of sustainable construction material
- Concerns of the residents (Project Affected Persons, if any)

Magnitude of impact: The magnitude of the impact will be localized as Major Issue.

1.10 Scope of EIA

The project requires the Environmental Impact Assessment to identify environmental impacts of construction and operational phases of the proposed project of The Garden Residence Project.

The scope of EIA of The Garden Residence Project is as follows:

- The identification and assessment of all major and minor impacts during pre-construction, construction and operational phases.
- Identification of all significant impacts that may require detailed assessment.
- Propose mitigation measures to minimize, eliminate, or compensate for the potential adverse impacts that may arise during the pre-construction, construction, and operational phases of the project.
- Public consultation with all the stakeholders of the proposed project.
- Preparation of Environmental Management Plan.

- Conclusions and recommendations; and
- Preparation of an Environmental Report for submission to Environmental Protection Agency, Pakistan.

The Terms of Reference for the EIA report has been attached in **Annexure-2**.

1.11 Approach and Methodology

1.11.1 Approach for EIA

The approach for conducting EIA of The Garden Residence Project is to follow the requirement of Pakistan Environmental Protection Agency (Review of IEE/EIA) Regulations, 2000.

1.11.2 Kick-off Meeting with the Proponent

A kick-off meeting was held between the PPI team and Project Coordinator of The Garden Residence Project.

During this meeting, the study's list of activities relevant to the project's environmental impact assessment were discussed.

1.11.3 Collection of Secondary Data

All available published and unpublished information pertaining to the background environment was obtained and reviewed. All data sources were carefully reviewed to collect the following information:

- Physical Environment: topography, geology, soils, surface and groundwater resources and climate.
- Biological Environment: habitat types, flora, and fauna (particularly rare or endangered species), critical habitats, and vegetation communities within the area.
- Socio-Economic Environment: settlements, socio-economic conditions, infrastructure, and land use; and
- Heritage Aspects: sites of cultural, archaeological or historical significance.

The list of the references of secondary data consulted during the EIA study is provided in **Annexure-3**. The glossary of terms used in the EIA report has been provided in **Annexure-4.**

1.11.4 Collection of Primary Data and Field Visit

The PPI team visited the project site and adjoining areas to obtain detailed knowledge of the area's environmental conditions. During the field visits, the existing environmental conditions were studied.

The Rapid Social Appraisal method was applied to discover the facts, empirically verifiable observations, or verifying the old facts on the project area's prevailing socio-economic and cultural conditions. Communities that were in the surrounding 1 km radius investigated during the field survey.

The ambient air quality and noise monitoring at the project site were carried out.

1.11.5 Analysis of Alternatives

The EIA report gives the details of alternatives considered during the planning and design phases of the project**.**

1.11.6 Public Consultation

Public consultations were held with community living in the vicinity of The Garden Residence Project site. Different aspects of the proposed project were highlighted to the community regarding their impacts on the project area's physical, biological, and socio-economic environment. Their concerns and suggestions were solicited.

The information obtained from the community was used to identify concerns and issues that have been subsequently mentioned and addressed in the EIA report. The list of the people met during the public consultation is provided in **Annexure-5**.

1.11.7 Review of Legislative Requirements

The information on environmental policies, national and international laws, and guidelines relevant to the project was reviewed. A synopsis of all relevant laws has been narrated in the report.

1.11.8 Identification and Evaluation of Impacts

The identification of impacts is a key activity in the environmental assessment process, which is based on the professional judgment of our experienced team supported by national and international guidelines.

The potential impacts were identified with methodical consideration of likely or possible significant impacts on the environment for Installation of the incinerator project. This task aimed to assess the associated risks with these impacts.

Each impact identified has been evaluated against its significance in terms of severity and likelihood of its occurrence. The impact evaluation process prioritized each potential impact and screened out insignificant or inconsequential impacts.

The significance of the impacts has been assessed in terms of the natural ecosystem's effects, public concern level, and conformity with legislative or statutory requirements. The severity's assessment was to consider the nature, magnitude, extent and location, timing and duration, and reversibility of the potential impact. The evaluation of the significant impacts has formed the basis for the development of the Environmental Management Plan.

1.11.9 Identification of Mitigation Measures

The objective of identification of mitigation measures is to identify practices, technologies or activities that would prevent or minimize all significant environmental impacts and propose physical and procedural controls to ensure that mitigation is effective.

Based on the impact evaluation performed, changes or improved practices have been suggested, where practical, in the planned activities, to prevent and control unacceptable adverse impacts resulting from normal or extreme events. Monitoring requirements and institutional arrangements for monitoring have been defined and suggested.

1.11.10 Development of Environmental Management Plan (EMP)

An Environmental Management Plan has been developed to implement the recommended mitigation measures of negative impacts during pre-construction, construction, and operation phase. The Environmental Monitoring Plan has been developing to monitor the Environmental Management Plan's achievement during pre-construction, construction, and operational phases of the project.

The EMP also lays down procedures to be followed during the project's operation and identifies all concerned personnel's roles and responsibilities, including reporting in the operational phase.

1.12 Organization of the EIA Report

This report has been structured in the following manner:

Chapter 1 (*Introduction*) provides an overall introduction to the project and impact assessment methodology.

Chapter 2 (*Legal Framework)* describes Pakistan's regulatory framework on the environment and its implications for the project.

Chapter 3 *(Project Description)* describes the proposed project, its layout plan and associated activities, raw material details and utility requirement.

Chapter 4 *(Project Alternatives)* details the potential alternatives that were considered during the design phase.

Chapter 5 *(Existing Environment*) describes the proposed project site's micro-environment and macro-environment. This chapter describes the physical, ecological, and socio-economic resources land of the project area and surroundings.

Chapter 6 *(Public Consultation)* describes details of discussions held with primary and secondary stakeholders.

Chapter 7 *(Impact Assessment and Mitigation Measures)* details the potential environmental and social impacts of the proposed project on the different features of the micro and macro-environment using the matrix method.

Chapter 8 *(Environmental Management Plan)* explains the mitigation measures proposed for the project to minimize the impacts to acceptable limits. It also describes the implementation of mitigation measures on the ground and monitoring environmental parameters against likely environmental impacts.

Chapter 9 *(Conclusion)* summarizes the report and presents its conclusions.

The last chapter is followed by **Annexures** that provides supporting information.

Figure 1.1 shows the summary of methodologies and activities to conduct EIA.

Table 1.1: Summary of Methodologies and Activities to Conduct EIA

Project screening
- Determine the Legal requirements of EIA is necessary

Scoping
- Decide the potential main issues to be addressed

Baseline Data Collecion
- Collecting relevant data on the state of environment

Impact Prediction
- Forecasting the likely changes in the environment as a result of the development

Impact Assessment
- Evaluation of the significance of the identified impacts

Mitigation
- Measures taken to reduce or remedy adverse impacts, or enhance positive impacts

Environmental Management and Monitoring Plan
- Environmental Management and Monitoring Plan (EMMP) develops for effective implementation of the recommended mitigation measures and to monitor the environmental parameters against likely environmental impacts

EIA Report Submission to EPA for approval
- EPA reviews all the nitty gritties of the report to make sure the compliance with environmental guidlines.

Correspondance with EIA for Final Approval
- EPA reviews the Draft report submitted and communicate comments to address discrepencies, if any.

Public Hearing
- For the purpose of dessimination of information of the Project with stakeholders, a public hearing is held with its 30 days prior advertisement in local/national news papers.

Project Approval/Rejection by EPA
- EPA issues environmental approval for the Project development after client/consultant addresses the comments from EPA on Draft report and Public Hearing.

2 Legislative Institutional Framework

2.1 Introduction

Pakistan being a signatory of multilateral international treaties has a comprehensive set of environmental legislation covering multiple environmental issues facing Pakistan like pollution of freshwater bodies and coastal water, air pollution, deforestation, loss of biodiversity, lack of proper waste management and climate changes. The basic policy and legislative framework and detailed rules, regulations and guidelines required for the implementation of the policies and enforcement of legislation for the protection of the environment and overall biodiversity are in place.

The compliance status of The Garden Residence Project has been reviewed with reference to the legislation and existing legal framework on the environment in Pakistan and International level as described henceforth.

2.2 National Conservation Strategy

The National Conservation Strategy (NCS) is the first policy document that pledged to balance Pakistan's economic development with natural resources conservation. The underlying goal of this document is that all economic and statutory development in the country should be such that it does not conflict with the interests of nature conservation. The Pakistan Environmental Protection Act, 1997 is the basic legislative tool empowering the government to frame regulations to protect the environment. The World Bank environmental guidelines are used to bridge the gaps, wherever needed. The policy, laws, regulations and standards relevant to The Garden Residence Project in environmental protection are described in the following sections.

2.3 Biodiversity Action Plan

Pakistan is a signatory to the Convention on Biological Diversity and is hereby obligated to develop a national strategy for conserving biodiversity. The Government of Pakistan has constituted a Biodiversity Working Group under the Ministry of Environment, Local Government and Rural Development to develop a Biodiversity Action Plan for the country. After an extensive consultative exercise, a draft Action Plan has been developed. The Plan, which has been designed to complement the NCS and the proposed provincial conservation strategies, identifies the causes of biodiversity loss in Pakistan and suggests a series of proposals to conserve biodiversity in the country.

2.4 National Environmental Policy, 2005

The National Environment Policy (NEP) aims to protect, conserve, and restore Pakistan's environment to improve citizens' quality of life through sustainable development. In NEP, the further sectorial guidelines, Energy Efficiency and Renewable directly related to building energy code for newly constructed buildings were introduced.

2.5 Laws and Regulations

Pakistan has a number of laws concerned with the regulation and protection of the environment. However, the enactment of comprehensive legislation on the environment, in the form of parliament, is a relatively new phenomenon. Most of the existing laws on environmental issues were enforced over an extended period of time, and are context-specific. The laws relevant to the developmental projects are briefly reviewed below.

2.5.1 Pakistan Environmental Protection Act, 1997

The Pakistan Environmental Protection Act, 1997 (the Act) is the basic legislative tool empowering the government to frame regulations to protect the environment. The Act applies to a broad range of issues. It extends to air, water, soil, marine and noise pollution, and hazardous waste handling. The discharge or emission of any effluent, waste, air pollutant or noise in an amount, concentration or level in excess of the National Environmental Quality Standards (NEQS) specified by the Pakistan Environmental Protection Agency (Pak EPA) has

been prohibited under the Act. Penalties have been prescribed for those contravening the provisions of the Act. The powers of the federal and provincial Environmental Protection Agencies (EPAs), established under the Pakistan Environmental Protection Ordinance 1983, have also been considerably enhanced under this legislation. They have been given the power to conduct inquiries into possible environmental law breaches either of their own accord or upon the registration of a complaint.

The requirement for environmental assessment is laid out in Section12 (1) of the Act. Under this section, no project involving construction activities or any change in the physical environment can be undertaken unless an Initial Environmental Examination (IEE) or an Environmental Impact Assessment (EIA) is conducted. Approval is received from the Federal or relevant Provincial EPA. Section 12(6) of the Act states that this provision applies only to such categories of projects as Pakistan Environmental Protection Agency (Review of IEE and EIA Regulations), 2000.

2.5.2 Pakistan Environmental Protection Agency (Review of IEE and EIA Regulations), 2000

Pakistan Environmental Protection Agency (Review of IEE and EIA Regulations), 2000 (the Regulations) prepared by the Pakistan Environmental Protection Agency under the powers conferred upon it by the Act, provide the necessary details on preparation, submission and review of the IEE and the EIA. Categorization of projects for IEE and EIA is one of the main components of the Regulations.

Projects have been classified based on the expected degree of adverse environmental impacts. Project types listed in Schedule-I are designated as potentially less damaging to the environment and those listed in Schedule-II as having potentially serious adverse effects. Schedule-I projects require an IEE to be conducted, provided they are not located in environmentally sensitive areas. For the Schedule-II projects, conducting an EIA is necessary. Salient features of the regulation, relevant to the proposed project are listed below:

- Categories of projects requiring IEE and EIA are issued through two schedules attached to the regulations.
- Depending on the cost of the project, a fee has been imposed for review of EIA and IEE.
- The submittal is to be accompanied by an application in prescribed format included as schedule IV of the Regulations.
- The EPA is bound to conduct preliminary scrutiny and reply within 10 days of submittal of the report a) confirming completeness, b) asking for additional information, or c) requiring additional studies.
- The EPA is required to make every effort to complete the review process for IEE within 45 days and of the EIA within 90 days of the confirmation of completeness.
- EPAs accord their approval subject to the following conditions:
    - Before commencing construction of the project, the proponent is required to submit an undertaking accepting the conditions.
    - Before commencing the project's operation, the proponent is required to obtain from the EPA a written confirmation of compliance with approval conditions and requirements of the IEE/ EIA.
- An EMP is required to be submitted with the request for obtaining confirmation of compliance.
- The EPAs are required to issue a confirmation of compliance within 15 days of receipt of the request and complete documentation.
- The IEE/ EIA approval will be valid for three years from the date of the accord.
- A monitoring report is required to be submitted to the EPA after completion of construction, followed by annual monitoring reports during operations.

The construction of The Garden Residence Project falls in schedule-II of the regulations. Hence, this type of project needs an EIA to be conducted.

2.6 National Environmental Quality Standards (NEQS), 2000

The NEQS, promulgated under the PEPA 1997, specify the following standards:

- Maximum allowable concentration of pollutants (16 parameters) in gaseous emissions from industrial sources,
- For power plants operating on oil and coal:
  - Maximum allowable emission of sulphur dioxide,
  - Maximum allowable increment in the concentration of sulphur dioxide in the ambient air,
  - Maximum allowable concentration of nitrogen oxides in ambient air, and
  - Maximum allowable emission of nitrogen oxide for steam generators as a function of heat input.
- Maximum allowable concentration of pollutants (32 parameters) in municipal and liquid industrial effluents discharged to inland waters, sewage treatment and sea (three separate sets of numbers).

The NEQS for liquid effluents discharged to inland waters, gaseous emission from industrial sources, and motor vehicles' emissions are provided as on the following website. http://www.environment.gov.pk/info.html

The National Environmental Quality Standards (NEQS), 2000, specify the following standards:

- Maximum allowable concentration of pollutants (32 parameters) in municipal and liquid industrial effluents discharged into inland waters, sewage treatment facilities, and the sea (three separate sets of numbers)
- Maximum allowable concentration of pollutants (16 parameters) in gaseous emissions from industrial sources
- Maximum allowable concentration of pollutants (02 parameters) in gaseous emissions from vehicle exhaust and noise emission from vehicles.
- Maximum allowable noise levels from vehicles.

These standards also apply to the gaseous emissions and liquid effluents generated by the generator, process waste etc. The standards for vehicles will apply during the construction as well as operation phase of the project. Standards for air quality have not been prescribed as yet.

2.6.1 NEQS for Liquid Effluent

The National Environmental Quality Standards (NEQS) for the discharge of effluent from industry are presented in **Table 2.1**.

Table 2.1: NEQS for Liquid Effluent Discharge

Parameters	Into Inland Waters	Into Sewage Treatment	Into Sea
Tempereture	=<3°C	=<3°C	=<3°C
pH Value	6-9	6-9	6-9
Biological Oxygen Demand $(BOD)_5$	80	250	80
Chemical Oxygen Demand (COC)	150	400	400
Total Suspended Solids (TSS)	200	400	200

Parameters	Into Inland Waters	Into Sewage Treatment	Into Sea
Total Dissolved Solids (TDS)	3500	3500	3500
Grease & Oil	10	10	10
Phenolic Compounds (as phenol)	0.1	0.3	0.3
Chlorides (as Cl')	1000	1000	SC
Fluoride (as F')	10	10	10
Cyanide (CN') total	1.0	1.0	1.0
An-ionic Detergents (as MBAs)	2.0	20	20
Sulphate (SO'')	600	1000	SC
Sulphide (S')	1.0	1.0	1.0
Ammonia (NH^3)	40	40	40
Pesticides	0.15	0.15	0.15
Cadmium	0.1	0.1	0.1
Chromium (trivalent & hexavalent)	1.0	1.0	1.0
Copper	1.0	1.0	1.0
Lead	0.5	0.5	0.5
Mercury	0.01	0.01	0.01
Selenium	0.5	0.5	0.5
Nickel	1.0	1.0	1.0
Silver	1.0	1.0	1.0
Total Toxic Metals	2.0	2.0	2.0
Zinc	5.0	5.0	5.0
Arsenic	1.0	1.0	1.0
Barium	1.5	1.5	1.5
Iron	8.0	8.0	8.0
Manganese	1.5	1.5	1.5
Boron	6.0	6.0	6.0
Chlorine	1.0	1.0	1.0

Source: *NEQS, Pakistan Environmental Protection Agency*

2.6.2 NEQS for Gaseous Emission

The National Environmental Quality Standards (NEQS) for permissible limits of gaseous emission from industry are presented in **Table 2.2**.

Table 2.2: NEQS for Gaseous Emission

Parameter	Source of Emission	Standard
Smoke	Smoke opacity not to exceed	40% or 2 Ringlemann Scale or equivalent smoke number

Parameter	Source of Emission	Standard
Particulate Matter	Boilers & Furnaces:	
	Oil Fired	300
	Coal-Fired	500
	Cement Kilns	300
	Grinding, crushing, clinker coolers and related processes, metallurgical processes, converters, blast furnaces and cupolas	500
Hydrogen Chloride	Any	400
Chlorine	Any	150
Hydrogen Fluoride	Any	150
Hydrogen Sulphide	Any	10
Sulphur Oxides	Sulfuric Acid/sulphonic Acid Plants	5000
	Other Plants except power plants operating on oil and coal	1700
Carbon Monoxide	Any	800
Lead	Any	50
Mercury	Any	10
Cadmium	Any	20
Arsenic	Any	20
Copper	Any	50
Antimony	Any	20
Zinc	Any	200
Oxides of Nitrogen	Nitric Acid Manufacturing Unit	3000
	Other plants except for power plants operating on oil or coal:	
	Gas-fired	400
	Oil fired	600
	Coal-fired	1200

Source: *NEQS Pakistan Environmental Protection Agency*

2.6.3 NEQS for Vehicular Emission

The National Environmental Quality Standards (NEQS) for permissible limits of exhaust emissions from vehicles are presented in **Table 2.3.**

Table 2.3: NEQS for Vehicular Emission

Parameters	Standards (Maximum permissible limits)	Measuring Method
Smoke	40% or 2 on the Ringleman Scale During engine acceleration mode	To be compared with Ringleman chart at a distance of 6 meters or more
Carbon Monoxide	Emission Standards: New Vehicle = 4.5% Used Vehicle = 6%	Under idling conditions: non-dispersive infrared detection through the gas analyzer.
Noise	85 dB (A)	A sound meter at 7.5 meters from the source

Source: *NEQS Pakistan Environmental Protection Agency*

2.6.4 NEQS for Drinking Water, 2010

The National Environmental Quality Standards (NEQS) for drinking water quality, 2010 are presented in **Table 2.4**.

Table 2.4: NEQS for drinking water quality

Parameter	Standard values	WHO guidelines
Biological		
All water intended for drinking (E. Coli or Thermo-tolerant Coliform bacteria)	Must not be detectable in any 100 ml sample.	Must not be detectable in any 100 ml sample.
Treated water entering the distribution system (E. Coli or Thermo-tolerant Coliform and Total Coliform bacteria)	Must not be detectable in any 100 ml sample.	Must not be detectable in any 100 ml sample.
Treated water in the distribution system (E. Coli or Thermo-tolerant Coliform and Total Coliform bacteria)	Must not be detectable in any 100 ml sample. In the case of large supplies, where sufficient samples are examined, must not be present in 95% of the samples taken throughout any 12-month period.	Must not be detectable in any 100 ml sample. In the case of large supplies, where sufficient samples are examined, must not be present in 95% of the samples taken throughout any 12-month period.
Physical		
Color	≤ 15 TCU	≤ 15 TCU
Taste	Non-acceptable	Non-acceptable
Odour	Non-acceptable	Non-acceptable
Turbidity	< 5 NTU	< 5 NTU
Total hardness	< 500 mg/L	---
TDS	<1000	<1000
pH	6.5- 8.5	6.5- 8.5
Chemical		
Essential Organic	mg/Litre	mg/Litre
Alminium	≤ 0.2	0.2
Antimony	≤ 0.005	0.02
Arsenic	≤ 0.05	0.01
Barium	0.7	0.7
Boron	0.3	0.3
Cadmium	0.01	0.003
Chloride	≤ 250	250
Chromium	≤ 0.05	0.05
Copper	2	2
Toxic Inorganic		mg/Litre

Parameter	Standard values	WHO guidelines
Cyanide	≤ 0.05	0.07
Flouride	≤ 1.5	1.5
Lead	≤ 0.05	0.01
Mangnese	≤ 0.5	0.5
Mercury	≤ 0.001	0.001
Nickel	≤ 0.02	0.02
Nitrate	≤ 50	50
Nitrite	≤ 3	3
Zinc	5	3
Pesticides mg/L		PSQCA No.4639-2004. page No 4 Table No. 3serial No. 20-58
Phenolic Compounds		<0.002
Polynuclear aromatic hydrocarbons		0.01
Radioactive		
Alpha emitters bq/L	0.1	0.1
Beta emitters	1	1

Source: *NEQS Pakistan Environmental Protection Agency*

2.6.5 NEQS for Ambient Air and Noise

The National Environmental Quality Standards (NEQS) for Ambient Air and Noise, 2010 are presented in **Table 2.5** and **2.6.**

Table 2.5: NEQS for Ambient Air

Pollutants	Time Weighted Average	Concentration in Ambient Air (ug/m^3)
Sulfur Dioxide (SO_2)	Annual Average* 24 hrs**	80 120
Oxides of Nitrogen gas (NO)	Annual Average* 24 hrs**	40 40
Oxides of Nitrogen gas (NO_2)	Annual Average* 24 hrs**	40 80
Ozone (O_3)	1 hour	130
Suspended Particulate Matter (SPM)	Annual Average* 24 hrs**	360 500
Respirable Particulate Matter (PM_{10})	Annual Average* 24 hrs**	120 150
Respirable Particulate Matter ($PM_{2.5}$)	Annual Average* 24 hrs** 1 hr	15 35 15
Lead (Pb)	Annual Average* 24 hrs**	1 1.5

Pollutants	Time Weighted Average	Concentration in Ambient Air (ug/m^3)
Carbon monoxide (CO)	8 hrs	5 mg/m^3
	1 hr	10 mg/m^3

*** Annual Arithmetic mean of minimum 1040 measurements in a year taken twice a week 24 hourly at a uniform interval*
** 24 hourly /8 hourly values should be met 98 % of the year, 2 % of the time, it may exceed.*
Source: *NEQS, Pakistan Environmental Protection Agency*

Table 2.6: NEQS for Noise

Area	Daytime	Nighttime
Residential area	55	45
Commercial area	65	55
Industrial area	75	65
Silence area	50	45

Source: *NEQS, Pakistan Environmental Protection Agency*

2.7 Building Energy Code of Pakistan, 2008

The scope of this code is to provide:

(a) Minimum energy-efficient requirements for the design and construction of:

- New buildings and their systems.
- New portions of buildings and their systems.
- New systems and equipment in existing buildings.

(b) Criteria for determining compliance with these requirements.

The Building Energy Code of Pakistan 2008 is available at the following link;

http://www.enercon.gov.pk/images/building%20code.pdf

2.8 Institutional Set-Up

The country's apex environmental body is the Pakistan Environmental Protection Council (PEPC), presided over by the Chief Executive of the Country. Other bodies include the Pakistan Environmental Protection Agency (Pak-EPA), provincial EPAs (for four provinces, AJK and Gilgit Baltistan) and environmental tribunals.

The EPAs were first established under the 1983 Environmental Protection Ordinance; the PEPA 1997 further strengthened their powers. The EPAs have been empowered to receive and review the environmental assessment reports (IEEs and EIAs) of the proposed projects, and provide their approval (or otherwise).

The Garden Residence Project is located in Islamabad. Therefore, the EIA report will be submitted to the Pakistan Environmental Protection Agency, Islamabad for obtaining environmental approval for the project.

2.21 Environmental Protection Agency's Environmental Guidelines

The Pak EPA has prepared a set of guidelines for conducting environmental assessments. The package of regulations, of which the guidelines form a part, includes the PEPA 1997 and the NEQS. The guidelines themselves are listed below:

- Guidelines for the preparation and review of Environmental Reports,
- Guidelines for public consultation,

- Guidelines for Sensitive and Critical Areas, Sectorial Guidelines.

It is stated in the Pakistan Environmental Protection Agency (Review of IEE and EIA)

Regulations, 2000 that the EIA or IEE must be prepared, to the extent practicable, in accordance with the Pakistan Environmental Protection Agency guidelines. The government of Pakistan has also framed guidelines for the preparation of IEE of Projects in various developmental sectors.

2.9 Implication of Legislations to the Project

The implication of the legislation, as mentioned above to the pre-construction, construction, and operational phase of The Garden Residence Project, would be as follows:

M/s FG Investments, being the proponent of the project, will ensure that the project's construction and operational phases be carried out in accordance with the EIA report and Environmental Management Plan is effectively implemented.

The project will be subjected to four basic provisions relating to pollution control under the Pakistan Environmental Protection Act, 1997, as contained in section 11, 13, 14 and 15 as follows:

- Section 11 prohibits discharge or emission of any effluent or waste or air pollutant or noise in excess of the NEQS, or the established ambient standards for air, water or land.
- Section 13 prohibits hazardous wastes.
- Section 14 prohibits handling hazardous substances except under a license or in accordance with the provision of any local law or international agreement.
- Section 15 prohibits motor vehicles' operation for each air pollutant or noise is being emitted in excess of the NEQS or the established ambient standard.

3 Description of the Project

3.1 Introduction

This chapter provides a description of the project, its salient features, location, components and various phases.

3.2 Type and Category of the Project

The proposed project is the construction of The Garden Residence Project, Sector F-10 Markaz, Islamabad, which falls in Schedule II of Pakistan Environmental Protection Agency (Review of IEE and EIA) Regulation 2000 under category J. Any other project for which filing of an EIA is required by the Federal Agency under sub-regulation (2) of Regulation 5.

3.3 Objective of the Project

The objective of the project is to provide residential space with state of the art facilities and a peaceful residential environment in the Sector F-10 Markaz, Islamabad. The project will;

- Provide sustainable development
- Provide more accommodation while covering less land.
- Enhance economic activities and contribute to the promotion of skill applications and improved business practices.

3.4 Project Administrative Jurisdiction

The project site lies in the capital city of Islamabad, which comes under the jurisdiction of the administration of the Federal Government.

3.5 Project Location and Accessibility

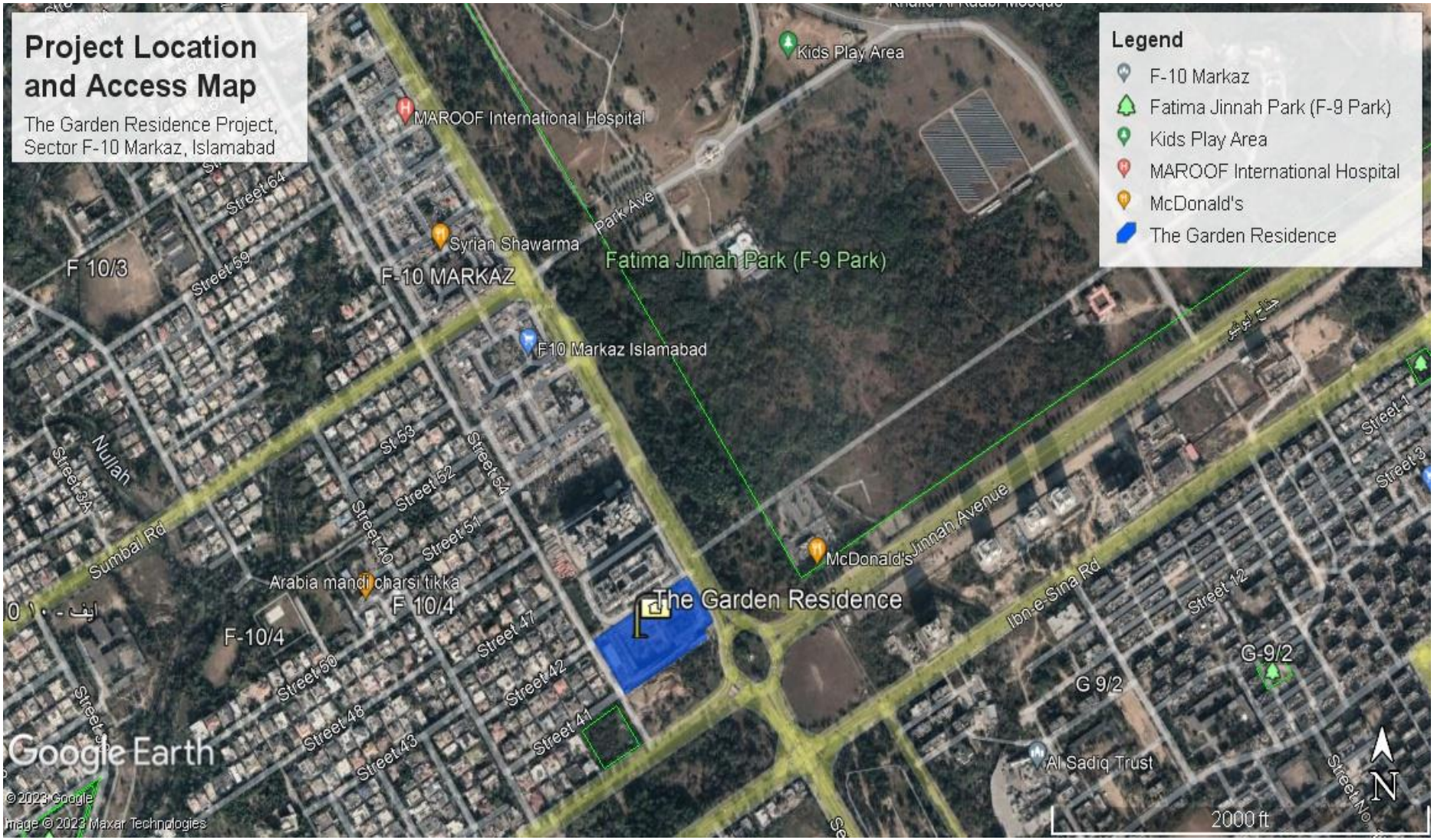
The project site is located on Plot No. 8, Sector F-10 Mrakaz, Islamabad, on a piece of land measuring 105,750 sq. ft (225'x470'). The project site can be accessed from Nazim-ud-din Road and Ibn-e-Sina Road from the south, through Service Road East in the West, and through Jinnah Avenue from the north side of the project site. The coordinates of the project site are 33°41'24.4212" N, 73°1'0.3468" E.

The surrounding areas near the project site of The Garden Residence Project are as follows and shown in **Figure 3.1**:

- **North :** Service Road East + F-9 Park (250 m)
- **South :** Sector F-10/4 (100 m)
- **East :** Vacant Land + Nazim-ud-Din Road (100 m)
- **West :** Siler Oaks Residential Apartments (25 m)

The project location and accessibility map of the project site is shown in **Figure 3.1.**

Figure 3.1: Project Location & Accessibility Map



3.6 Description of the Project

The project consists of 2 towers. Tower A/B is a 28-storey residential building (3 basements + Ground + 24 Floors+ 2 Service Floors), with a height of approximately 318 ft. Towers A/B will cover an area of 10,390 sq. ft. Tower C is a 37-storey residential building (3 basements + Ground + 33 Floors+ 3 Service Floors) with a height of approximately 438 ft. Tower C will cover an area of 13,273.74 sq. ft. The project will be constructed on land measuring 21 kanals or 105,750 sq. ft (225'x470').

The Garden Residence Project will comprise 328 housing units (188 in Tower A/B, and 140 in Tower C). The covered area of the building is 1,030,623.84 sq. ft and it will be an exclusively residential building.

The Garden Residence Project will be equipped with state-of-the-art HVAC system for efficient ventilation and firefighting system, comprised of fire alarm system, automatic sprinklers, smoke detection system, fire extinguishers and 2 underground firefighting tanks of total capacity 232 m^3 (116 m^3 each) reserved specifically for firefighting and overhead tank with capacity of 45.5 m^3 of which, 25 m^3 is dedicated as firefighting reservoir.

The total water requirement is 415 cubic meter/day considering all the units while the total electricity load of the building will be 1.5 MW. The source of water will be CDA supply line, with ground water as a backup and IESCO will provide the electricity connection.

The total cost of the project is Rs. 5 billion and will be completed in 4 years.

Salient Features

- Three basement parking floors
- Dedicated Service floors
- Allotted free parking for residents.
- Secure entrance and ample reception area
- 18 resident and cargo lifts
- 24 hours security system
- Air conditioning
- 1 Phase electric meter
- 24 hours backup generator for lifts, basement parking and circulation area
- Generator for limited office back-up available

The aim of FG Investments is to bring the most high-end residential towers in Islamabad with unique design and state of the art amenities and conveniences required.

The site plan, layout plans and cross-section for basements, ground floor, first, second and subsequent floors and top roof of The Garden Residence Project have been provided from **Figure 3.2** to **3.10**.

The total area of the plot is 105,750 sq. ft. of which the building will be covering 25% while 75% will b eopen spaces and green spaces for outdoor activities. The land use of The Garden Residence Project will be in accordance with the CDA's existing building by-laws.

Table 3.1: Total Floor Area included in F.A.R of The Garden Residence Project

SCHEDULE OF AREAS

Sr. No.	**Description**	**Net Area F.A.R**
1	Basement-01	105750.00
2	Basement-02	105750.00
3	Basement-03	105750.00
	TOWER-A/B	
4	Ground Floor	8041.07
5	1st Floor	4171.72
6	Service Floor	10390.25
7	2nd to 10th Floor	77482.27
8	Service Floor	10390.25
9	11th to 21st Floor	92956.27
10	22nd Floor	6984.40
11	23rd Floor	7353.94
12	24th Floor	3448.24
	TOWER-C	
13	Ground Floor	10347.93
14	1st Floor	8828.31
15	Service Floor	13170.64
16	2nd to 22nd	228359.02
17	Service Floor	13170.64
18	23rd Floor	10239.66
19	24th Floor	9536.68
20	Service Floor	11289.62
21	25th & 26th Floor	17857.41
22	27th Floor	8096.76
23	28th Floor	7475.41
24	29th Floor	6787.90
25	30th & 31st Floor	12235.41
26	32nd Floor	4806.12
27	33rd Floor	3639.36
		528647.78
	TOTAL AREA	**1030623.84**

Source: *Submission Drawings of The Garden Residence Project*

Figure 3.2: General layout Plan of The Garden Residence Project, Sector F-10 Markaz, Islamabad

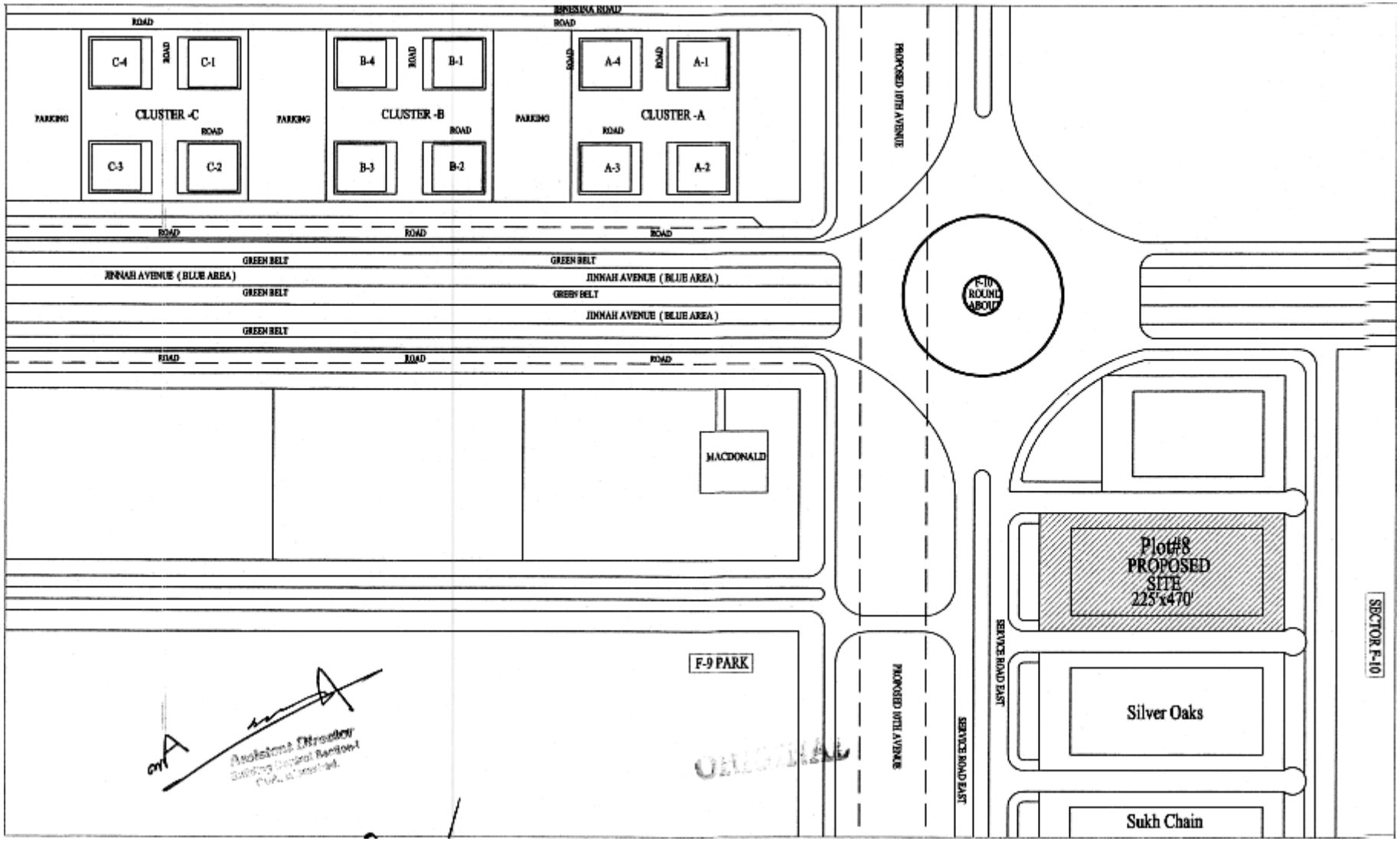


Figure 3.3: Basement 1, 2, 3 Layout Plan of The Garden Residence Project, Sector F-10 Markaz, Islamabad

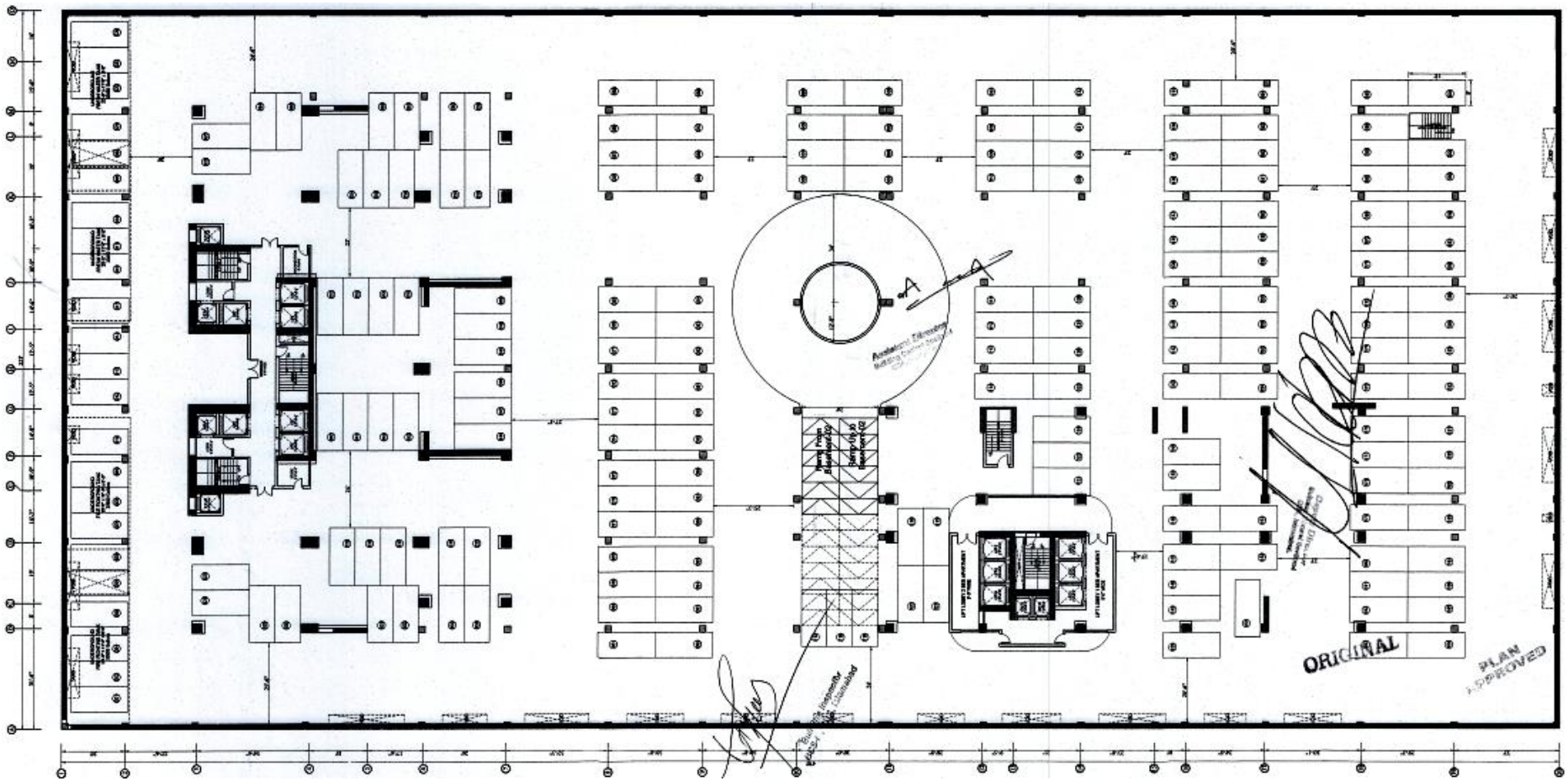


Figure 3.4: Layout Plan of Ground Floor of The Garden Residence Project, Sector F-10 Markaz, Islamabad

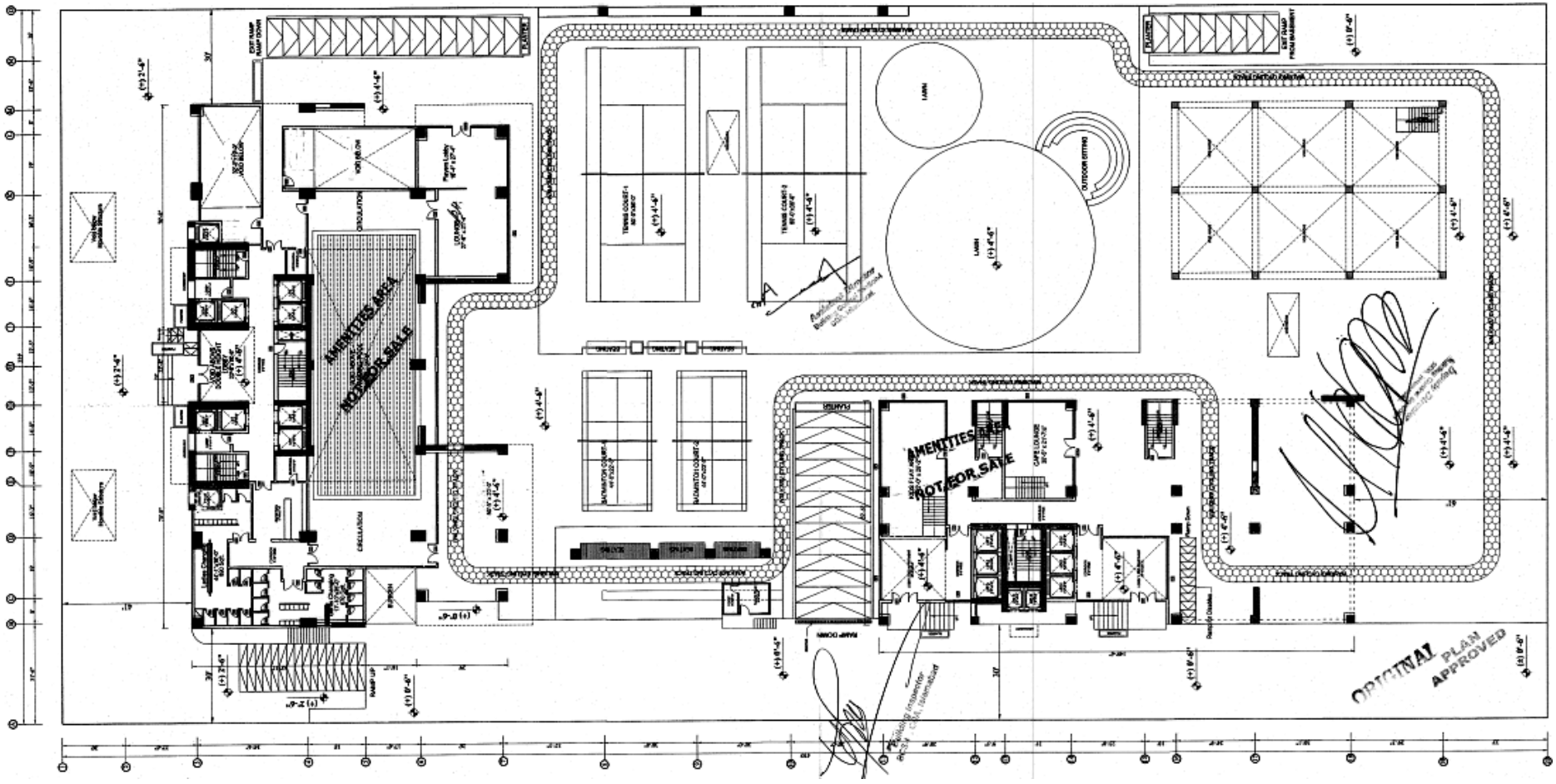


Figure 3.5: Layout Plan of 1st Floor of The Garden Residence Project, Sector F-10 Markaz, Islamabad

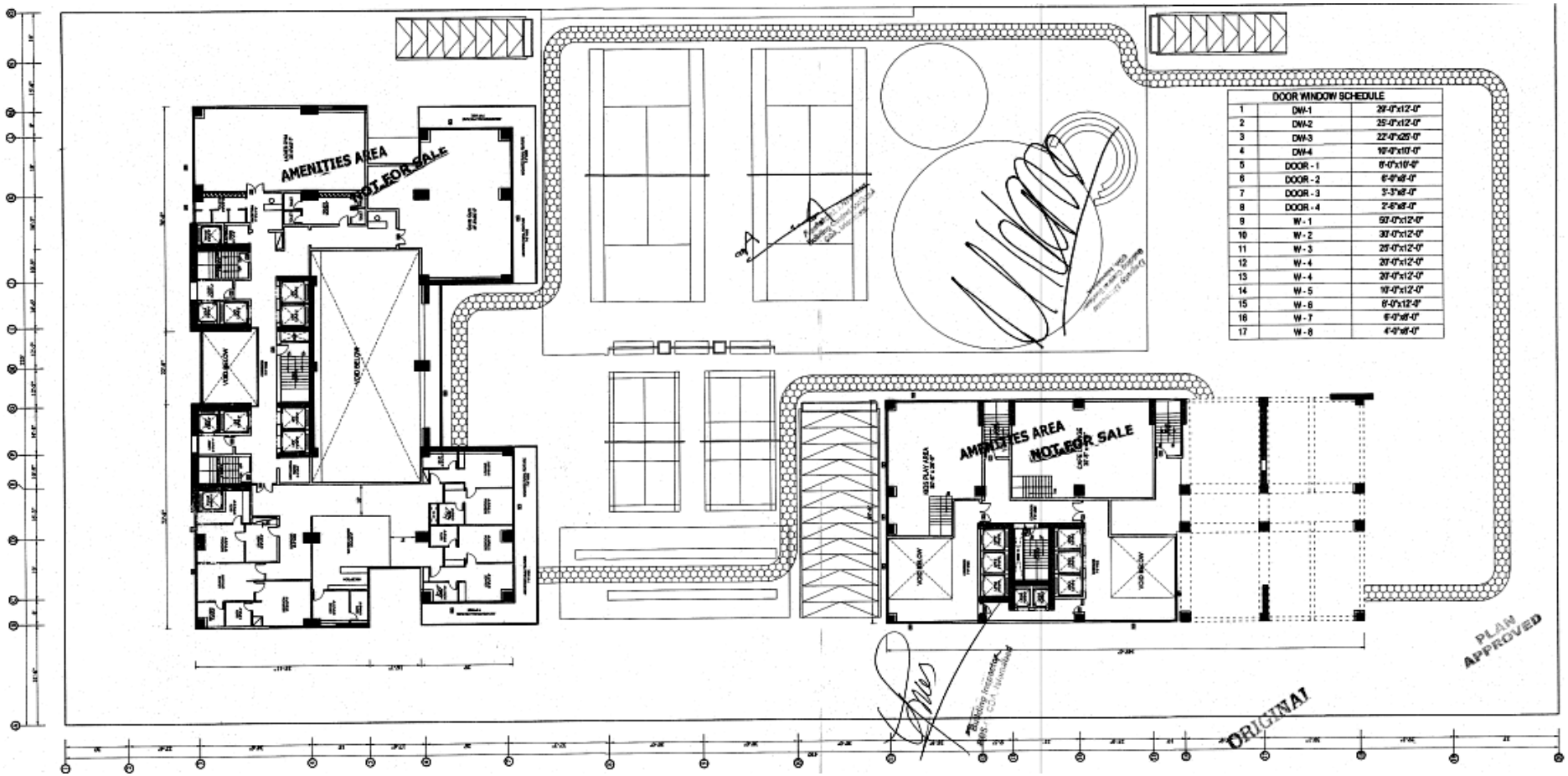


Figure 3.6: Layout Plan of service and 2nd Floor Tower A/B of The Garden Residence Project, Sector F-10 Markaz, Islamabad

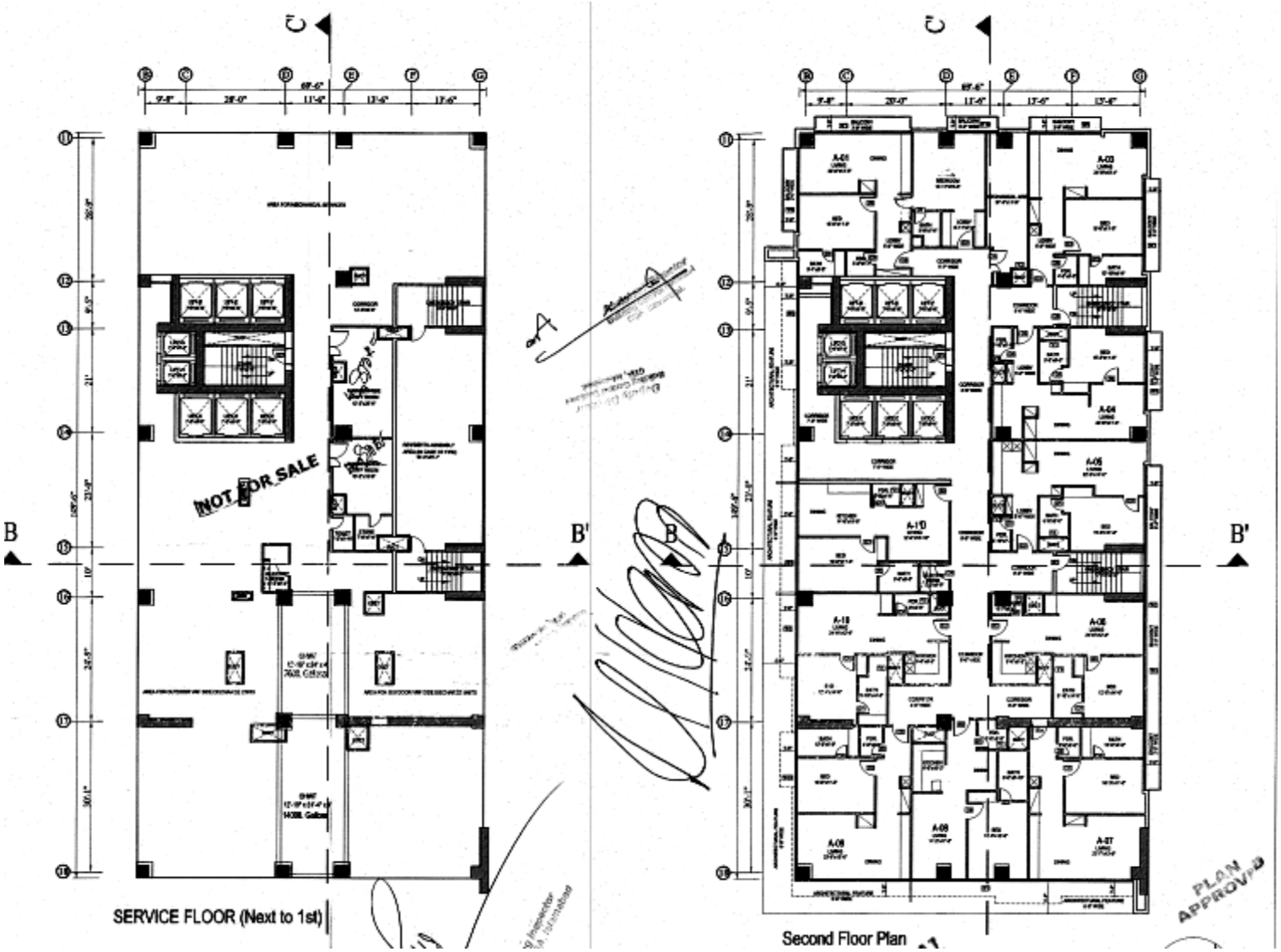


Figure 3.7: Layout Plan of 3rd – 10th, Service and 11th – 21st Floor Tower A/B of The Garden Residence Project, Sector F-10 Markaz, Islamabad

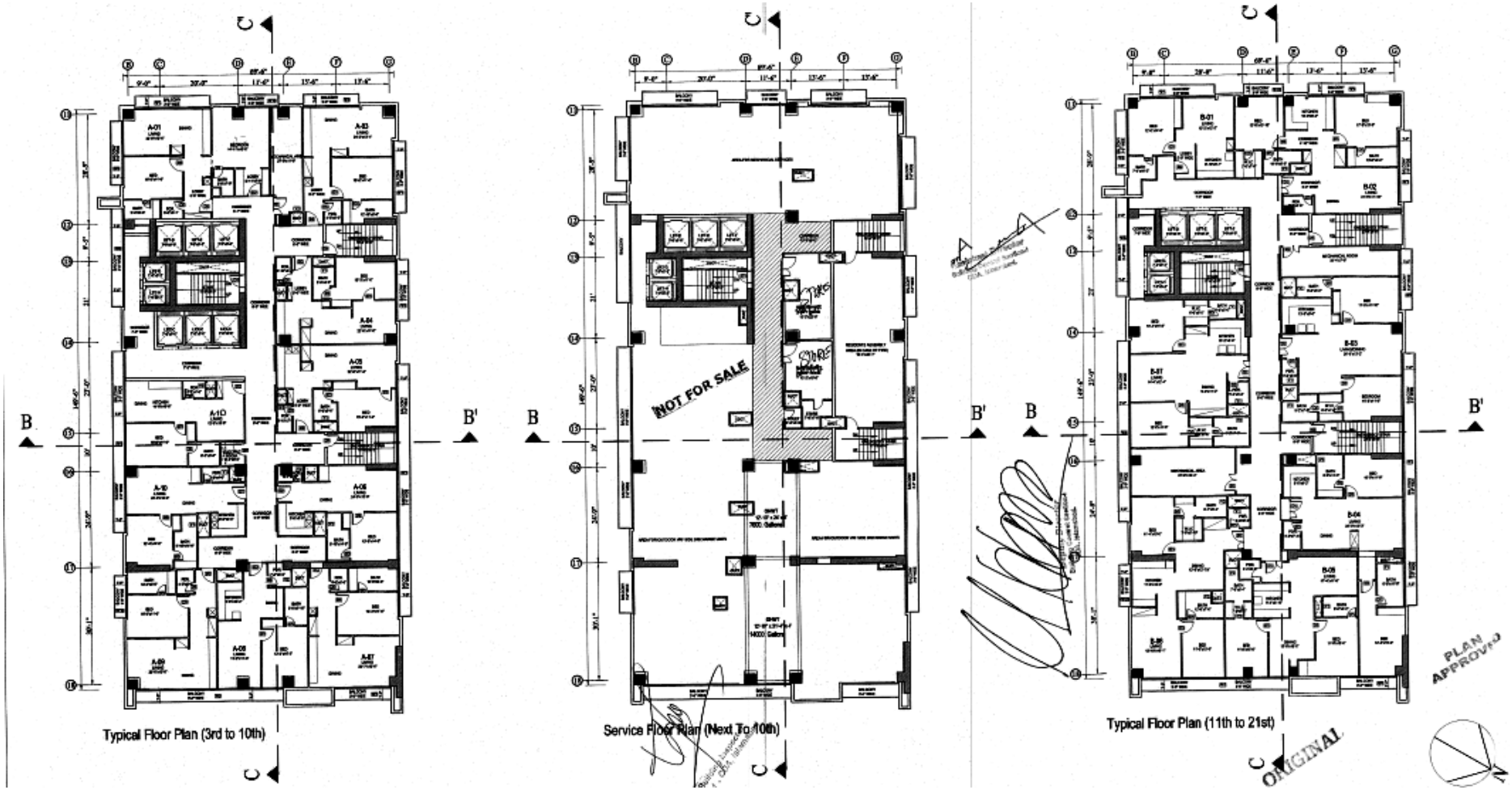


Figure 3.8: Layout Plan of 22nd, 23rd and 24th Floor Tower A/B of The Garden Residence Project, Sector F-10 Markaz, Islamabad

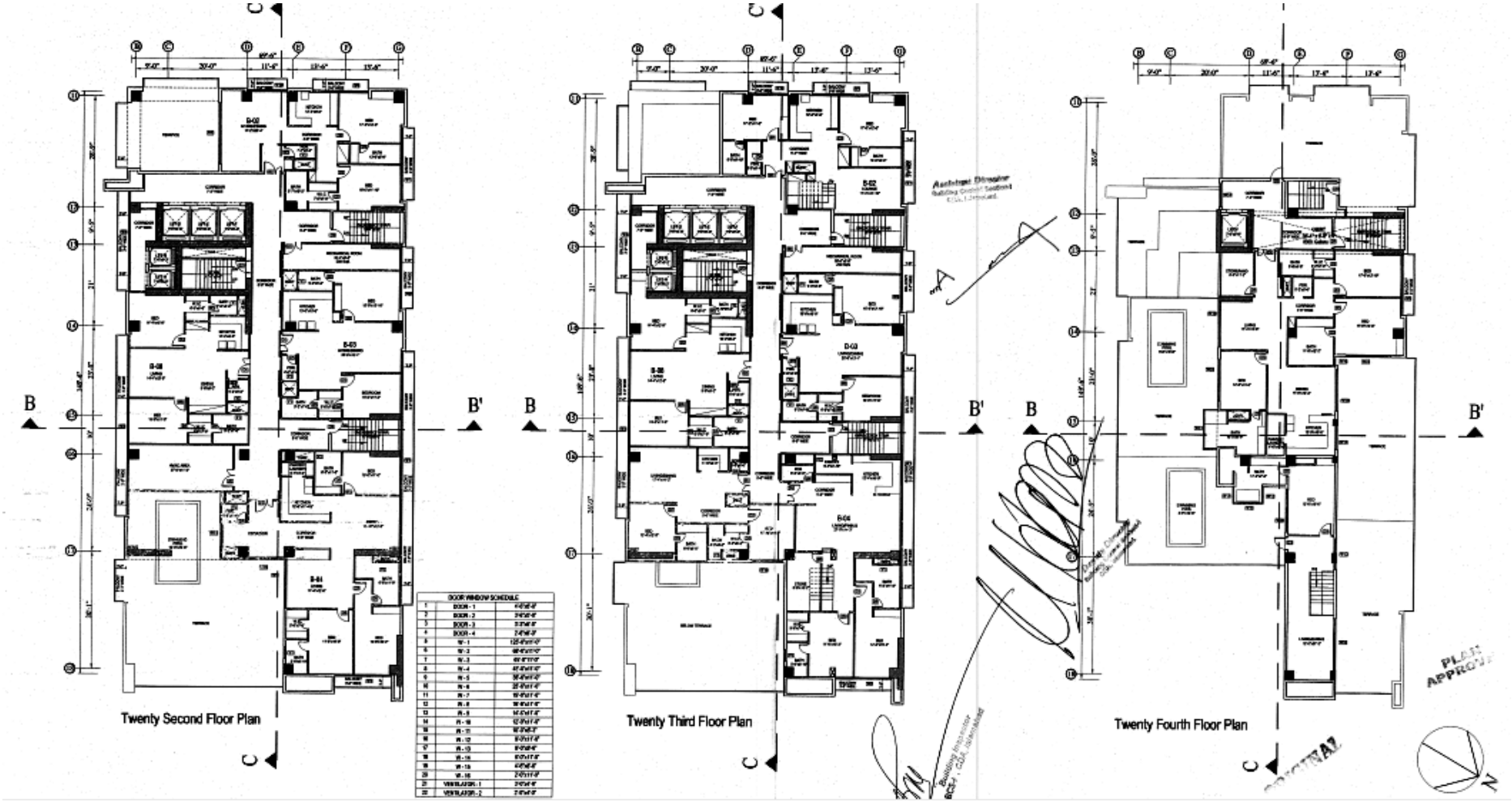


Figure 3.9: Layout Plan of Service Floor and 2nd Floor Tower C of The Garden Residence Project, Sector F-10 Markaz, Islamabad

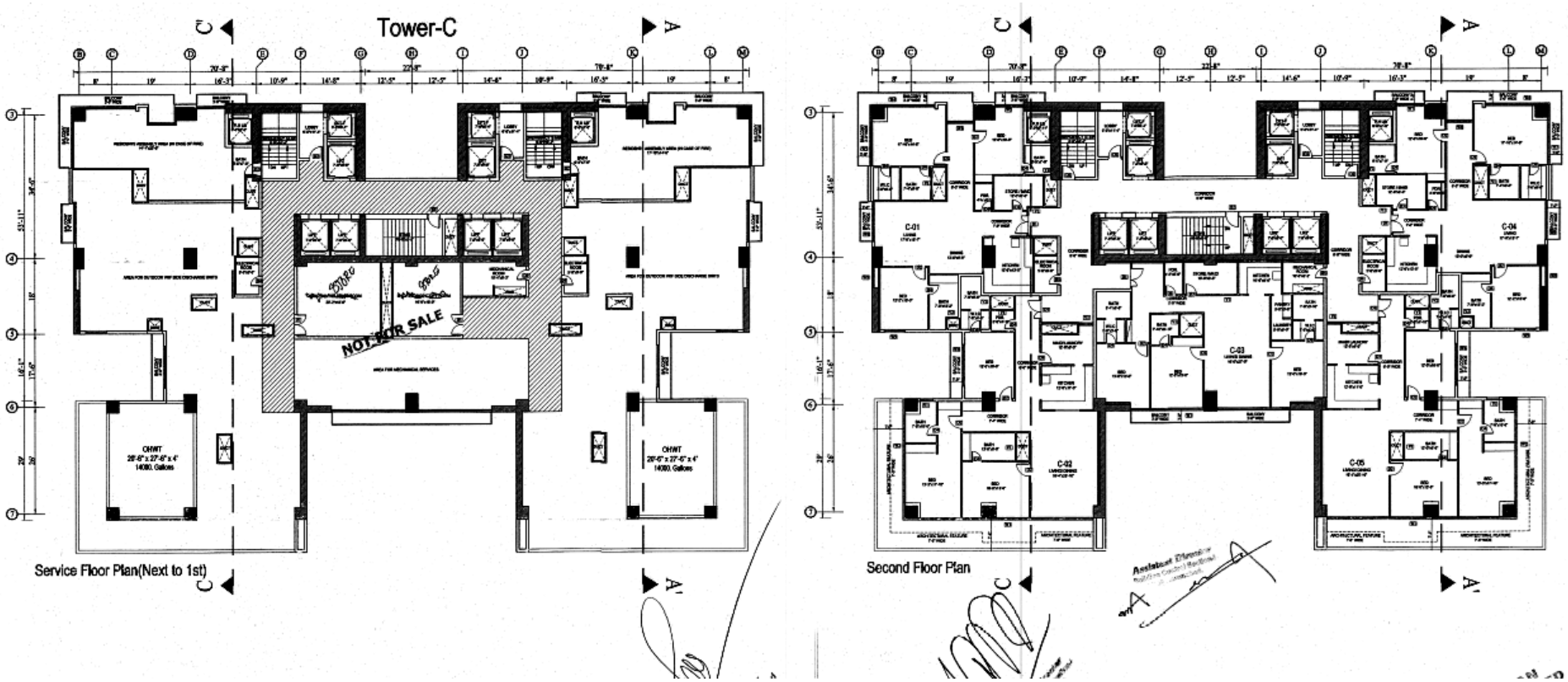


Figure 3.10: Layout Plan of 3rd – 11th and Service Floor Tower C of The Garden Residence Project, Sector F-10 Markaz, Islamabad

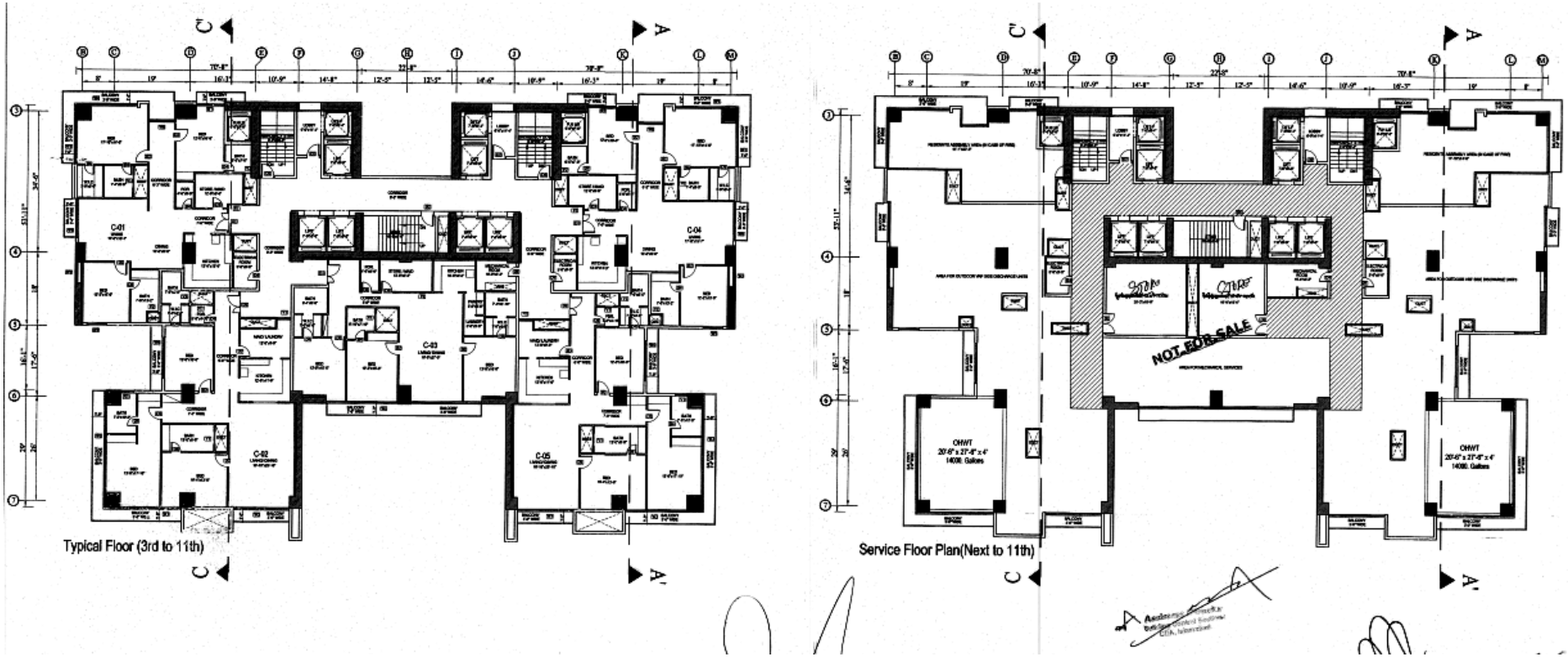


Figure 3.11: Layout plan of 12th – 22nd and 23rd Floor Tower C of The Garden Residence Project, Sector F-10 Markaz, Islamabad

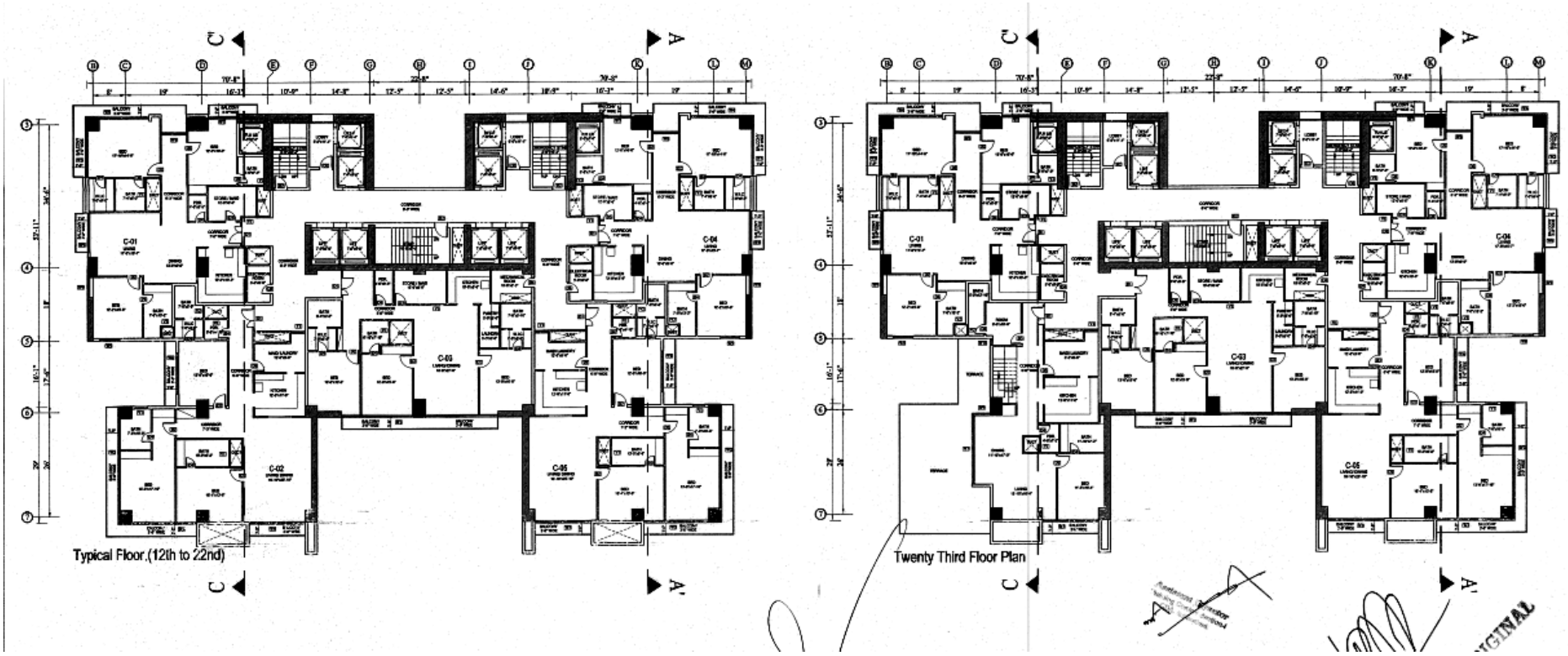


Figure 3.12: Layout plan of 24th – 25th Floor Tower C of The Garden Residence Project, Sector F-10 Markaz, Islamabad

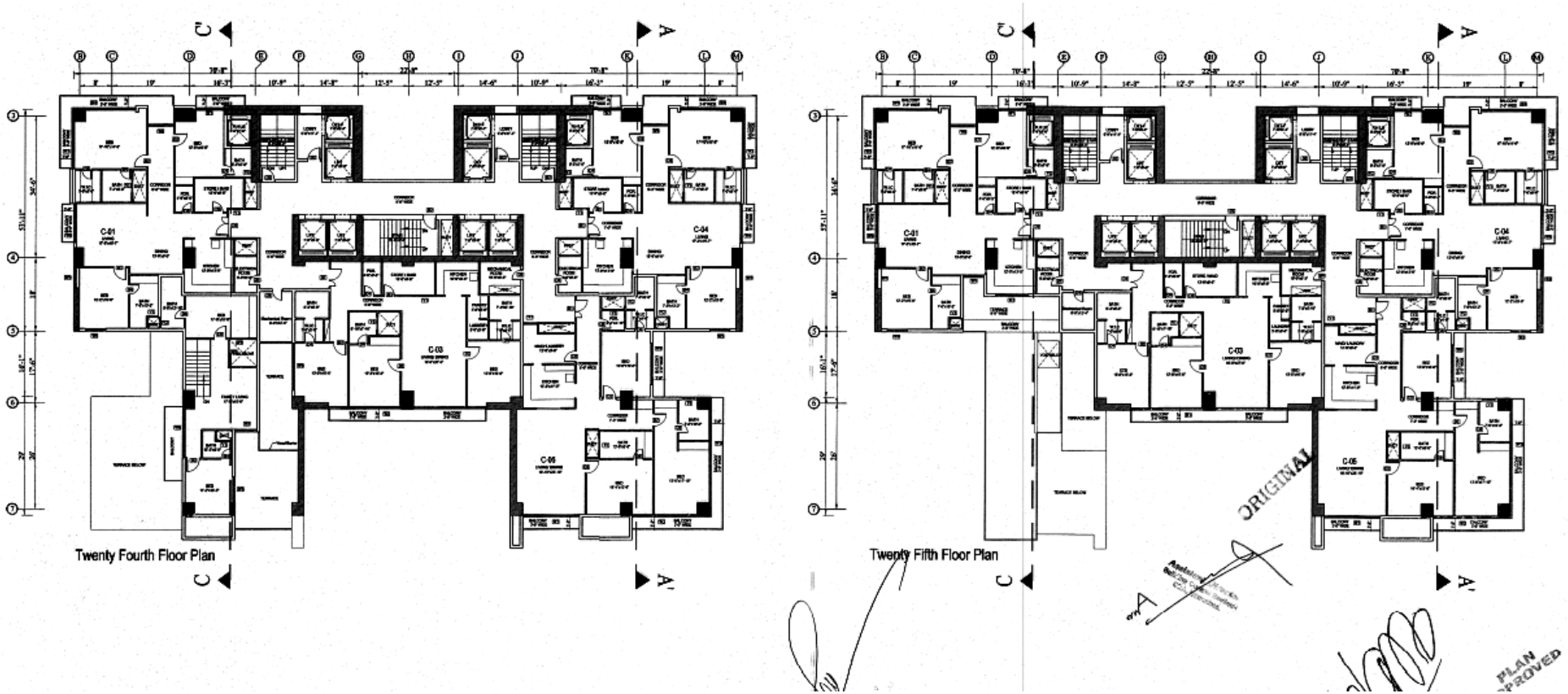


Figure 3.13: Layout plan of Service and 26th Floor Tower C of The Garden Residence Project, Sector F-10 Markaz, Islamabad

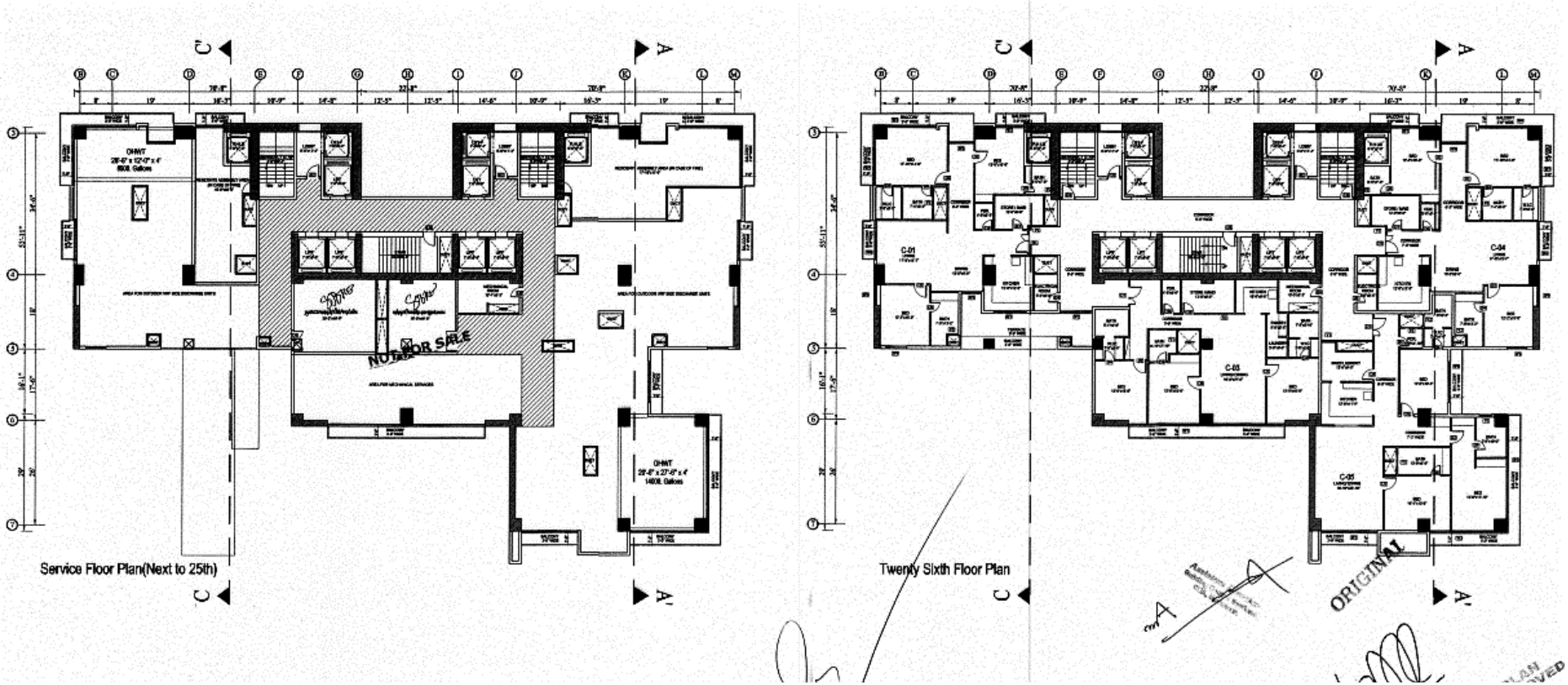


Figure 3.14: Layout plan of 27th – 28th Floor Tower C of The Garden Residence Project, Sector F-10 Markaz, Islamabad

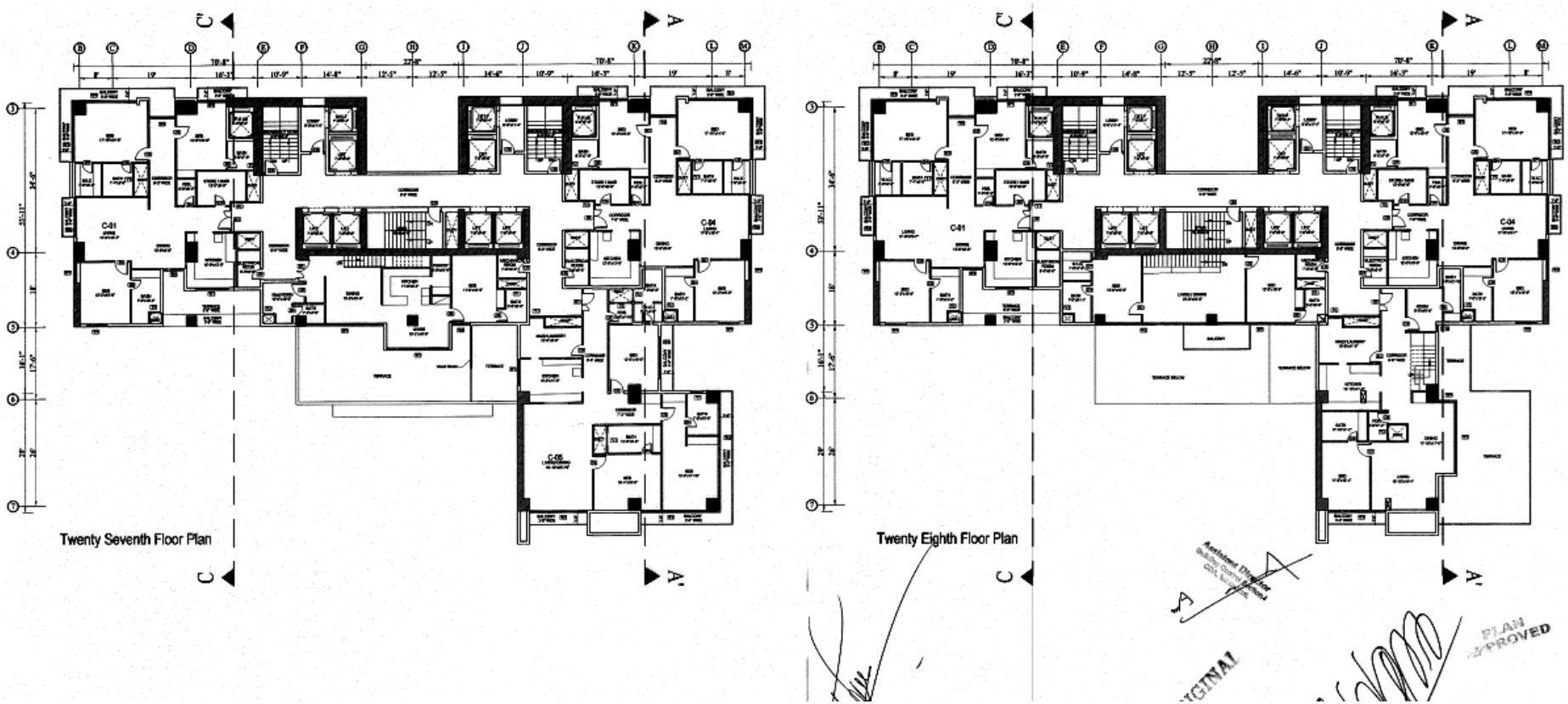


Figure 3.15: Layout plan of 29th – 30th Floor Tower C of The Garden Residence Project, Sector F-10 Markaz, Islamabad

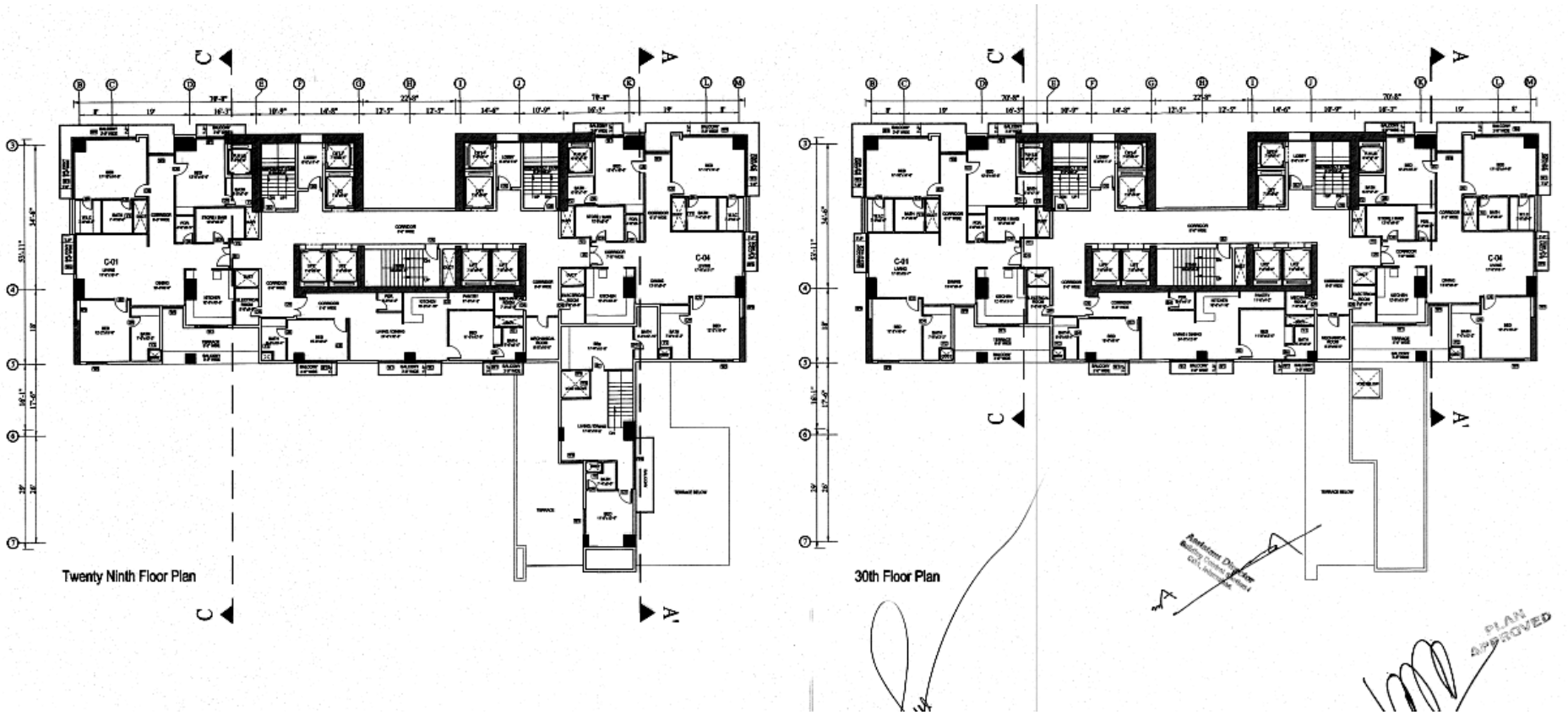
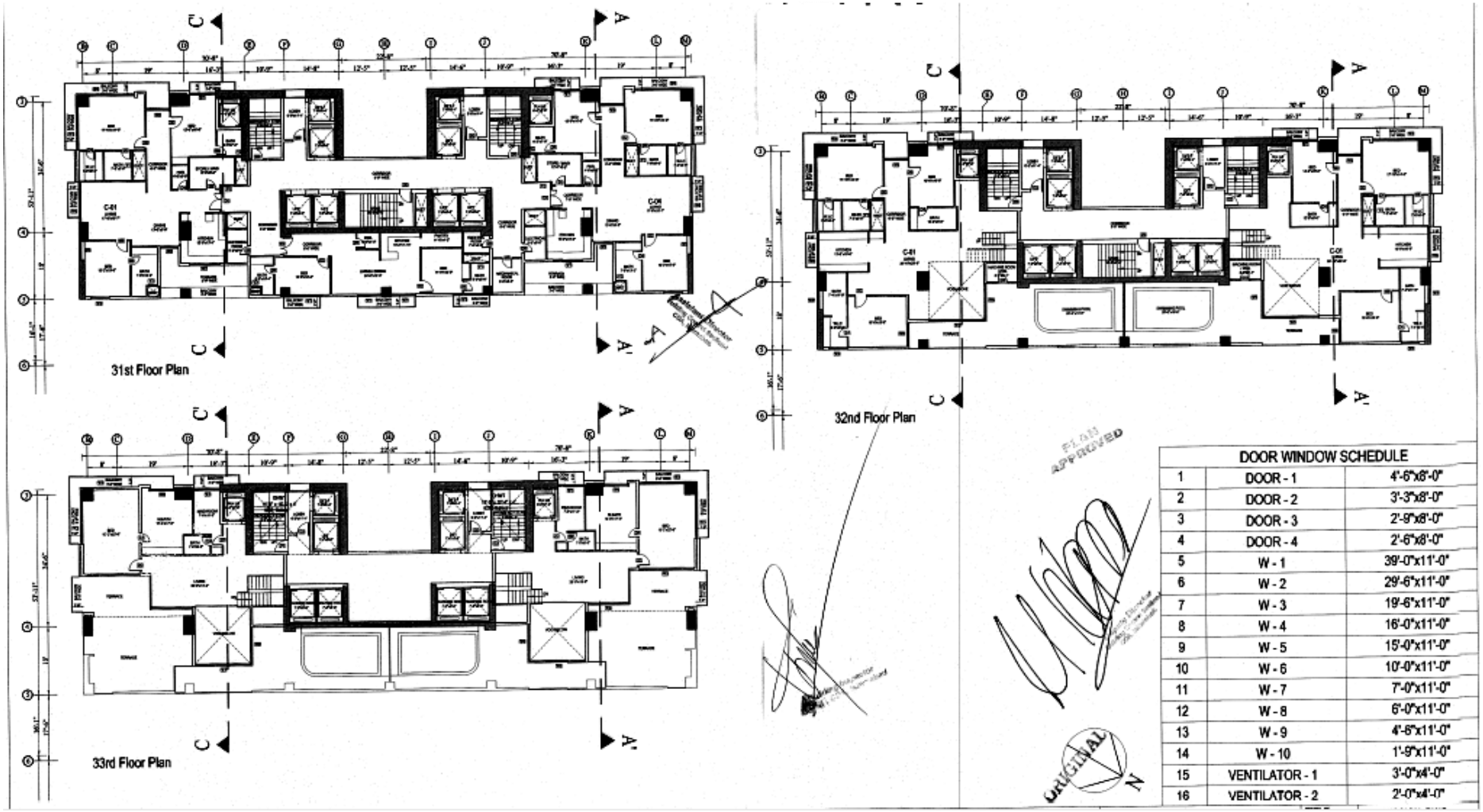


Figure 3.16: Layout plan of 31st – 33rd Floor Tower C of The Garden Residence Project, Sector F-10 Markaz, Islamabad



DOOR WINDOW SCHEDULE		
1	DOOR - 1	4'-6"x8'-0"
2	DOOR - 2	3'-3"x8'-0"
3	DOOR - 3	2'-9"x8'-0"
4	DOOR - 4	2'-6"x8'-0"
5	W - 1	39'-0"x11'-0"
6	W - 2	29'-6"x11'-0"
7	W - 3	19'-6"x11'-0"
8	W - 4	16'-0"x11'-0"
9	W - 5	15'-0"x11'-0"
10	W - 6	10'-0"x11'-0"
11	W - 7	7'-0"x11'-0"
12	W - 8	6'-0"x11'-0"
13	W - 9	4'-6"x11'-0"
14	W - 10	1'-9"x11'-0"
15	VENTILATOR - 1	3'-0"x4'-0"
16	VENTILATOR - 2	2'-0"x4'-0"

3.7 Occupancy of The Garden Residence Project

There will be 328 housing units in the Garden Residence Project (188 in Tower A/B, and 140 in Tower C). The estimated occupancy of the Garden Residence Project will be 1,968 with an average of 6 persons per housing unit. The expected population is shown in **Table 3.3.**

Table 3.2: Total Occupancy for The Garden Residence Project

Sr. No.	Description	No. of Units.	Persons/unit	Total Persons
1.	Apartments	328	6	1,968
	Total	**326**		**1,968**

Source: *PPI estimates.*

3.8 Design Criteria of The Garden Residence Project, Sector F-10 Markaz, Islamabad

The Garden Residence Project has been designed to ensure life and positivity on all the floors and in every corner of the building. Luxury, Comfort and Style, all put in together without compromising on highest architectural standards and construction quality. Purpose built spaces for residence with immaculate detailing and unmatched finishing.

FG Investments has made a very conscious effort to ensure maximum convenience and ease of residents at The Garden Residence Project by dedicating 2 whole services floors between 1st and 2nd, and 10th and 11th floors in Tower A/B; and 3 whole services floors between 1st and 2nd, 11th and 12th, and 25th and 26th floors in Tower C.

Figure 3.17: Dedicated Service Floors in Tower A/B

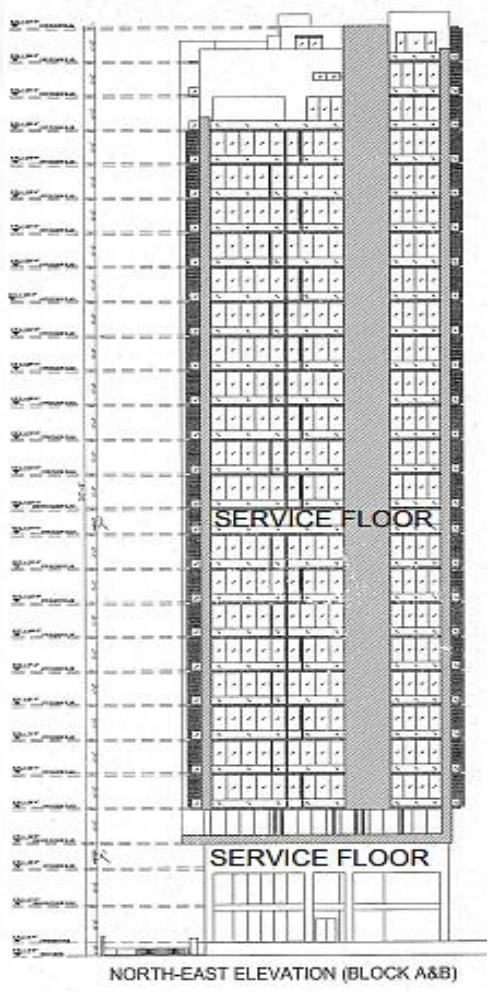
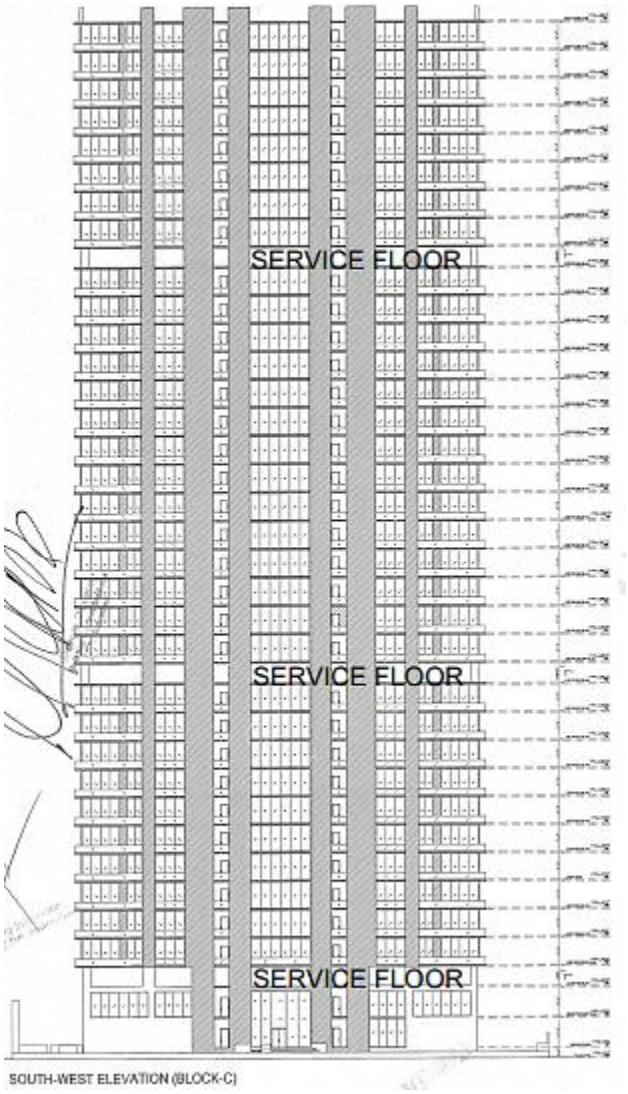


Figure 3.18: Dedicated service floors in Tower C



3.8.1 Structural System

Intermediate Moment Resisting Frame: Building frame system will be used for building design. The intermediate moment resisting system frame consists of a combination of reinforced concrete shear/core walls. The structural stablility certificate of the building is provided as **Annexure – 6**.

Floor System: Floor system shall be reinforced concrete flat slab system.

Foundation: Reinforced concrete raft foundation supported on the soil.

3.8.2 Design Codes of Practice

The following Codes of Practice, Standards and Publications have been adopted in the design of The Garden Residence Project, Sector F-10 Markaz, Islamabad:

SBC 2007 Standard Building Code of Pakistan

ACI 31899 Details and Detailing of Concrete Reinforcement

3.9 Facilities to be provided at The Garden Residence Project

The Garden Residence Project will have state of the art facilities as follows:

3.9.1 Electrical Systems

The main source of electricity will be Islamabad Electric Supply Corporation (IESCO). MV Bulk supply will be procured from IESCO; there will be 11 kV Bulk (with the owner's maintained pre-paid meters for individual offices).

The "Stand-By Power Supply" is an essential part of the Power System in the building. Given this project's nature, it has been mutually decided to provide 100% backup power supply through prime-rated Diesel Generators.

Adequate low consumption LED lights are proposed in all areas including Lift lobbies, corridors, entrance to other common services areas.

Centralized Intelligent Lighting Control system shall be provided to operate and control the Light fixtures of Circulation, Parking, Boundary Wall, and Facade areas in the most optimized and scheduled manner.

All the services rooms, lobbies, Corridors, and Circulation areas shall be provided with enough general power socket outlets for cleaning and convenience.

Instead of the conventional air terminal, an Early Streamer Emission (ESE) Lightning Arrestor has been provided for lightning protection on the Lift Machine room at the building's rooftop. The Main I.T Server room and Central Security room shall have a dedicated centralized UPS to provide uninterrupted power supply to IT Equipment, Server room and all life safety/security equipment like CCTV, Fire alarm, Public Address, Security system etc.

The total electricity requirement of The Garden Residence Project has been estimated to be 1.5 MW.

3.9.2 Water Demand

The estimated domestic water demand of The Garden Residence Project project per day is 109,536 Gallons (415 cubic meters) per day. 4 underground and 4 overhead tanks will be installed as part of the proposed project. 2 underground and 2 overhead tanks will be dedicated for fire fighting while others will store water for domestic use.

Table 3.3: Water Storage of TGR

Underground Water Tank (UGWT)	Gallons
UGWT-01 (Domestic Use)	30,650
UGWT-02 (Domestic Use)	30,650
UGWT-03 (Dedicated for Firefighting)	30,650
UGWT-04 (Dedicated for Firefighting)	30,650
Overhead Water Tank (OHWT)	
OHWT-01 (Domestic Use)	12,019.83
OHWT-02 (**50%** Reserved for Firefighting, **50%** Domestic Use)	12,019.83
Total Storage	
Total Water Storage for Domestic Use	50,258.745
Total Water Storage for Firefighting	45,238.915

Water supply for The Garden Residence Project is primarily based on CDA water supply connection and water tankers, with borewell will be used as a backup.

3.9.3 Sewerage Disposal System

The sanitary sewerage system is designed based on 80% of the daily water consumption for The Garden Residence Project is 50,258 Gal/Day. So accordingly, the sewage of The Garden Residence Project will be approximately 40,206.4 Gal/Day.

The sewer system of The Garden Residence Project has been designed to dispose into the CDA sewerage line.

3.9.4 Water Drainage System

The drainage system of The Garden Residence Project will be connected with the drainage network of CDA.

3.9.5 Solid Waste Management

According to an estimate, The Garden Residence Project will produce approximately 1,968 kg (1.968 ton) of solid waste per day during the operational phase with an average of 1 kg/capita/day.

The solid waste will have a proper management system. The solid waste collection will be carried out through refuse chute system

A garbage room shall be provided to receive the daily waste material for final dispose-off through garbage vans.

Solid Waste will be handed over to Metropolitan Corporation Islamabad (MCI) for further disposal. For recyclables, the contractor shall be hired to sell this waste. The solid waste will be collected by MCI staff, and they will dispose of waste at a designated disposal site in Islamabad.

3.9.6 Fire Suppression

The Fire Suppression Systems includes Standpipe and Hose systems and Portable Extinguishers.

The fire standpipe and hose systems have been provided for class III occupancy level as per NFPA-14. Landing Valves have been installed on each floor in the fire exit stairs for the use of firefighters.

For the hose system, 61,300 gallons has been provided in an underground tank. This reserved water will not be used for the building requirement.

Portable fire extinguishers have been provided along fire escape routes. The type and number of extinguishers shall be subjected to the requirement of NFPA-10.

Firefighting system will be comprised of;

Fire Fighting System:

- Automatic Sprinkler System
- Smoke Detection System
- Staircase pressurization system
- 4 x Lifts Pressurization system
- Class-1 Fire Hose Cabinet system
- Class-II Fire Hose Reel system
- Fire Extinguishers
- Fire Suppression System (Electrical Rooms)
- Fire Breeching Inlets
- Portable Trolley Extinguishers

Fire Alarm System:

- Fire Alarm Control Panel

- Emergency Light System Panel
- Smoke Detectors
- Heat Detectors
- Gas Detectors
- Manual Call Point
- Manual Glass Break
- Monitoring Modules
- Zone Control Valve Modules
- Emergency Lights
- Emergency Exit Lights

3.9.7 Air-conditioning system

In each apartment unit, VRF system will be installed for air conditioning. This decentralized option is environment-friendly and cost-effective as compared to centralized options. The advantages of the VRF System are as follows:

- VRF systems provide simultaneous heating and cooling
- VRF systems run at a very low volume. Unlike some older HVAC technologies, VRF systems are extremely quiet. Installing a VRF system has the added benefit of reducing ambient noise both inside and outside of a building.
- VRF systems are easy to install.
- VRF System has the ability of modular expansion.

3.9.8 Vertical Transportation

The Garden Residence Project project will have 18 passenger and cargo lifts for vertical transportation.

3.9.9 Building Management System

The Building Management System will be a PC based system. It will combine the latest state of the art technology with simple operating techniques and will be used to manage and monitor the building services installation. The BMS PC will be located in the control room, which will monitor all the buildings through the BMS network.

3.9.10 Car Parking

The car parking is as per the requirement of CDA. The parking requirements will be accommodated within the plot line, including basements.

As per parking requirements basement shall be used for parking only. According to the project's design, there is a provision of 520 slots for car parking in the 3 basements of The Garden Residence Project.

3.9.11 Vegetation Features of the project site

The plot does not have any tree. In the vicinity of the plot there are 9 trees of Kachnar, Amaltas, Cheer Pine Eucalyptus and Sukh Chain along Service Road East and a few shrubs. However, the trees will not be cut or harmed.

3.10 Sustainable Features of the Project

M/s FG Investments is committed to sustainably developing its project. The following sustainable features have been provided in this project:

- The planning & design of The Garden Residence Project has been carried out keeping in mind the natural topography, sun, and wind direction.
- VRF Air Conditioning System will be installed in the building, which is an energy-efficient system.

- The building will have a PC Based Building Management System. Adequate low consumption LED lights are proposed in all areas including Lift lobbies, corridors, entrance to other common services areas. Similarly, Double glazed low-E glass will be installed in the building as well.
- M/s FG Investments will encourage its occupants to use use cotton bags instead of plastic bags.

3.11 Land acquisition

M/s FG Investments has the possession of Plot No. 8, along the proposed 10th avenue, Sector F-10 Markaz, Islamabad.

3.12 Time Schedule

The Garden Residence Project will be completed by July 2027 (4 years). The time schedule of the project is shown in **Table 3.4**.

Table 3.4: Time Schedule for The Garden Residence Project

Description/Year	**Year**	**1**				**2**				**3**				**4**			
	Months	**1-3**	**4-6**	**7-9**	**10-12**	**13-16**	**14-16**	**17-20**	**21-24**	**25-27**	**28-30**	**31-33**	**34-36**	**37-39**	**40-42**	**43-45**	**46-48**
Foundation works																	
Construction of 3 Basement																	
Construction of ground floors																	
Construction of floors 1-10																	
Construction of floors 11-20																	
Construction of remaining floors																	
Handover of The Garden Residence Project																	

3.13 Project Phases

The Garden Residence Project project would be implemented in three phases, i.e. Pre-construction/ design, Construction and Operation.

3.13.1 Pre-construction/Design Phase

Site Investigation: The key site investigation activities include area survey, land surveying and site investigations.

Geotechnical/Soil Investigation: An extensive soil investigation of the project site been carried out. The results indicate that the soil strength is sufficient to bear 37 storey building load.

3.13.2 Construction Phase

Contractor Mobilization: This component involves the transportation of construction machinery and equipment to the project site and establishing the contractor's camp and office. The contractor will be responsible for the activities being carried out at the project site.

The equipment and machinery will be brought to the project site through Street 54. All activities related to the transportation of materials will be carried out during nighttime. The campsite facilities of the contractor include site office and areas for equipment and installation materials. The contractor office will be established at the project site.

Site Preparation: Usually, this activity involves the operation of earth-moving machinery and substantial land clearing, levelling and grading, as well as cutting and filling activities.

This activity's first task is to demarcate the site and other benchmarks, with the help of drawings prepared during the pre-construction and design phase of the project. Once marking is complete; the land will be cleared and prepared for subsequent construction activities. The whole purpose is to maintain the harmony of the area during construction.

Construction Activities: The construction activities will be carried out using the conventional methodology and sequence of work. The activities will include excavation, masonry work, carpentry, wiring, piping and plumbing, flooring, painting and installation of fixtures. Other activities will include laying cables, water supply, sewerage and storm drainage systems, junction boxes and providing connections to the building. Supervision of this whole activity will be carried out by The Garden Residence Project management and the consultant.

Staffing: Construction crews will have the responsibility of the civil contractor and its petty contractor. It is estimated that a maximum of 50 personnel will be working at the site at a given time during the peak construction period.

These will essentially include masons, carpenter, electricians, painters, plumbers and general labourers. For unskilled employment, preference will be given to residents of the project area. **Table 3.6** details the staffing requirement during the construction phase of the project.

Table 3.5: Staff for the Construction Phase of The Garden Residence Project

No	Description	No Posts
1	Skilled workers (Technicians, plumbers, labour)	60
2	Unskilled labour/ helper	40
	Total	**100**

Construction Machinery: The following construction machinery is expected to be present at the project site:

- Water tanker

- Water pumps
- Diesel generator
- Vehicles for personnel movement
- Compactors

An exact number of the above equipment and vehicles will vary depending upon the work schedule.

Construction Material: The construction material will include cement, sand, crush, bricks, steel bars, paint, piping material, electrical material and finishing material. Most materials will be procured from Islamabad and Rawalpindi.

Cement Mixing Plant: With the advancement of technology, pre-mix concrete is now widely available and very successful for high rise building project particularly, in dense urban environments where installation of Cement Mixing Plant is not possible.

To significantly reduce dust, noise and air pollution at the project site, ready mix concrete will be brought and poured at the construction element.

Disposal of Excavated/Construction Waste: Construction waste will be recycled by the contractor if possible. Otherwise, it will be disposed of at designated site which will be decided at the time of award of a contract with the contractor in consultation with CDA.

Traffic Load during Mobilization (and Demobilization) of Contractor: All of the constructions equipment and vehicles will be transported to the site via Service Road East. However, the arrival of this equipment and vehicle will be relatively controlled and minimized during weekdays.

Traffic Load for Construction Materials Supplies: It is estimated that on average, 3 - 5 truckloads per day will be supplying different types of materials to the site during the peak construction period. The condition of Service Road East is satisfactory and as such larger trucks will be used. Other staff will move on small vehicles.

Other Supplies

Water: During the construction phase, a maximum of about 5,000 GPD of water will be required for construction activities and human consumption. The contractor will arrange the water supply.

Fuels**:** For the construction equipment and vehicle, diesel will be required. The peak consumption of diesel would be 3,000 litres per day.

Electricity: Temporary connections will be obtained from IESCO for construction activities and camp.

Camp Supplies: Camp supplies can be procured from Islamabad and transported to the site via Ibn-e-Sina Road.

Camp Site Sanitation Facilities: The sanitation facilities will be provided at the campsite, and the contractor will construct a septic tank with soakage pit for storage, removal, and careful disposal of solids from wastewater to minimize environmental pollution and to improve the project site environment. The sewerage from the project site will be connected with the CDA sewerage system.

Site Restoration Plan: The contractor will prepare a site restoration plan for the construction site office's closure, which will be submitted to the Project Engineer and management of The Garden Residence Project.

The main areas to be considered for the site restoration include the construction areas, campsite etc. These areas will be restored to the original condition before construction with

maximum efforts. The restoration work comprises removing all temporary construction works, removing the fence installed, levelling off areas (where required), etc.

3.13.3 Operational Phase

The project manager will be responsible for the day-to-day operation and maintenance of The Garden Residence Project.

Figure 3.19: Pictorial presentation of Project Site

Exhibit 3.1: Southern Side view of the Project site

Exhibit 3.2: Access Road of the project

Exhibit 3.3: Trees along the Service Road East

Exhibit 3.4: PPI team consulting workers on the project site and Project site in the background

Exhibit 3.5: Site visit of PPI Team to project site

Exhibit 3.6: View of Service Road East

4 Project Alternatives

4.1 Background

Regardless of the chosen approach and its adjoining management strategies for project implementation, there are always alternative ways to implement the project using the same resource base. Therefore, to exercise all available options and select suitable management and technological options, it is necessary to exercise the alternatives available.

The three significant alternative management options used therein are the 'no project option', 'site alternative option' and the 'build as proposed option'.

4.2 Site Alternative

The proposed project is located in F-10 Markaz, along the proposed 10th Avenue and across the F-9 park. The project site can be accessed from Nazim-ud-din Road and Ibn-e-Sina Road from the south, through Service Road East in the West, and through Jinnah Avenue from the north side of the project site.

The proposed project will be constructed exclusively for residential purposes.

The existing land use of the project area already has a number of highrise building projects operational under construction such as the Silver Oaks and Sukh Chayn Tower.

The future benefits of the total initial investment cost at the proposed location will be much higher than a location in the outskirts of Islamabad. The proposed location is easily accessible from all corners of Islamabad, so citizens will prefer to have their home at such a prime location. Moreover, F-10 Markaz and G-9 Markaz are at walking distance from the proposed project location, and employees can have easy access to public transport.

Considering all the benefits of being located at the proposed site, it is concluded that the current site is the most suitable location for The Garden Residence Project.

4.3 Economic Alternative

The proposed project will harness the substantive role of private investments as a means of mobilizing private sector resources for financing, construction, maintenance, and operation of projects for delivery of physical and social infrastructure services; to improve the efficiency of management, operation and maintenance of infrastructure facilities by the introduction of modern technologies and management techniques.

The immediate economic benefits of the proposed project are the generation of employment opportunities and revenue. The land use will be changed from vacant land into a Residential Tower, which will return more benefits during the operational phase than the current land use of the project site. The Garden Residence Project will comprise of apartments. The net present value of future benefits exceeds the initial investment cost for the proposed project, which indicates the economic feasibility of a project, considering all the mitigation measures suggested as part of this EIA report are implemented during construction and operational phase of the project.

4.4 Environmental Alternative

The proposed project site is located in an urban setting with similar landuse. There may be potential environmental and human health impacts of the proposed project during the project's construction phase. However, the proposed project has been planned to introduce green building and contribute towards sustainable development. All the sustainable features required for a green building have been incorporated into the building design. Following green features is part of the proposed project.

- Energy Efficiency and Renewable Energy.
- Water Efficiency.

- Environmentally Preferable Building Materials and Specifications.
- Waste Reduction.
- Toxics Reduction.
- Indoor Air Quality.
- Smart Growth and Sustainable Development.

Considering the environmental protection measures to be taken during construction and operational phase of the project and the sustainable features of the proposed project, it can be implied that the proposed project will enhance the environment of the project area during the operational phase of the project.

4.5 Conclusion

No alternative site has been identified. If the project is not implemented, all positive impacts related to The Garden Residence Project will be lost. The establishment of a residential tower is likely to address the concerns of the project area, Islamabad city and the whole country regarding the shortage of housing. It will uplift the social and economic growth of the country. The best option is to go ahead with the project while ensuring the implementation of mitigation measures against potential adverse impacts.

5 Description of the Environment

5.1 Introduction

This chapter describes the existing environmental conditions of the project site and area. The project area is the area falling within 1-2 km radius of the project site.

5.2 Islamabad

Islamabad Capital Territory is the capital and the ninth-largest city in the country that is spread over an area of 906 sq. km., and is divided into three segments: (i) Islamabad Urban Area, including institutional and industrial area, covering 220 sq. km. (ii) Islamabad Park is occupying 220 sq. km. (iii) Islamabad rural area measuring 446 sq. km.

Islamabad Capital Territory is divided into eight zones: Administrative Zone, Commercial District, Educational Sector, Industrial Sector, Diplomatic Enclave, Residential Areas, Rural Areas and Green Area. Islamabad city is divided into five major zones: Zone I, Zone II, Zone III, Zone IV, and Zone V. The rural area of Islamabad encompasses 132 villages administratively consists of 12 Union Councils. Islamabad has been planned in parallel belts with Administrative Sector, Diplomatic Enclave, Public Building Area, Residential Sectors, a Commercial area called the Blue Area and Industrial areas.

Islamabad is located at 33.43°N 73.04°E, at the northern edge of the Potohar Plateau and the foot of the Margalla Hills in Islamabad Capital Territory. Its elevation is 540 meters (1,770 ft.). The modern capital and the ancient Gakhar city of Rawalpindi stand side by side. They are commonly referred to as the Twin Cities, where no exact boundary exists between them.

To the northeast of the city lies Murree's hill station and to the north lies the Haripur District of Khyber Pakhtunkhwa. Kahuta lies on the southeast, Taxila, Wah Cantt, and Attock District to the northwest, Gujar Khan, Rawat, and Mandrah on the southeast, and the metropolis of Rawalpindi to the south and southwest. Islamabad is located 120 kilometres (75 mi) SSW of Muzaffarabad, 185 kilometres (115 mi) east of Peshawar, 295 kilometres (183 mi) NNE of Lahore, and 300 kilometres (190 mi) WSW of Srinagar, the capital of Indian Kashmir.

The area of Islamabad is 906 square kilometres (350 sq. mi). A further 2,717 square kilometres (1,049 sq. mi) area is known as the Specified Area, with the Margalla Hills in the north and northeast. The southern portion of the city is an undulating plain. It is drained by the Kurang River, on which Rawal Dam is located.

5.3 Physical Environment

5.3.1 Topography

The topography of Islamabad consists of plains and mountains. The northern part of the metropolitan area comprises the mountains terrain of the Margalla Hills. Rawal Lake lies in the northeast just below the hills. The southern portion of this city is an undulating plain drained by Korang River followed by its tributaries. Towards the east is a relatively flat area with bare soil and settlements.

The project site is a plain land bounded by Service Road East and the proposed 10th Avenue to the North.

5.3.2 Geology and Soils

The Potohar region has a complex geological history of mountain formation, alluvial-loessic depositions, and erosion cycles. Limestone is the characteristic rock of Margalla range. In age, it ranges from the Jurassic to Triassic. It is usually reddish or bluish-white, mixed or alternating with its beds of red or bluish clay or shades or sandstones. Adiala, Dhamial-Loibher forests are situated over alluvial deposits. The deposits contain small-sized rounded pebbles of sandstone, quartzite or granite and sand mixed or alternating with clayey deposits. They have been described as alluvial deposits, but it is equally probable that they have a glacial origin.

The ridges and valleys in the area are formed by alluvial deposits from the hills that that have been buried in the ridges of sandstone and covered by interbedded sandy silt and limestone gravel. Most of the region's urbanisation is primarily focused on the Piedmont bench area dissected more into the south side. The southern area comprises sandstone, mudstone, and conglomerate of the Siwalik Group of Neogene to Pleistocene crop out along the many steep-sided stream valleys that dissect the land. The northern edge of which extends southwards is predominantly Piedmont bench. Landforms of the area can be further divided into land formed by erosion and landforms constructed by sediments' deposition. Different soil types and landforms with a range of slopes and active geological processes may limit the land's suitability for various purposes.[3]

The project area's soil is composed of clay/silt formed of alluvial deposits laid by the past and present river system in varying thickness.

5.3.3 Land Use

Patterns of land use in Islamabad have evolved throughout the years. They have been influenced by environmental and physical factors such as landforms, climate, water availability, and human factors such as population size, growth, economic demands, and cultural practices or customs.

The project site can be classified as non-agriculture land.

Natural vegetation includes scrub, forest, and plantation, which are about 38.15% in Islamabad in 2016. Bare soil covers more than 46%. The built-up area covers 15.14% of the total, while water is only 0.44%.

Table 5.1: Temporal Variation of Land use

Sr. No	Class	The area in Percentages (%)			
		1990	2000	2010	2016
1	Permanent Vegetation	24.27	34.35	36.199	38.15
2	Urban Area	03.70	3.84	7.125	15.144
3	Bare Soil	71.42	61.34	56.2	46.26
4	Water	0.60	0.46	0.45	0.44

Source: *DIGITAL ENVIRONMENTAL ATLAS OF ISLAMABAD: Establishment of Geometric Centre for Climate Change and Sustainable Development Pakistan environmental Protection Agency Ministry of Climate Change*

5.3.4 Seismic Risk

Islamabad region can be divided into three major structural zones. The mountainous north, including Margalla Hills, is complexly folded and thrust along the Hazara Fault Zone. Southwards the mountains are a sloping piedmont bench that is truncated in sandstone and shale. The Soan River flows along the axis of Soan syncline. Islamabad lies just at the edge of Hazara Fault Zone, consisting of an arc of thrusted and folded rocks about 25km wide and 150 km long that is convex to the south and extends west-southward away from the Himalayan syntaxis. There are many thrust sheets in the Islamabad area. Some of these thrust faults are in Margalla Hills, which extends north of Fatehjang and form Kala Chita Range.

5.3.5 Major Earthquakes

The Islamabad region lies in a tectonically active zone, where earthquakes have been frequenting in recent geological history due to the structure's faulting and folding. Geological

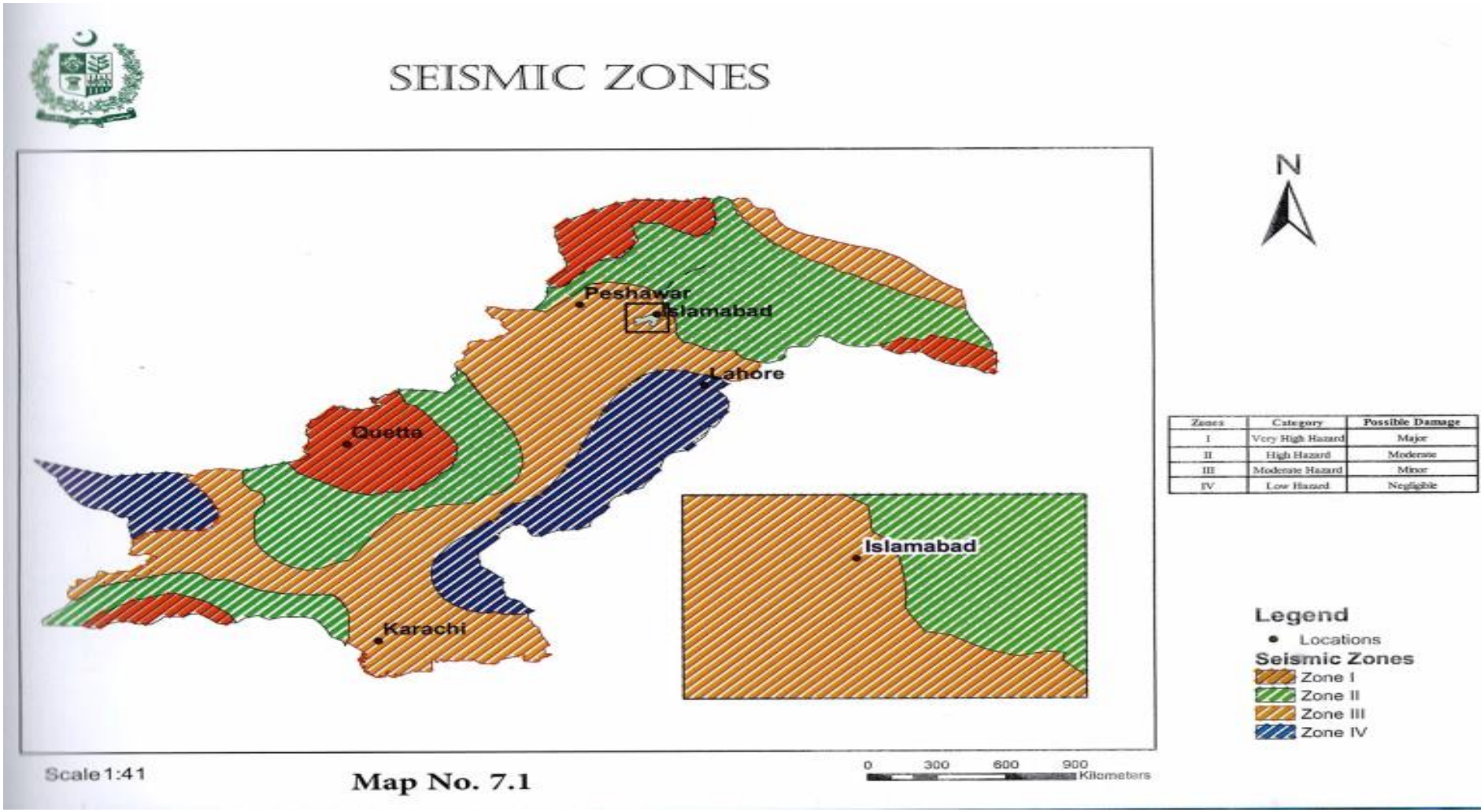
[3] *DIGITAL ENVIRONMENTAL ATLAS OF ISLAMABAD:* Establishment of Geometric Centre for Climate Change and Sustainable Development Pakistan environmental Protection Agency Ministry of Climate Change

past shows that there were many activities of earthquakes in the past in the region. The Soan syncline is an asymmetric, faulted fold of regional extent, plunging west southward. Although earthquake shaking is not confined to areas near-surface faults, the surface rupture risk is greater where the surface has been broken previously. Earthquakes in 2005 (7.6 magnitudes) resulted in large area destruction in Islamabad. Repeated earthquakes have been hitting the area almost every year. [4]

The Seismic Map of Islamabad is given in **Figure 5.1**.

[4] *DIGITAL ENVIRONMENTAL ATLAS OF ISLAMABAD:* Establishment of Geometric Centre for Climate Change and Sustainable Development Pakistan environmental Protection Agency Ministry of Climate Change

Figure 5.1: Seismic Map of Islamabad



Source: *DIGITAL ENVIRONMENTAL ATLAS OF ISLAMABAD (2016):* Establishment of Geometric Centre for Climate Change and Sustainable Development Pakistan Environmental Protection Agency Ministry of Climate Change

5.3.6 Surface Water

The Soan and Kurang Rivers are the main streams draining the area. Their primary tributaries are the Ling River, draining north-westward into the Soan; Gumreh Kas, draining westward into the Kurang from the area between the Kurang and Soan; and Lei Nala, draining southward into the Soan from the mountain front and urban areas. The Kurang and Soan Rivers are dammed at Rawal and Sambli Lakes, respectively, to supply water for the urban area. Extensive forest reserves in the Kurang and Soan Rivers' headwaters benefit the quality and quantity of water supply.

There is no nullah or other surface water resource in the vicinity of the project site.

5.3.7 Ground Water

A chemical analysis test of the ground water in the project site of The Garden Residence Project was conducted. The samples of ground water were collected on 26th February 2023 at 33°41'26.60"N 73°0'57.36"E, and were received by the Environmental Services Pakistan on 27th February 2023 for analysis.

The laboratory report detailing the ambient air and noise level monitoring report is attached in **Annexure-7.**

S. No	Parameters	Reference values	Concentration	Method/ Equipment Used	Remarks
1	pH*	6.5-8.5	7.1	SMWW 4500H+B	Within Limits
2	Total Dissolved Solids (TDS)*	<1000 mg/L	643 mg/L	SMWW 2540C	Within Limits
3	Chloride (as Cl^-) *	<250 mg/L	33 mg/L	SMWW 4500Cl-B	Within Limits
4	Cadmium (Cd) *	0.01 mg/L	ND	U.S. EPA-200.7	Within Limits
5	Chromium (Cr) *	≤ 0.05 mg/L	ND	U.S. EPA-200.7	Within Limits
6	Copper (Cu) *	2.0 mg/L	ND	U.S. EPA-200.7	Within Limits
7	Lead (Pb) *	≤ 0.05 mg/L	ND	U.S. EPA-200.7	Within Limits
8	Manganese (Mn) *	≤ 0.5 mg/L	0.03 mg/L	U.S. EPA-200.7	Within Limits
9	Nickel (Ni) *	≤ 0.02 mg/L	ND	U.S. EPA-200.7	Within Limits
10	Zinc (Zn) *	5.0 mg/L	ND	U.S. EPA-200.7	Within Limits
11	Antinomy (Sb)	≤ 0.005 mg/L	ND	U.S. EPA-200.7	Within Limits
12	Aluminum (Al)	≤ 0.2 mg/L	ND	U.S. EPA-200.7	Within Limits
13	Arsenic (As)	≤ 0.05 mg/L	ND	U.S. EPA-200.7	Within Limits
14	Boron (B)	0.3 mg/L	0.02 mg/L	U.S. EPA-200.7	Within Limits
15	Barium (Ba)	0.7 mg/L	0.1 mg/L	U.S. EPA-200.7	Within Limits
16	Mercury (Hg)	≤ 0.001 mg/L	ND	U.S. EPA-200.7	Within Limits
17	Selenium (Se)	0.01 mg/L	ND	U.S. EPA-200.7	Within Limits
18	Total Coliforms	-----	ND	SMWW 9221 B	Within Limits

19	Fecal Coliforms Bacteria	Must not be detectable in any 100ml sample	ND	SMWW 9221 F	Within Limits
20	E. Coli	Must not be detectable in any 100ml sample	ND	SMWW 9221 F	Within Limits
21	Color	≤ 15 TCU	ND	SMWW 2120 C	Within Limits
22	Taste	Non-Objectionable / Acceptable	Acceptable	Organoleptic	
23	Odor	Non-Objectionable / Acceptable	Acceptable	Organoleptic	Within Limits
24	Turbidity	<5NTU	1.4 NTU	SMWW 2130 B	Within Limits
25	Total Hardness as $CaCO_3$	<500 mg/L	420 mg/L	SMWW 2340 C	Within Limits
26	Cyanide (CN^-)	≤ 0.05 mg/L	ND	SMWW 4500 CN^- F	Within Limits
27	Fluoride (Fl^-)	≤ 1.5 mg/L	0.3 mg/L	U.S. EPA-9214	Within Limits
28	Nitrate (NO_3^-)	≤ 50 mg/L	22.6 mg/L	SMWW 4500 NO_3^-B	Within Limits
29	Nitrite (NO_2^-)	≤ 3 mg/L	ND	SMWW 4500 NO_2^-B	Within Limits
30	Residual Chlorine	0.2-0.5 mg/L	ND	SMWW 4500-Cl B	Within Limits
31	Phenolic Compounds (as Phenols)	No Guideline Value Set	ND	SMWW 5530 C	----

5.3.8 Climate

Records for the Pakistan Department of Meteorology's Islamabad station indicate a monsoonal climate of hot, rainy summers and cool, dry winters; precipitation is characteristic of Pakistan's semiarid zone. The monsoon rains usually start in June, peak in August, and end by September. A much smaller winter monsoon peaks in March. The four monsoon summer months always have some precipitation, but any other months can be completely dry. Annual rainfall of only 249.1 was recorded in 2008. The high of 1,732 mm was recorded in 1983. The average for 1931–2006 was 1,055 mm. The maximum recorded temperature was 45.9 degrees Celsius (°C) in June 2014, and the minimum was –3.9°C in one year before 1961. Freezing temperatures are rare and have been recorded only in November, December, and January in Islamabad's mountainous areas.

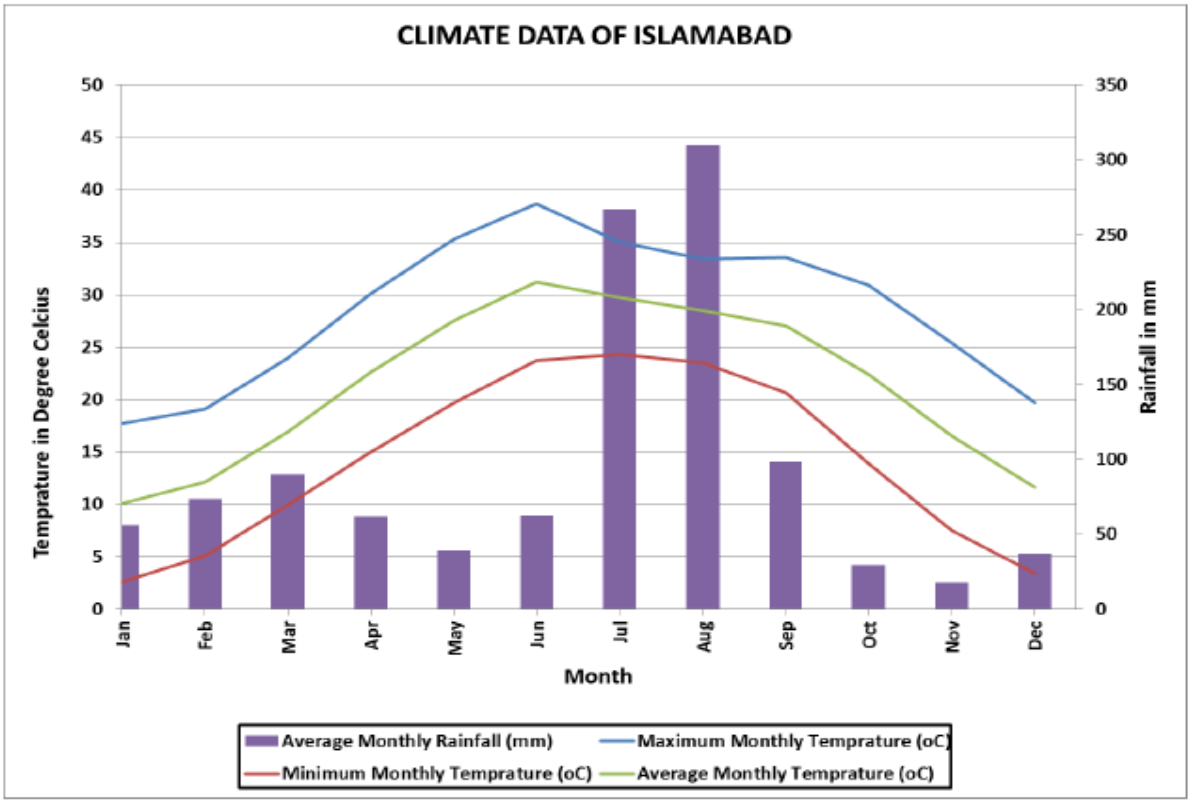
Islamabad has distinct seasons marked by wide variation in temperature. The climate remains very salubrious from April to October, but the winters get very cold due to snowfall. The coldest

months are December, January, and February. The hottest months are June and July. Rainfall in April and May is occasional, but the heaviest rain is in July and August.

The temperature of capital territory Islamabad ranges between -1 ^{0}C to 46 ^{0}C. The coldest month is January when the mean maximum temperature is 18.3 ^{0}C, and the mean minimum is 3.8 ^{0}C. From February to May the temperature rises at the rate of 5.0 ^{0}C per month. The highest temperature reached in May when the mean maximum temperature remains 39.1 ^{0}C. Humidity varies greatly in Islamabad.

Climate Data of Islamabad, including rainfall and mean minimum and maximum temperature is shown in **Figure 5.2**.

Figure 5.2: Mean Monthly Meteorological Data of Islamabad[5]



5.4 Air Quality and Noise Level Monitoring

The ambient air quality and noise level monitoring was conducted and compared against the National Environmental Quality Standards (NEQS) for Sulphur dioxide (SO_2), Oxide of Nitrogen (as NO), oxide of Nitrogen (as NO_2), Ozone (O_3), Suspended Particulate Matter (as SPM), Respirable Particulate Matter (as PM_{10}), Respirable Particulate Matter (as $PM_{2.5}$), and Carbon monoxide (CO) during 24 hours at the project site.

The ambient air and noise level monitoring was conducted on 25th February to 26th February 2023 for 24 hours at the project site of The Garden Residence Project.

The GPS coordinates of ambient air quality and noise level monitoring location are 33°41'24.93"N 73°0'57.36"E. The ambient air quality and noise monitoring was carried out by EPA Certified laboratory, ESPAK.

The laboratory report detailing the ambient air and noise level monitoring report is attached in **Annexure-7.**

Ambient Air Quality Monitoring

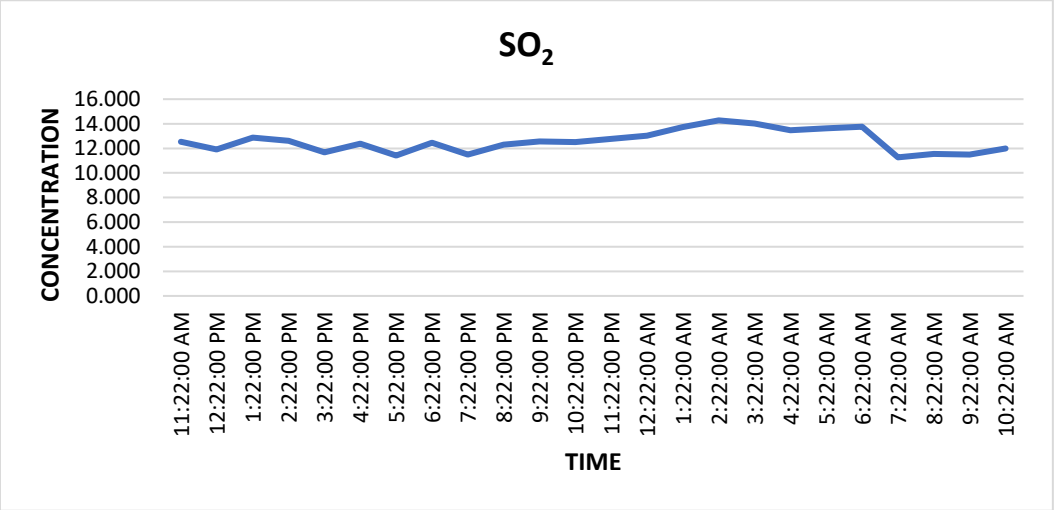
[5] https://www.worldweatheronline.com/lang/en-pk/islamabad-weather-averages/islamabad/pk.aspx

Sulphur dioxide (SO_2): Sulphur dioxide (SO_2) is a colourless, poisonous gas with a strong odour. Coal and petroleum containing Sulphur compounds produce Sulphur dioxide after their combustion. It is one of the main contributors to acid rains because of oxidation of SO_2 in the presence of a catalyst such as NO_2 forms H_2SO_4. It irritates eyes, nose, and throat. It may impair lung function and aggravate respiratory diseases.

The 24h average concentration of SO_2 at the monitoring site was 12.571 µg/m^3, which complies with the NEQS (120 µg/m^3) of Pakistan.

The hourly variation graph shows that the concentration of SO_2 varies between 11.270 µg/m^3 to 14.275 µg/m^3 during 24 hrs monitoring. This is due to the fact that there is no major industry near the project site.

Figure 5.3: Hourly Variation of Sulfur dioxide (SO_2) at the Project Site

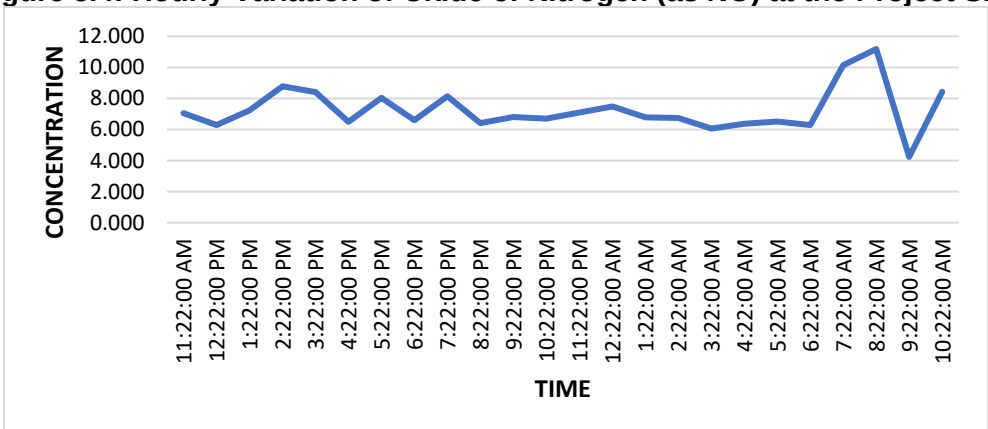


Nitrogen dioxide (NO): Nitric oxide (nitrogen oxide, nitrogen monoxide) is a molecular, chemical compound with a chemical formula of NO. One of several oxides of nitrogen, it is a colourless gas under standard conditions. It is also produced naturally by the extremely high air temperatures produced along the lightning path in thunderstorms. Nitric oxide should not be confused with nitrous oxide (N_2O), an anaesthetic, or nitrogen dioxide (NO_2), brown toxic gas and a major air pollutant. The latter is a product to which nitric oxide is rapidly oxidized in air.

The averaged (24h) concentration of NO 7.259 µg/m^3 remained in compliance with NEQS (40 µg/m^3) at the ambient air quality monitoring site**.**

The highest concentration (11.181 µg/m^3) of NO was observed at 8:22 AM. The lowest concentration of NO was (4.23176 µg/m3). The values kept on fluctuating, but all of them were within the NEQs limit (40 µg/m3) so, the site is safe from NO toxicity.

Figure 5.4: Hourly Variation of Oxide of Nitrogen (as NO) at the Project Site



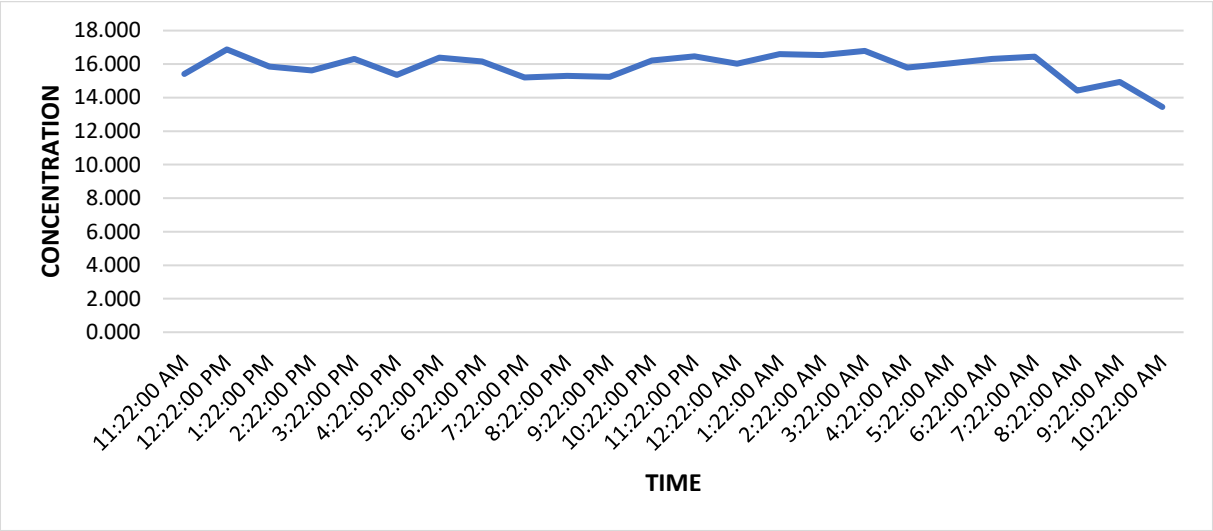
Nitrogen dioxide (NO_2): Nitrogen dioxide (NO_2) is a light brown gas that can become an important urban haze component. Oxides of nitrogen are likely the second most abundant atmospheric contaminants in many cities, ranking next to Sulphur dioxide.

Nitrogen oxides usually enter the air due to high-temperature combustion processes, such as those occurring in automobiles and power plants.

The primary sources of nitrogen oxides (NO_x) are motor vehicles and thermal power generation. The averaged (24h) concentration of NO_2 (15.820 µg/m^3) remained in compliance with NEQs (80 µg/m^3) at the ambient air quality monitoring site**.**

The highest hourly average concentration of Nitrogen dioxide was 16.875 µg/m^3 and the lowest concentration registered was 13.442 µg/m^3.

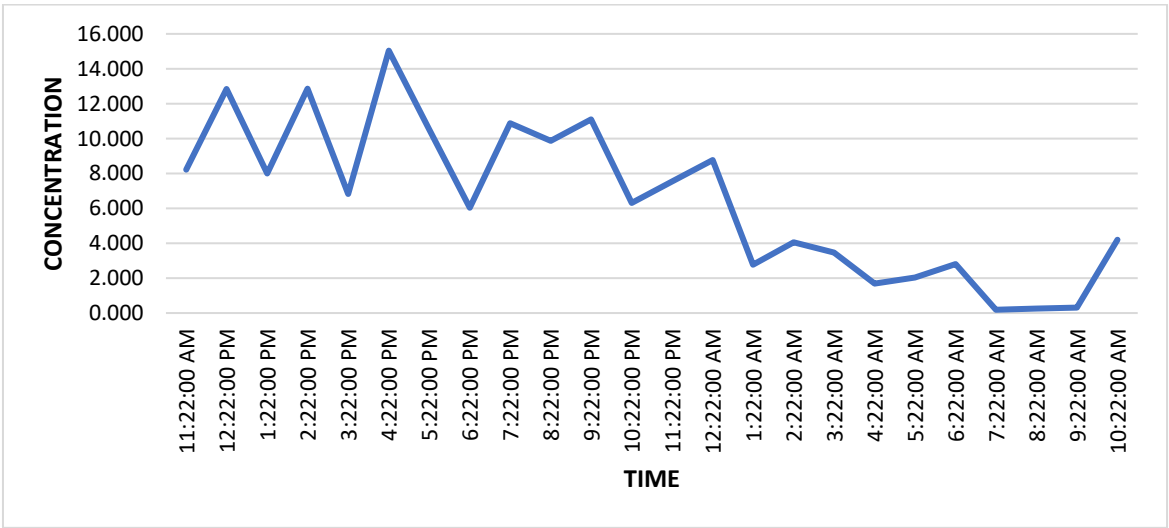
Figure 5.5: Hourly Variation of Oxide of Nitrogen (as NO_2) at the Project Site



Ozone (O_3): The averaged (24h) concentration of O_3 (6.526 µg/m^3) remained well within compliance limits of NEQS (120 µg/m^3) at the project site. Ozone is formed indirectly by the action of sunlight on nitrogen dioxide.

The O_3 concentration varies from 0.189 ug/ m^3 to 15.040 ug/m^3. This figure shows that the baseline concentration of O_3 is within the limit (120 µg/m^3). The abrupt fall of the ozone value at night time can be justified by the fact that the action of sunlight on NO_2 forms ozone.

Figure 5.6: Hourly Variation of Ozone (O_3) at the Project Site

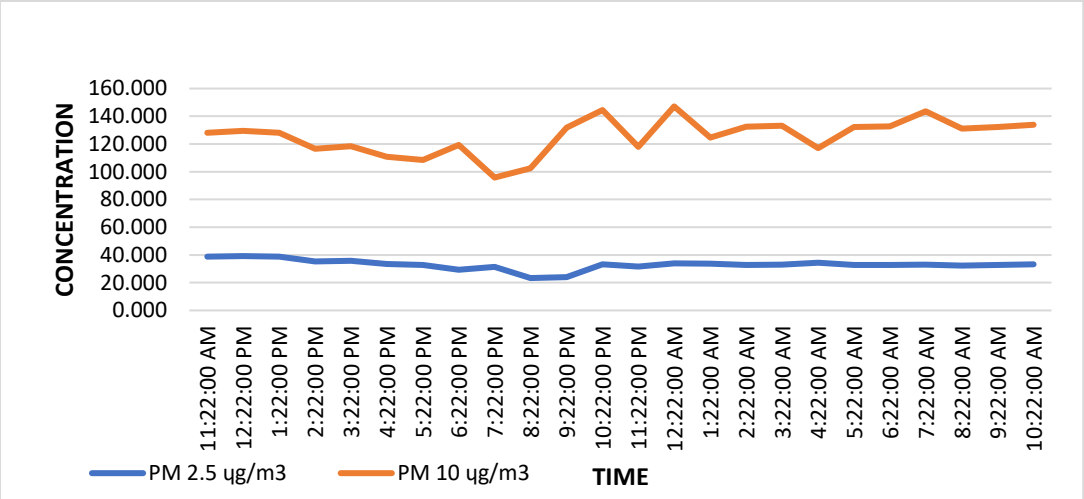


Particulate Matter: Particulate matter (PM) is solid matter from smoke, dust, fly ash, or condensing vapours that can remain suspended in the air for an extended period. PM_{10} means the particulate matter is having an aerodynamic diameter of 10 micrometres while $PM_{2.5}$ means the particulate matter is having an aerodynamic diameter of 2.5 micrometres or less. Particulates include an array of atmospheric materials, carbon-based matter such as soot, ashes, windblown dirt, sand, soil dust, metals, and plant matter such as pollens. The composition of particulate matter varies with the place, season, and weather conditions.

Fine PM can be sulfates, nitrates, organic matter (organic carbon compounds), elemental carbon (soot), and soil dust (crustal materials).

The time-averaged (24h) concentration of PM_{10} is 125.512 ug/$m^{3,}$ and $PM_{2.5}$ is 32.9 which complies with the NEQS of 150 ug/$m^{3,}$ and 35 ug/m^3 respectively.

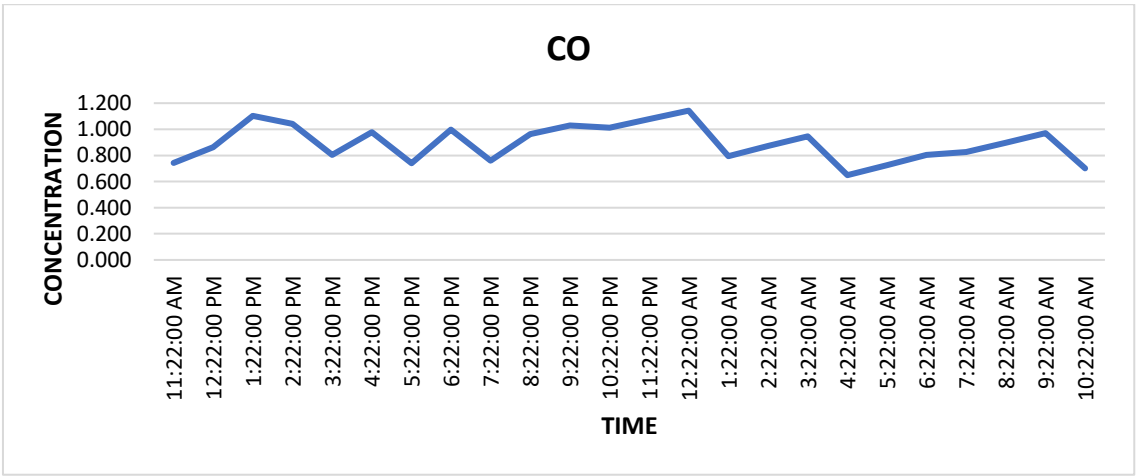
Figure 5.7: Hourly Variation of Respirable Particulate Matter (as $PM_{2.5}$ & PM_{10}) at Site



Carbon monoxide (CO): Carbon monoxide is an odourless, colourless and highly poisonous gas that has its major origin in the incomplete combustion of carbonaceous materials. Although industrial processes contribute to CO pollution levels, however, the principal source of CO is automobiles. Vehicles operating at colder temperatures (in winter, during engine warm-up or in stop-and-go traffic) produce significant quantities of this deadly gas and is of particular concern in urban areas.

The Carbon monoxide (CO) concentration was monitored for 24h at the selected site. The 24h averaged value of CO was compared with NEQS for ambient air. The averaged CO at the project site was found to be 0.893 mg/m^3 within the NEQS (i.e. 5mg/m^3) and presented in **Figure 5.8.**

Figure 5.8: Hourly Variation of Carbon Monoxide (CO) at the Project Site



The SO_2, NO, NO_2, O_3, SPM, PM_{10} and $PM_{2.5}$ and CO concentrations meet the NEQS limits.

Therefore, it is concluded that presently there is no air pollution at the project site. Proper plantation around the site will help to maintain the air quality of the area in future.

Noise Level Monitoring

Ambient noise levels were also continuously recorded at the project site for 24 hours. The sound pressure level (dB) were frequency weighted on A-curve (dB (A)) and time-weighted (dB (A) L_{eq}) on an hourly basis.

The averaged noise level during daytime was 66 dB and 59 dB during day time and night time respectively. The slight spike in noise levels can be attributed to the traffic on nearby roads and the construction activities adjacent to the proposed project site. During the construction of the project, special care will be taken for noise and vibration.

Summary of Ambient Air and Noise Monitoring

The concentrations of SO_2, CO, NO, NO_2, O_3, PM_{10}, and $PM_{2.5}$, concentrations (i.e., 12.571 µg/m^3, 0.893 mg/m^3, 7.259 µg/m^3, 15.820 µg/m^3, 6.526 µg/m^3, 125.512 µg/m^3, 239 µg/m^3 and 32.982 µg/m^3) meet the NEQS limits (i.e., 120 µg/m^3, 5 mg/m^3, 40 µg/m^3, 80 µg/m^3, 130 µg/m^3, 150 µg/m^3, 35 µg/m^3).

Table 5.2: Summary of Ambient Air Quality and Noise Results at the Project Site

Parameter	Averaging Time	NEQS	Unit	Average Concentration at the project site
Sulphur dioxide (SO_2)	24 h	120	µg/m^3	12.571
Nitric Oxide (NO)	24 h	40	µg/m^3	7.259
Nitrogen dioxide (NO_2)	24 h	80	µg/m^3	15.820
Ozone (O_3)	1 h	130	µg/m^3	6.526
Particulate Matter (PM_{10})	24 h	150	µg/m^3	125.512
Particulate Matter ($PM_{2.5}$)	24 h	35	µg/m^3	32.982
Carbon monoxide (CO)	8 h	5	mg/m^3	0.893
Noise level (Day time)	-	55	dB(A)	66
Noise Level (Nighttime)	-	45	dB(A)	59

5.5 Biological Environment

5.5.1 Flora

The vegetation of project area around Islamabad is a representative of Dry Subtropical Scrub Forest which is dominated by *Acacia Modesta* (Phulai), *Ziziphus mauritiana* (Ber); *Ziziphus nummularia* (Mullah), etc. Other associates existing in varying proportions include *Prosopis cineraria* (Jand), *Melia azadirachta* (Dharek); *Morus alba* (Mulberry-Shahtoot); *Dalbergia sissoo* (Tahli-Shisham); *Acacia nilotica* (Kiker). In the undergrowth *Cannabis sativa* (Bhang), *Calotropis procera* (Desi Ak), *Parthenium hysterophorous* (Gandi Booti) and *Ocimum bacilicum* (Niazbo) are predominant.

Presently, the plot area does not have any tree.

5.5.2 Fauna

In its original form, the Dry Subtropical Scrub Forest constituted the habitat of wild fauna consisting of a host of animals and birds. As the disturbance increased to a maximum level with complete inhabitation, wildlife abundance and diversity decreased to a minimum.

Figure 5.9: Pictorial presentation of vegetation in the project area

Exhibit 5.1: Pine Cheer

Exhibit 5.2: Sukh Chain

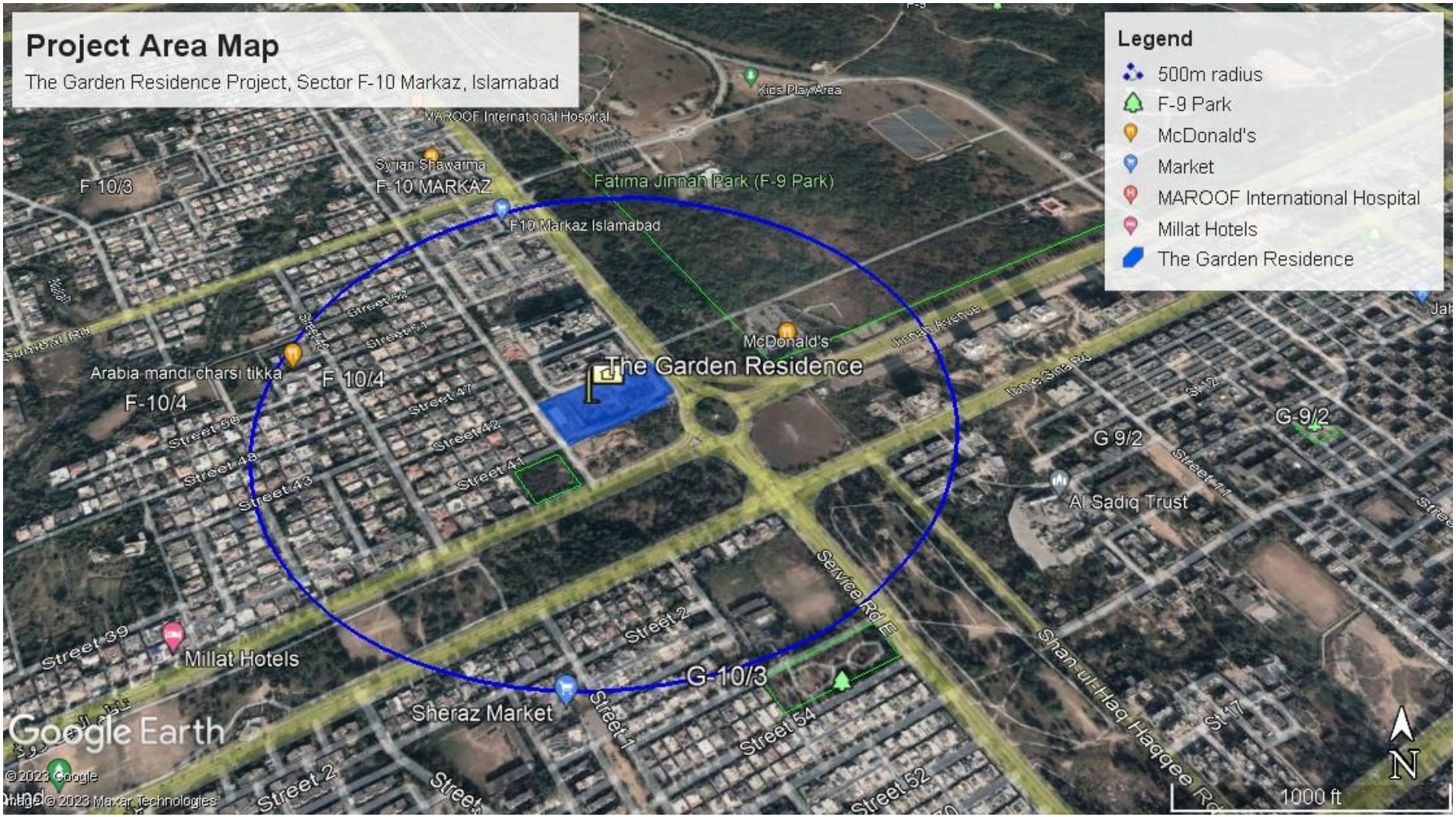
Exhibit 5.3: Kachnar

Exhibit 5.4: Amaltas

5.6 Socio-Cultural Environment

This section provides a detailed discussion of the local community's socio-economic and socio-cultural environment in the project area, Islamabad. This area may get direct positive or negative impacts from the construction of The Garden Residence Project. **Figure 5.10** shows the main environmental receptor within a 500 m radius of the project site.

Figure 5.10: Project Area Map of The Garden Residence Project



Location

The proposed project site will be located in Sector F – 10 Markaz.

Ethnic Structure

Islamabad, the capital of Pakistan, is home to people from all over the country who reside here for different purposes; from the education of children to finding better job opportunities and availing better health facilities. People of Sector F – 10/4 come from different provinces of Pakistan with diverse cultures and ethnic backgrounds.

Transportation

Private transport is common in Islamabad and adjacent areas. The roads in the project area are metalled, and public transport is easily available on Service Road East. The mode of local transport is Suzuki, Vans while taxis, Uber and Careem services are also available.

Education

There are a number of private and public educational institutions in Sector F – 10 such as Islamabad Model College for Boys F -10/4, Beacon House F -10 /4 campus and many other.

Public Health

Islamabad has both public and private medical Centre. Maroof International Hospital is one of the renowned private hospital in Sector F – 10 Markaz.

Drinking water supply

The Sector F 10 is facilitated by CDA Water Supply System the same as in other sectors of Islamabad.

6 Stakeholder Consultation

6.1 Approach to Public Consultation

The public consultation process with various stakeholders has been approached to involve public and other stakeholders from the earliest stages. Public consultation has taken place during the planning and design phase of the project. The focus of attention has been the population near the proposed project site that may be affected by the project.

The stakeholders' viewpoints have been taken into account, and their concerns and suggestions for possible improvements have been included in the EIA where appropriate.

Much of the public consultation process has revolved around concerns for the mitigation of construction stage impacts and possible traffic congestion during the project's operational phase.

The stakeholders involved in the process were the Proponent of The Garden Residence Project, officials of CDA-Environment Wing, Allama Iqbal Open University (AIOU), Islamabad Electric Supply Corporation (IESCO), Pakistan Meterological Department (PMD), Real Estate Project Director and McDonald's F-9.

6.2 Public Consultation

The community living within the project area was consulted during the EIA of the project. The project activities and their positive and negative impacts on the physical, biological, and socio-economic environment were highlighted. Stakeholders' concerns regarding various aspects, existing environment and impacts of the project are also included in the EIA report.

6.3 Objectives of Consultation

Public consultation plays a vital role in studying the effects of the project on the stakeholders and the successful implementation and execution of the proposed projects. Public involvement is a compulsory feature of environmental assessment, which leads to better and more acceptable decision-making. The overall objective of the consultation with stakeholders is to help verify the environmental and social issues that have been presumed to arise and identify those that are not known or unique to the construction of The Garden Residence Project.

The main objectives of the Consultation process are:

- Information dissemination, education, and liaison;
- Identification of problems and needs;
- Reaction, comment, and feedback on the proposed project; and
- Documentation of mitigation measures proposed by the stakeholders.

6.4 Major Stakeholders and their Apprehensions

Meetings with major stakeholders were organized to discuss project-specific issues and their potential impacts on the local and regional environments. Stakeholders consulted, and their valuable suggestions and comments are described below:

Name and Designation	Location	Opinions/Concerns/Issues/Suggestions
Mr Ahmad Naeem Qamar, CEO, FG Investments Col (Retd) Akhtar Saeed, Project Coordinator, The Garden Residence	Project site	▪ FG Investments is responsible developers with plenty of experience in construction of highrise building. One of our flagship projects is the SEE 3 developments located in New Blue Area, Islamabad. ▪ The Garden Residence is one of a kind highrise building in Islamabad which will have a height of 432 ft making it one of the tallest buildings in Islamabad. ▪ We have assembled a very experience team for the construction of the towers and they will ensure Health, Safety and Environment measures are carried out as per international standards and best practices.
Mr. Karam Khan, Deputy Director, PMD	Sector H-8/2, Islamabad	▪ The workers should have proper PPEs and the construction material should be properly handled. ▪ There should be proper tree plantation to offset air quality deterioration in the area. The nearby F – 9 Park provides an ideal space for the plantation of the trees ▪ Groundwater recharge must be encouraged. All the rainwater should be directed towards ground water recharge well. ▪ Climate change is affecting the weather patterns, the building should be designed to withstand these changes particularly, the drainage system should have capacity to accommodate large amount of rainfall in short duration.
Mr. Akhtar Rasool, Director Environment (West) /Parks	CDA Environment Wing, F-9 Park	▪ The proponent should plant 5000 trees of Kachnar, Amaltas, Sukh Chain, Peepal, Arjun, Cheer Pine, Tabebuia and fruit trees in CDA's designated area in D-12. ▪ The proponent should be responsible for the planted trees for at least 1 year. ▪ The concerned authorities should ensure the implementation of the plantation Plan
Dr. Sofia Khalid, Chairperson, Department of Environmental Science,	Allama Iqbal Open University (AIOU), H-8, Islamabad	▪ Any possible traffic congestion should be kept in mind and mitigated on priority basis ▪ There should be a proper waste management and collection system, preferably with waste chutes are suitable for highrise buildings. ▪ The proponent should keep any aesthetic concerns in mind. ▪ There should be proper environmental considerations and adjustments in the project for pollution control
Mr Sher Afzal, Environmental & Social Safeguard Section	IESCO, Islamabad	▪ Since the project contains a 37 storey tower, the project must incorporate sustainable technology in the design to make it more environment friendly.

Name and Designation	Location	Opinions/Concerns/Issues/Suggestions
		▪ The increased population and demand for urban housing, the vertical expansion is necessary.This kind of building provides more accommodation by occupying less space. We actually need to shift towards high rise buildings due to the reason that the population of the country is dramatically increasing and available space in urban areas is already very less. ▪ The electrical wiring system must be done carefully to avoid any short circuit, and fire safety with emergency exit must be part of the building layout plan duly approved by the concerned departments. Any incident within the building can cause the loss of many lives. Water, electricity and gas should be used responsibly. ▪ The proponent should ensure appropriate Environmental, Occupational Health and Safety measures during construction phase of the project.
Mr. Ghulam Mustafa Khan Niazi, Project Director	Silver Oaks Luxury Apartments, F-10 Markaz	▪ There is no objection to the project as i twill help in addressing the shortage of housing ▪ CDA should enforce the rule that no machinery work can be done after 6pm as it causes noise and nuisance for the residents in surrounding areas ▪ There should be no truck or crane movement at night ▪ Refrain from excessive honking ▪ The sewerage and water supply system will get stressed as it is old, CDA should upgrade the system to enhance its capacity.
Ms. Khubra Munir, Shift Manager	McDonald's, F-9, Islamabad	▪ There is no objection or concern for the proposed project ▪ The project will bring in more customers
Mr. Nizam Khan Mr. Muhmammad Arif, Carpet Sellers	F-10 Markaz, Islamabad	▪ The carpet sellers raised no concerns regarding the project. They faced no difficulties due to construction activities ▪ Their business will grow as the population of the area increases
Mr Farhan Lodhi, Chief Executive Officer, Environmental and Waste Management Solutions	Islamabad	▪ High rise buildings are the need of the hour due to increasing land prices. ▪ My suggestion is that proponent should to cater middle income segment accomodation for this project. ▪ Considering the high energy prices prevailing these days, proponents should actively implement energy conservation features in the building and the roof floor should be exclusively reserved for solar power panels.

6.5 Consultation with the Communities

A series of roadside discussions were carried out with the residents and management of Silver Oaks Luxury Apartments, F-10, Islamabad, located adjacent to the north-east of the project site.

During the public consultation, 12 people were consulted. During the roadside and public consultation, people were informed about the project's salient features, location, and activities.

The viewpoints of respondents are as follows:

- The residents suggested that the CDA and Pak EPA should depute a team to regularly inspect the building's construction, meaning it is being built according to the standards of construction.
- Some of the residents particularly of Sector F - 10 /4 had apprehensions about the project's construction phase that it casuse traffic, dust and noise pollution. They also suggested that the construction phase should be carried out with great care to the nearby settlements.
- Residents cited that as Islamabad is located in an active seismic area, the proponent should carry out a detailed soil strength test. The structural design should be carried out by a certified professional.
- Some of the women had apprehensions about security and privacy issues during the construction phase of the project. The consultant assured the women of safety.
- The real estate dealers are happy about constructing new residential towers as it would bring in business for them.
- Generally, people supported the project as it is necessary for the country's economic development, creating jobs and meeting the housing demand.
- The project area residents stated that a properly thought-out traffic management plan should be developed that ensures smooth access and egress of vehicles.
- According to respondents, they are not socially or environmentally threatened by the project if proper mitigation measures will be in place during the project's construction and operational phase.
- Construction activity should be avoided during night time.
- The dust suppression measures should be adopted, such as water sprinkling of the project site. Similarly, other strategies for dealing with water and noise pollution should also be adopted.

Figure 6.1: Pictorial Presentation of Public and Stakeholders Consultation

Exhibit 6.1: Consultation with workers on site

Exhibit 6.2: Consultation with a steel fixer on site

Exhibit 6.3: Consultation with the staff at McDonald's nearby

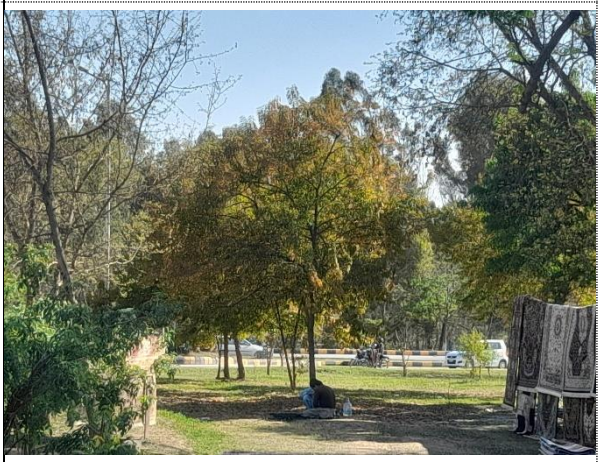


Exhibit 6.4: Consultation with carpet sellers nearby

Exhibit 6.5: Consultation with safety officer on site

Exhibit 6.6: Mehran Gate of F-9 Park near the Project Area

Exhibit 6.7: Safety signboards in the project area

Exhibit 6.8: Nearby McDonald's in F-9 where consultation was held.

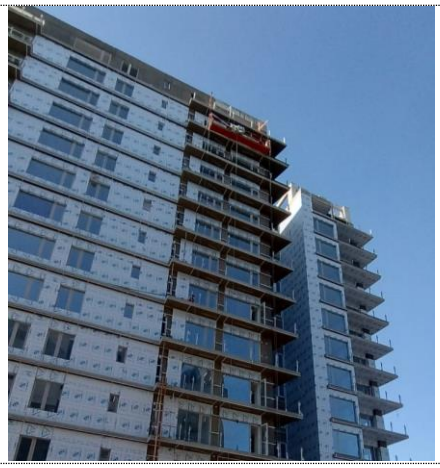


Exhibit 6.9: The underconstruction Sukh Chayn building near the project site

Exhibit 6.10: Management office of Silver Oaks Luxury Apartments where consultation was held

7 Impact Assessment and Mitigation Measures

7.1 Introduction

This chapter provides screening of potential environmental impacts of the proposed project, discusses the stakeholders' views, assesses the significance of the potential impacts, and recommends mitigation measures to minimize if not eliminate the potentially adverse impacts of the proposed activities.

7.2 Environmental Screening of the Project

To examine the environmental impact of the project, an Environmental Screening Matrix has been developed as part of the present EIA study that focuses on the potential environmental impacts of the project during pre-construction/design, construction and operational phases.

7.2.1 Impact Identification with Matricies

Environmental metrics are designed to assess the environmental impact of technology or activity. Such impacts are primarily related to using natural resources (lifecycle INPUTS) and generating waste and emissions (lifecycle OUTPUTS). The ultimate sustainability goal is to minimize the environmental impacts due to using non-renewable resources and minimizing waste and pollution. Since the complete elimination of these impacts is hardly possible (any technology has its environmental costs), it is also important to evaluate the rate at which environment can absorb the impacts and become remediated.

Impact Identification with Matrices:

A Matrix has been prepared for the identification of different environmental impacts and their associated risks or benefits. The Matrix also presents the mitigation measures or environmental enhancement measures for the identified impacts and the change in risk after the mitigation techniques have been adopted.

Risk Assessment

The risk assessment of the project activities is carried out for all the negative impacts following the basic steps listed below:

- Identify the potential impact
- Assess the risk
- Apply the appropriate measure

Risk is assessed as the likelihood that the activity will influence the environment as well as the consequence of the effect occurring. It is often described as this:

Risk = Likelihood X Consequence

The likelihood is further classified and relatively valued into: Certain (5), Likely (4), Possible (3), Unlikely (2), Rare (1)

- Certain: Will undoubtedly happen/recur on a frequent basis.
- Likely: Will probably happen/recur, but it is not a persisting issue/circumstances.
- Possible: Might happen or recur occasionally
- Unlikely: Do not expect it to happen/recur but it may do so
- Rare: This will probably never happen/recur

The consequence is further classified and relatively valued into: Remarkable (5), Major (4), Moderate (3), Minor (2), Insignificant (1).

- *Remarkable:* Impact on a larger area and highly sensitive receptors.
- *Major:* Impact on a large area and slightly sensitive receptors.
- *Moderate:* Impact on a small area with few receptors.
- *Minor:* Impact on a very small area with almost no receptors.
- *Insignificant:* Almost no impact.

Based on the classification and values, a risk analysis matrix has been developed and presented in **Table 7.1.**

Table 7.1: Environmental Screening Matrix (un-mitigated) of The Garden Residence Project

Likelihood		Consequence and Value			
	Remarkable (5)	Major (4)	Moderate (3)	Minor (2)	Insignificant (1)
Certain (5)	25	20	15	10	5
Likely (4)	20	16	12	8	4
Possible (3)	15	12	9	6	3
Unlikely (2)	10	8	6	4	2
Rare (1)	5	4	3	2	1

Based on the related values in **Table 7.1** following risk impact categories are identified.

- Extreme Risk (score 20-25): require more intensive mitigation measures
- High Risk (score 10-19): Will have a large impact which requires specific mitigations
- Medium Risk (score 5-9): Will have a small impact which can be mitigated easily
- Low Risk (score 1-4): professional judgment

Positive impacts

Positive impacts are also evaluated in the Matrix using the same methodology; however, a different color scheme is used.

Based on the classification and values, a positive impact analysis matrix has been developed and presented in **Table 7.2.**

Table 7.2: Positive Impact Analysis Matrix

Likelihood		Consequence and Value			
	Remarkable (5)	Major (4)	Moderate (3)	Minor (2)	Insignificant (1)
Certain (5)	25	20	15	10	5
Likely (4)	20	16	12	8	4
Possible (3)	15	12	9	6	3
Unlikely (2)	10	8	6	4	2
Rare (1)	5	4	3	2	1

Based on the related values in Table 7-3 following positive impact categories are identified.

- Extremely Beneficial (score 20-25): Will add a lot of value to the local environment
- Highly Beneficial (score 10-19): Will have a large positive impact on the environment
- Medium (score 5-9): Will have a small positive impact
- Low (score 1-4): Will not have any significant impact

Table 7.3: Impact Identification with Matrix

Project activity	Environmental and Social issues	Risk Assessment			Mitigation Measures for risks/Enhancement measures for positive impacts	Risk Assessment after taking mitigation Measures		
		Likelihood	Consequence	Significance		likelihood	Consequence	Significance
Pre-construction Phase Impacts								
Site Selection	Encroachment on historic/cultural values	1	1	1	Site selection has been done in a way to ensure no historical site in a 500 m radius. The plot was auctioned off by CDA	1	1	1
	Resettlement	2	5	10	No resettlement will be caused by the project.	1	3	3
Site Preparation	Noise	5	3	15	Noise barriers around the construction site along with mufflers (silencers) for vehicles and construction equipment to minimize noise.	4	2	8
	Dust generation	5	3	15	Additional water to be applied for dust suppression during dry weather.	3	2	6
	Damage to vegetation	4	3	12	Measures to be taken to enhance natural vegetation and to minimize impacts on the local bird population	2	2	4
Construction Phase Impacts								
Construction Works	Soil Erosion and degradation	5	3	15	Minimal land clearing, leveling and grading to reduce soil erosion. Construction of temporary reinforced walls to contain debris. Waste to be categorized and recycled. Slope stabilization measures to be taken during the project.	3	2	6
	Air Quality Deterioration	5	3	15	Construction equipment to be well maintained to reduce exhaust emissions. Workers to be provided with Personal Protective Gears (e.g., masks). Water to be used for dust suppression.	3	2	8
	Loss of vegetation	5	3	15	Spiling of chemicals and other effluents on the soil will be avoided.	3	2	6

Project activity	Environmental and Social issues	Risk Assessment			Mitigation Measures for risks/Enhancement measures for positive impacts	Risk Assessment after taking mitigation Measures		
		Likelihood	Consequence	Significance		likelihood	Consequence	Significance
					Tree plantation will also be carried out.			
	Damage to Wildlife	5	3	15	Measures to be taken to enhance natural vegetation and to minimize impacts on the local bird population	3	2	6
	Noise and Vibration	4	3	12	Barriers to be constructed in sensitive areas. Night-time activities will not be held unless unavoidable.	3	2	6
	Quarrying Hazards	3	4	12	Exposed soils to be stabilized with mulch and grass to prevent hazards.	3	2	6
Waste Disposal	Surface (and Groundwater) quality	4	3	12	Wastewater will be properly drained into the CDA sewerage line.	3	2	6
	Solid Waste Disposal	4	4	16	Any solid waste generated during construction will be recycled or disposed of in the nearest waste disposal site after consultation with CDA.	2	3	6
	Waste Effluent Disposal	4	4	16	Waste effluent generated from the septic tank will be properly drained into the nearest sewerage line on the site.	3	3	9
Positive impact	Job opportunities	4	4	16	Training will be arranged to hire a local crew for the project.	5	4	20
Operational Phase Impacts								
Operation of Office facility	Air Quality	3	5	15	The building will install proper HVAC system to facilitate ventilation in the building.	2	4	8
	Safety Hazard, Public Health & Nuisance	4	4	16	The building will be properly monitored by the HSE Officer to ensure that all the health and safety measures are applied.	3	3	9
	Noise	4	3	12	Noise barrier and mufflers will be used to minimize noise generation.	3	3	9
	Wastewater	4	3	12	Wastewater will be properly drained into the CDA sewerage line.	3	2	6
	Traffic congestion	3	3	9	Defensive and best driving practices will be inculcated in the project drivers.	2	2	4

Project activity	Environmental and Social issues	Risk Assessment			Mitigation Measures for risks/Enhancement measures for positive impacts	Risk Assessment after taking mitigation Measures		
		Likelihood	Consequence	Significance		likelihood	Consequence	Significance
	Solid waste	4	4	16	Solid waste will be disposed properly at CDA designated disposal site.	3	3	9
Positive impact	Employment	4	4	16	Availability of more offices will increase the employment opportunity.	5	4	20
	Efficient land use	4	4	16	Vertical expansion will help in efficient land use as people will get residential space and horizontal construction will be reduced, thus leaving more green areas.	5	4	20
	Reduction of energy consumption	4	4	16	The building will use innovative and advanced energy saving technologies such as double-glazing glass, emergency lights, LED energy savers etc.	4	5	20
	Business opportunities	4	3	12	Th project will give rise to small scale businesses in the vicinity.	4	4	16

7.3 Environmental Impact Characterization

During the environmental impact assessment process of The Garden Residence Project, the predicted impacts were characterized. Various aspects of the impact characterization include:

- Nature (direct/indirect)
- Duration of impact (short term, medium-term, long-term)
- Geographical extent (local, regional)
- Timing (Project phase)
- Reversibility of impact (reversible/irreversible)
- Likelihood of the impact (certain, likely, unlikely)
- Impact consequence severity (severe, moderate, mild)
- Significance of impact (High, medium, low)

The above aspects of environmental characterization are defined in **Table 7.1**.

Table 7.4: Impact Characterization of The Garden Residence Project

Categories	Characteristics
Nature	Direct: The environmental parameter is directly changed by the project. Indirect: The environmental parameter changes because of a change in another parameter.
Duration of impact	Short-term: Lasting only for the duration of the project, such as noise from the construction activities. Medium-term: Lasting for a period of few months to a year the project before naturally reverting to the original condition such as loss of vegetation due to the clearing of the campsite, contamination of soil or water by fuels or oil. Long-term: Lasting for a period much greater than medium-term impact before naturally reverting to the original condition such as loss of soil due to soil erosion.
Geographical extent	Local, regional (spatial dimension)
Timing	Construction and operation
Reversibility of impact	Reversible: When a receptor resumes its pre-project condition. Irreversible: When a receptor does not or cannot resume its pre-project condition.
Likelihood of the impact	Almost Certain: Impact expected to occur under most circumstances. Likely: Impact will probably occur under most circumstances Possibly: Impact may possibly occur at some time Unlikely: Impact could occur at some time Rare: Impact may occur but only under exceptional circumstances
Impact consequence severity	Major: When an activity causes irreversible damage to a unique environmental feature; causes a decline in abundance or change in distribution over more than one generation of an entire population of species of flora or fauna; has long-term effects (period of years) on socio-economic activities of significance or regional level. Moderate: When an activity causes long-term (period of years), reversible damage to a unique environmental feature; causes reversible damage or change in abundance or distribution over one generation of a population of flora or fauna; has short-term effects (period of months) on socioeconomic activities of significance on a regional level. Minor: When an activity causes short-term (period of few months) reversible damage to an environmental feature; sight reversible damage to a few species of flora or fauna within a population over a short period; has short-term (period of months) effects on socio-economic activities of local significance. Negligible: When no measurable damage to the physical, socio-economic, or biological environment above the existing level of public concern; and conformance with legislative of statutory requirements.
Significance of impact	Categorized as High, Medium, or Low Based on the consequence, likelihood, reversibility, geographical extent, and duration; the level of public concern; and conformance with legislative of statutory requirements.

Subsequent to the characterization, appropriate mitigation measures were identified, in order to minimize, if not completely eliminate, the adverse impacts associated with project activities. Finally, residual impacts were identified.

The impact characterization of the predicted impacts, mitigation measures and residual impacts are discussed below:

7.4 Pre-Construction/Design Phase Impacts

7.4.1 Project Sitting Impacts

The impacts associated with the project sitting are those which relate to its location at the designated site in Sector F-10 Markaz, Islamabad. These impacts are different from those which are associated with the project's construction and operation phases, in the sense that the construction and operation impacts are associated with the activities such as land clearing, waste disposal, whereas the sitting impacts relate to the mere presence of a facility at the given location.

For the proposed project, the

- The project site, land use and design
- Visual Impacts

These are characterized in **Table 7.2**, and discussed below:

Project Site, Land Use, and Design

The project site of The Garden Residence Project should be in line with the Master Plan of Islamabad for residential buildings. The land use and design should be in accordance with the building codes and by-laws of CDA for the construction of high rise buildings in Islamabad.

The design of The Garden Residence Project should be able to withstand the risks due to seismic activity, and necessary arrangements are in place for the health and safety of the occupants. The project will increase energy consumption and will put the burden on the already existing energy crisis in the country.

The water table in Islamabad has already dropped down to a depth of 400 ft at some locations. The extraction of water to meet the construction as well as operational needs of the project might put pressure on ground water resources.

In addition, more solid waste will have to be collected, transported, and disposed of at dumping site in I-12 as there is no landfill site. The proposed project can contribute towards the landfill crises indirectly.

The unmitigated impact associated with not following the Master Plan of Islamabad or its design does not meet the minimum requirement of CDA for construction of high rise building in Islamabad are characterized as follows:

Nature : Indirect

Duration : Long-term

Geo extent : Local

Reversibility : Irreversible

Likelihood : Possibly

Consequence : Severe

Impact significance : High

Mitigation Measures

Project Site: According to the Master Plan of Islamabad, the plot is reserved for residential purposes. Therefore, the project site is located in the designated residtential area of Islamabad.

Land Use: The land use of The Garden Residence Project is in accordance with the CDA Building bye-laws. The land-use plan The Garden Residence Project will be approved by CDA. There are multiple residential buildings in the vicinity of the proposed project site.

Design: The proposed structure of The Garden Residence Project will be in accordance with existing building by-laws, and its design will be approved by CDA. The following mitigation measures are proposed for earthquake and firefighting:

- The Building By-Laws and Codes of CDA will be strictly adopted.
- Complete equipment control system, fire escape stairs and secured access system supplemented with close circuit surveillance equipment/alarms will be included in the design of the building.
- The adequate internal and external water distribution system will be designed, with a standby system for sufficient water, which could also supply adequate quantity for firefighting.
- Adequate space will be provided for parking firefighting vehicle at the front and backside of The Garden Residence Project. The designated space will be able to withstand the load of the firefighting vehicle, which is 30-40 tons.
- Sufficient access points should be provided for access of firefighting staff to enter into The Garden Residence Project.
- Provision for pumping out water from the basement will be kept, to meet any emergency in case of water flooding the basement.
- CDA water supply system will fulfil the water supply and groundwater extraction will be used as a backup.
- The solid waste reduction, reuse and recycling will be encouraged during operational phase of the project.
- Adequate water storage for firefighting will be provided in the building. The pumps for firefighting will maintain constant pressure in the system.
- Standpipes, connected with fire pumps, will be provided in the building with fire hose cabinets on each floor. Each cabinet will house one 1.5 diameter hose of 100 ft. the length and attached to a gate valve of the same diameter.
- Orifice plates will be provided at the hose cabinets to control pressure at required level as per manufacturer's requirements.

Visual Impacts

The Garden Residence Project can potentially damage the natural landscape, and visual impact will be impacted. The unmitigated impact associated with the aesthetic value of the area is characterized as follows:

Nature :	Direct
Duration :	Long-term
Geo extent :	Local
Reversibility :	Irreversible
Likelihood :	Possibly

Consequence : Severe

Impact significance : High

Mitigation Measures

For the project, the visual impact has been minimized at different levels, as described below:

- First of all, the design of the sector should be adopted in a manner that minimizes the changes in the topography, landscape and damage to the natural vegetation.
- A plantation plan has been proposed for The Garden Residence Project which should be followed.
- Certain areas must be marked and left untouched to preserve natural vegetation.

Residual Impacts

As a result of the above mitigation measures, the visual impacts of the project will be greatly reduced. There will be some residual impact; however, its significance is expected to be low.

7.4.2. Shadow Analysis

Need for the Shadow Analysis: The proposed project would result in a new building reaching approximately 432 feet in height, including rooftop in the Sector F – 10. Shadow Studies illustrate the impact of development in terms of sun and daylight access to the surrounding context, including surrounding buildings, the public realm, public and private open space.

Shadow Studies may be required in support of development applications to demonstrate that the location and height of a proposed building if greater than 10.7m,[6] will not cause undue shade on the subject lands, and on surrounding context including building facades, private and public outdoor amenity and open spaces, public parkland, sidewalks, and other components of the public realm. The proposed building is planned to be 16 stories above ground level.

Therefore, it is intended to examine whether the proposed building would cast shadows on any publicly accessible sunlight-sensitive resources and assesses the potential effects of any such shadows.

Sun Light Sensitive Resources: Sunlight-sensitive resources are those resources that depend on sunlight or for which direct sunlight is necessary to maintain the resource's usability or architectural integrity. Following are the general classes of the shadow sensitive areas:

- Public open space (e.g. parks, playgrounds, plazas, schoolyards, greenways, landscaped medians with seating).
- Features of architectural resources that depend on sunlight for their enjoyment by the public. Only the sunlight-sensitive features need to be considered, as opposed to the entire resource. Such sunlight-sensitive features might include design elements that depend on the contrast between light and dark (e.g. recessed balconies, arcades, deep window reveals); elaborate, highly carved ornamentation; stained glass windows; historic landscapes and scenic landmarks; and features for which the effect of direct sunlight is described as playing a significant role in the structure's importance as a historic landmark.
- Natural resources where the introduction of shadows could alter the resource's condition or microclimate. Such resources could include surface water bodies, wetlands, or designated resources such as coastal fish and wildlife habitats. There is no such resource located within the proximity of the buildings leading to adverse impacts of the shadow on these resources.

[6] Standards for shadow studies

Non-Sunlight-Sensitive Resources: Non-sunlight-sensitive resources include:

- Sector streets and sidewalks (except green belts located around the side the roads as well as buildings);
- Private open space (e.g., front and back yards, stoops, vacant lots, and any private, non-publicly accessible open space).

Significant Adverse Shadow Impact: Any building puts adverse shadow impacts on its surroundings when its shadow falls on sunlight sensitive resources and reduces/ eliminates the provision of direct sunlight, thereby significantly changing the public use of the resources or threatening the flora or other resources. For the proposed development, each case will be thoroughly investigated based on the extent of the incremental shadow and the analysis of the resource sensitivity.
Shadow impacts from proposed developments should not exceed one hour in duration on the roofs, front, rear and exterior sidewalls of adjacent low rise (one to four stories) residential buildings including townhouses, detached and semi-detached dwellings. This criterion is met if there is shadow impact for no more than two consecutive hourly test times in the "No Impact Zone," i.e. the space between the front, rear and exterior sidewalls of the adjacent low-rise residential buildings and the respective lines of impact assessment.

Figure 7.1: Sun angle for June 21, 2023

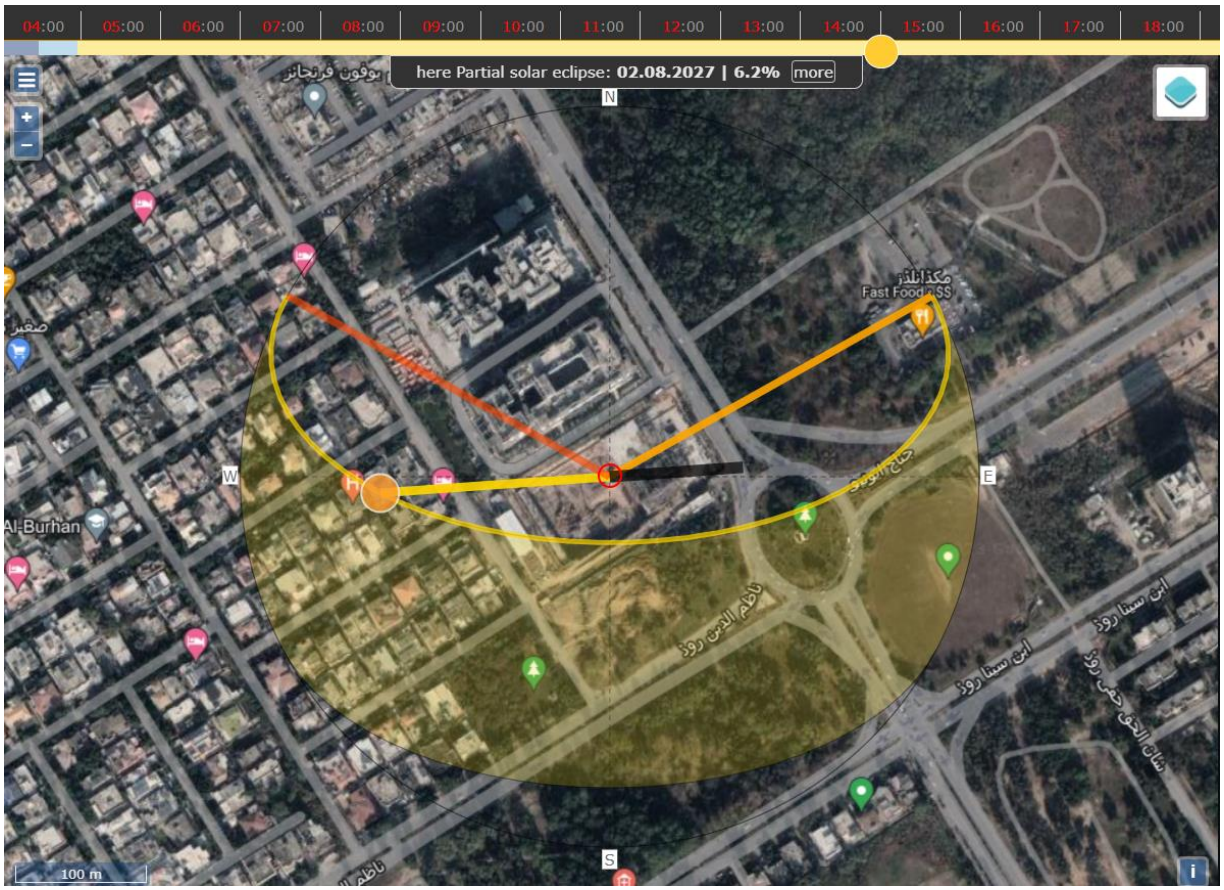
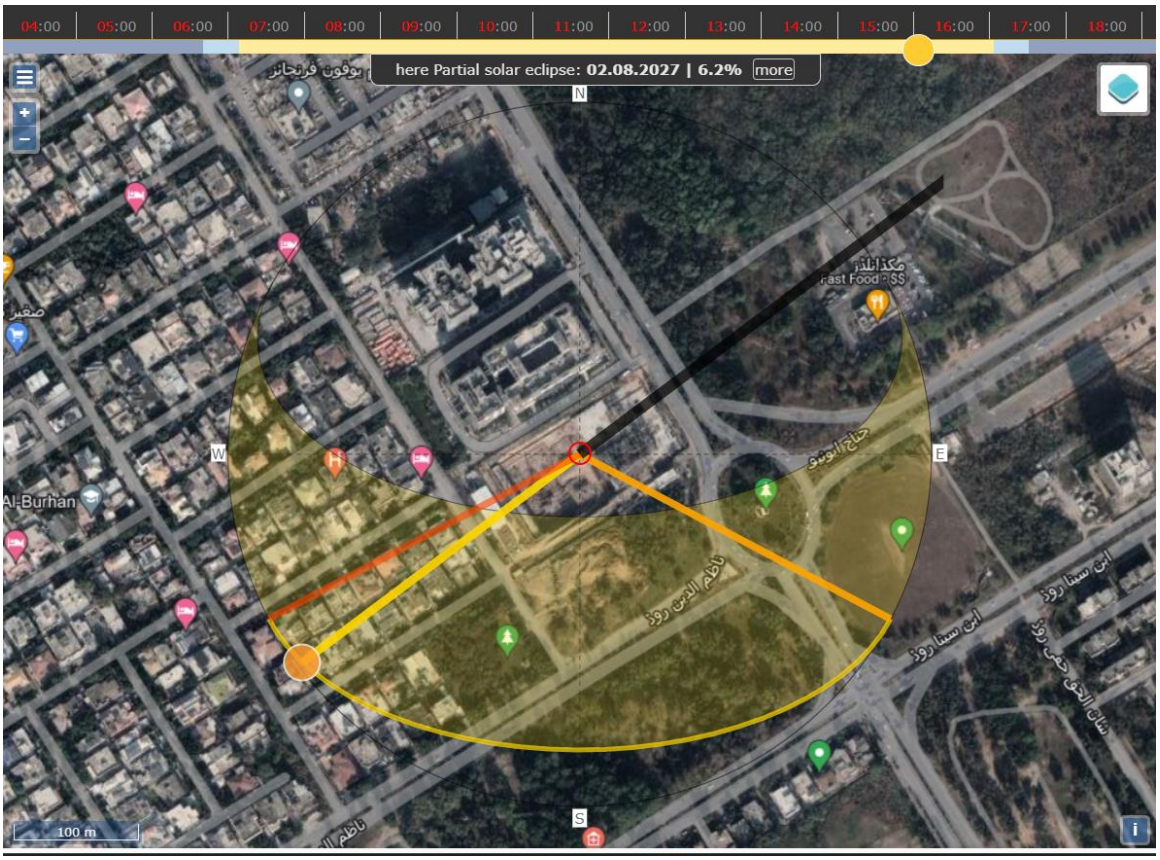


Figure 7.2: Sun angle for December 21, December 2023



Shadow Length

Using sun angle, a degree from the north and altitude, the SLF is calculated and is as follows:

Table 7.5: Linear Shadow length-June 21, 2023

Time	Azimuth	Altitude	Shadow length (m)
06:00	68.98°	10.96°	676.59
06:30	72.64°	16.82°	433.31
07:00	76.20°	22.82°	311.4
07:30	79.73°	28.91°	237.23
08:00	83.32°	35.07°	186.59
08:30	87.07°	41.28°	149.2
09:00	91.14°	47.52°	119.97
09:30	95.76°	53.74°	96.09
10:00	101.35°	59.91°	75.91
10:30	108.68°	65.93°	58.51
11:00	119.39°	71.64°	43.48
11:30	137.17°	76.57°	31.28
12:00	167.73°	79.54°	24.19
12:30	204.81°	78.83°	25.88

13:00	230.34°	74.95°	35.22
13:30	244.99°	69.66°	48.56
14:00	254.21°	63.81°	64.43
14:30	260.79°	57.72°	82.75
15:00	265.97°	51.53°	104.11
15:30	270.36°	45.29°	129.66
16:00	274.29°	39.06°	161.4
16:30	277.97°	32.87°	202.75
17:00	281.53°	26.73°	260.17
17:30	285.07°	20.67°	347.3
18:00	288.65°	14.71°	498.85
18:30	292.36°	8.91°	835.71

Figure 7.3: Linear Shadow length - June 21, 2023

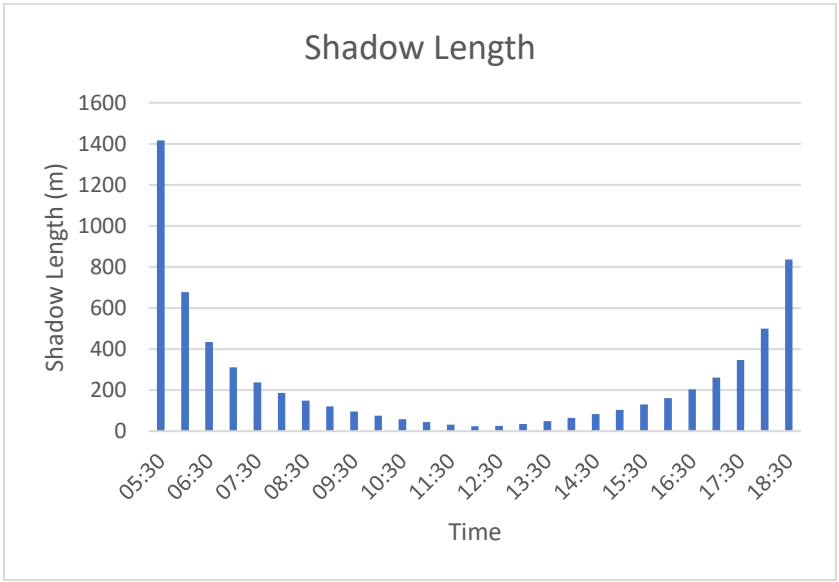
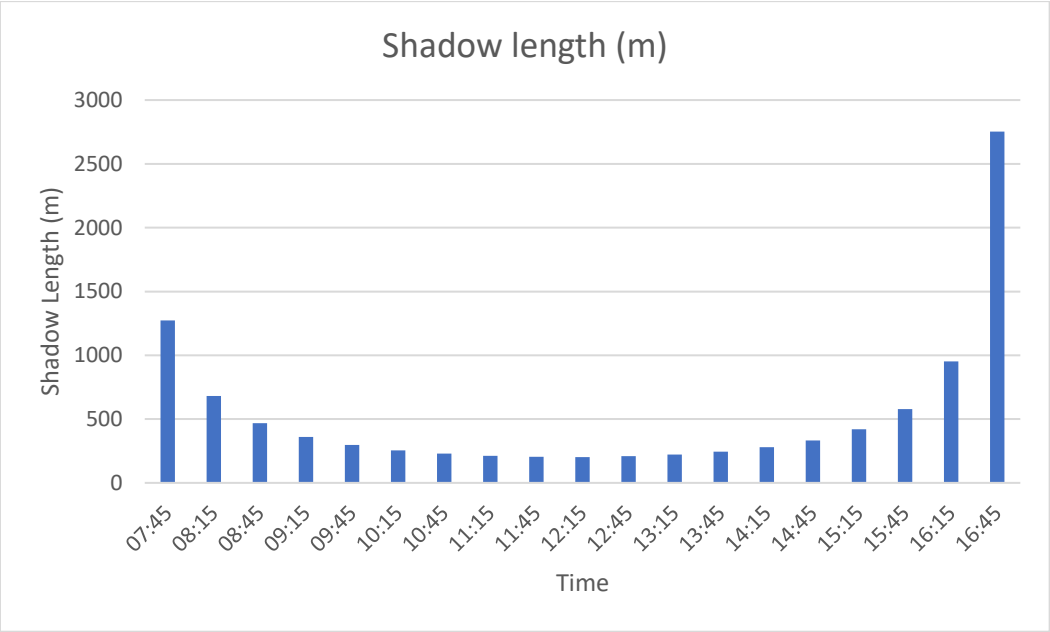


Table 7.6: Shadow length over different times of day for December 21, 2023

Time	Azimuth	Altitude	Shadow length (m)
07:45	123.19°	5.88°	1272.3
08:15	127.88°	10.89°	680.63
08:45	132.99°	15.62°	468.6
09:15	138.59°	19.96°	360.76
09:45	144.71°	23.82°	296.71
10:15	151.39°	27.12°	255.78
10:45	158.62°	29.75°	229.16
11:15	166.31°	31.63°	212.65
11:45	174.34°	32.68°	204.19

12:15	182.52°	32.85°	202.86
12:45	190.63°	32.14°	208.52
13:15	198.47°	30.57°	221.76
13:45	205.89°	28.22°	244.15
14:15	212.78°	25.16°	278.87
14:45	219.12°	21.50°	332.5
15:15	224.92°	17.34°	419.64
15:45	230.21°	12.75°	578.9
16:15	235.05°	7.83°	952.18
16:45	239.51°	2.73°	2752.29

Figure 7.4: Shadow length over different times of day for 21 December 2023



Assessment Findings and Mitigation Measures for Shadow

Assessment Findings: Shadows are resulting from The Garden Residence Project to be considered because of its height. The project is 37 storeys above the ground level, the sun rises during the morning will cast low shadows on the west, but with time, the shadow of the proposed building would increase and will fall on the buildings towards northwest and east. Following inferences might be drawn from the Shadow Analysis.

- On the Summer Solstice, i.e. 21st June 2023, at 06:00 "O" Clock in the morning, the shadow of the proposed building will be in **South-West** direction extending to **676 metres** long. However, quickly within 30 minutes, the shadow will reduce to **433 meters**. The shadow mostly falls on the Street 54. Besides this, it's early morning and sunlight is not required. Later on, the length of the shadow continues to decrease and adjust towards east thereafter mostly lies on the Service Road East and 10th Avenue.
- The Building will caste longest shadows in December in **North-East** side. The shadow length will be **2752.29 metres** long at 16:45 pm and will fall on 10th Avenue.

- Mitigation Measures: In order to compensate for the impacts due to the shadow effect of The Garden Residence Project, the following mitigation measures have been proposed:

- In the Service Road East and 10th Avenue which lies under the continuous effect of the shadow from The Garden Residence Project, shade-loving plants shall be planted to reduce the impacts of the shadows on the plants.

7.5 Contruction Phase Impacts

The construction phase will be by far the most significant part of the project with respect to environmental considerations since most of the impacts are likely to take place during this period. Various construction activities will invariably create environmental disturbances, which may have impacts on the physical, biological and social environment of the area and nearby community. Such impacts include the following:

Physical Environment

- Soil degradation and contamination
- Air quality deterioration
- Surface and groundwater contamination
- Solid Waste Management

Biological Environment

- Loss of/damage to the floral resources (natural vegetation) of the area
- Loss of/damage to faunal resources (wildlife) of the area

Social Environment

- Compensation for land acquisition
- Noise and vibration
- Safety hazards
- Public health and nuisance issue
- Sites of Archaeological or Historical Significance

These impacts are characterized in **Table 7.2** and can be readily pre-empted and mitigated.

The mitigation measures recommended in this section will need to be incorporated into the construction of the project.

These impacts and their respective mitigation measures are discussed below:

7.5.1 Soil Degradation and Contamination

The soil-related issues include soil erosion, slope stability, and soil contamination. These may be caused by the land clearing, levelling and grading, excavation and filling, construction activities and maintenance of equipment/vehicles.

Soil may be contaminated as a result of fuel/oils/chemical spillage and leakage, and inappropriate waste (solid as well as liquid) disposal.

Extraction of stone and gravel from the area may potentially lead to soil erosion.

The unmitigated impacts related to soil erosion and contaminations are characterized below.

Nature : Direct

Duration: Long-term

Geo extent : Local

Reversibility : Irreversible

Likelihood : Certain

Consequence : Moderate

Impact significance : High

Mitigation Measures

The followings mitigation measures will minimize soil erosion and contamination:

- Land clearing, levelling and grading be minimized and carried out in a manner to minimize soil erosion.
- Good management of topsoil should be done to prevent the loss of soil fertility.
- Excavated slopes will not be left untreated/unattended for long durations. Appropriate slope stabilization measures will be taken per the design (i.e. Stone pitching). Temporary measures, such as the construction of temporary walls reinforced with brick lining bordering the construction areas to contain debris and spoil, will also be undertaken to avoid soil erosion and water contamination.
- The stone and gravel will not be extracted from Islamabad.
- Vehicles and equipment will not be repaired at the project site. If unavoidable, impervious sheathing will be used to avoid any soil contamination.
- For the domestic sewage from the contractor's camp, septic tanks with soaking pits will be constructed having adequate capacity. Waste oils (if any) will be collected in drums and sold to the recycling contractors.
- The recyclable waste from the project site (such as cardboard, drums, broken/used parts, etc.) will be sold to recycling contractors, or where appropriate reuse/recycle it.
- The hazardous waste should be kept separate and handled according to the nature of the waste. While storing, hazardous waste will be marked.
- Domestic solid waste will be disposed of in a manner that does not cause soil contamination/water contamination.

Residual Impacts

Appropriate construction practices and management actions as listed above, will greatly minimize the soil erosion and contamination. The significance of the residual impacts is therefore expected to be 'low'.

7.5.2 Air Quality Deterioration

Construction machinery and project vehicles will release exhaust emissions, containing Carbon Monoxide (CO), Oxides of Sulfur (SOx), Oxides of Nitrogen (NO_x) and Particulate Matter (PM).

These emissions can deteriorate the ambient air quality in the immediate vicinity of the project site. Furthermore, construction activities such as excavation, land levelling, filling and vehicular movement on unpaved tracks may also cause fugitive dust emissions.

The unmitigated impacts related to air quality deterioration are characterized below:

Nature : Direct

Duration : Short-term

Geo extent :	Local
Reversibility :	Reversible
Likelihood :	Likely
Consequence :	Minor
Impact significance :	Medium.

Mitigation Measures

The following mitigation measures will minimize the emission and their impacts:

- Construction machinery and vehicles will be kept in good working condition and properly tuned, in order to minimize the exhaust emissions.
- Fugitive dust emissions will be minimized by spraying water on the soil, where required and appropriate.

Residual Impacts

The above measures will reduce the magnitude of the adverse impacts on ambient air quality. The significance of the residual impacts on air quality is expected to be low.

7.5.3 Noise and Vibration

Noise and vibration will be generated by the construction machinery and vehicles during construction activities.

The unmitigated impacts related to the noise and vibrations caused by the project are characterized as follows:

Nature :	Direct
Duration :	Short-term
Geo extent :	Local
Reversibility :	Reversible
Likelihood :	Certain
Consequence :	Moderate
Impact significance :	High

Mitigation Measures

- Construction equipment and vehicles will have exhaust mufflers (silencers) to minimize noise generation.
- Noise monitoring will be done at the project site, and if found more than 55 dBA, appropriate sound reduction mechanism (such as a noise barrier) will be put in place.
- Blasting will not be allowed as part of the proposed construction activities.

Residual Impact

With the implementation of the above mitigation measures, the residual noise impact will be low to medium.

7.5.4 Surface Water and Groundwater Contamination

The project activities that can contaminate soil may also contaminate the surface water and groundwater. These include.

- Solid waste disposal

- Sewerage disposal
- Equipment/ vehicles maintenance
- Spillage/ leakage of fuels, oils and chemicals
- Campsite sanitation facilities

The unmitigated impacts of the proposed construction activities on the water resources of the area characterized below:

Nature :	Direct and indirect
Duration :	Short to medium term
Geo extent :	Local
Reversibility :	Reversible
Likelihood :	Likely
Consequence :	Major
Impact significance :	High

Mitigation Measures

The mitigation measures recommended to forestall soil contamination will also prevent surface and groundwater contamination.

Residual Impacts

If the recommended mitigation measures are effectively employed, the residual impacts of the project activities on the water resources of the area will be negligible.

7.5.5 Loss of Vegetation

Presently, there are no trees at the project site. In the vicinity of the project area, there are trees of Pine Chir, Amaltas, Shisham and Neem. The site preparation and construction activities may necessitate the removal of shrubs. Damage and/or loss of vegetation and clearing of other indigenous and introduced species, as well as undergrowth species which comprising bushes, grass, etc., will also lose.

The construction crew can also indulge in tree/shrub cutting to obtain fuelwood for the camp.

The unmitigated impacts of the proposed activities on the floral resources of the area are characterized below.

Nature :	Direct
Duration :	Medium to long-term
Geo extent :	Local
Reversibility:	Irreversible (reversible in medium to long-term)
Likelihood :	Certain
Consequence :	Severe
Impact significance :	High

Mitigation Measures

The follows mitigation measures will further minimize any negative impacts on the floral resources of the area:

- Endeavours will be made to compensate for the loss by enhancing the environment, through a plantation of trees and ornamental plants.

- A plantation plan for The Garden Residence Project has been prepared. The plan has a mix of appropriate trees/bushes which will be planted within the premises as well as the designated plantation site by CDA in D-12.
- All preventive measures will be adopted to control the spill-over of chemicals and other effluents on the ground to protect soil fauna and ensure microbial activity.
- Cutting of trees and other natural vegetation will be minimized as far as possible through astute planning.
- A record will be maintained for any tree cutting.
- The construction crew will be provided with LPG as cooking (and heating, if required) fuel. Use of fuelwood will not be allowed at the contractor camp.

Residual Impact

The trees planted under the plantation plan will take some time to grow and mature. Therefore, there will be some reduction of vegetation cover in the area. However, no vegetation will be possible in the built-up area. This impact cannot be fully mitigated, and the residual impact would be medium; at least in the medium term. In the longer run, however, the planted trees and vegetation will be more than compensate for any vegetation loss.

7.5.6 Damage to Wildlife

The project site is located in Sector F-10 Markaz, Islamabad, which provides little to no habitat for wildlife. However, F-9 park is located approximately 200 meters north of the project site which provides habitat for wildlife, but the construction activities will not have adverse impact considering the mitigation measures are implemented during project execution. The loss of natural vegetation discussed above and other project activities will potentially have adverse impacts on the faunal resources and habitats of the area as well. Smoke, chemicals, dust particles, and noise generated by heavy machinery are a scaring factor for wildlife. Rodents, hedgehogs, porcupines would lose their abode.

The unmitigated impacts of the proposed activities on the faunal resources of the area are characterized below:

Nature:	Direct
Duration:	Medium to long-term
Geo extent:	Local
Reversibility:	Irreversible (reversible in medium to long-term)
Likelihood:	Certain
Consequence:	Low
Impact significance:	Low

Mitigation Measures

- The measures to prevent soil and water contamination will forestall any adverse impact on the faunal resources of the area.
- Special measures will be adopted to minimize impacts on birds, such as avoiding noise-generating activities.
- Solid waste from the contractor's site office and construction waste will not be left in the open and be disposed of properly.
- The measures to restore natural vegetation loss in the area will benefit the area's fauna as well.

- The project staff will not be allowed to indulge in any hunting or trapping activities.
- Illumination levels at the site will be minimized, as far as possible.
- Appropriate diffusers should be used to restrict the illumination within the project site.
- Blasting should not be undertaken at the site for excavation purposes.
- Porcupine population has increased, as it is not palatable because of its quills. Destruction of habitat and consequent check on the population of this pest may prove to be boon to maintain ecological balance.
- Developmental activities and establishment of the project site would be a positive step to keep down the number of this undesirable species at the desirable level from the human point of view.

Residual Impact

Despite the above mitigation measures, there will be some residual impacts of the project on the faunal resources of the area. The significance of these residual impacts is expected to be medium.

7.5.7 Disposal of Construction Waste/Excavated Material

Dumping of construction wastes/excavated material, in the surrounding area, may limit the use of land in the project area. The solid waste may be generated due to different construction activities, and it will mainly include surplus excavated and construction material. It may also be generated from the construction camp.

The indiscriminate disposal of solid waste may cause dust emissions due to the wind blowing thereby affecting the health of the workers working or passing in the immediate vicinity of solid waste heaps. The impacts of solid waste would be temporary and minor negative in nature.

The unmitigated impacts of the proposed activities area are characterized below:

Nature:	Direct
Duration:	Medium to long-term
Geo extent:	Local
Reversibility:	Irreversible (reversible in medium to long-term)
Likelihood:	Certain
Consequence:	Severe
Impact significance:	Moderate

Mitigation Measures

- Management of construction activities will be done in a way to ensure minimal degradation to the soil around the project site
- Dumping of excavated waste and waste generated from the construction camp will be done at a designated site approved by CDA.

The contractors will be bound by contractual obligations to take care of the waste generated from the construction activities.

7.5.8 Traffic Management

During the construction phase, the movement of heavy machinery and transportation of construction material and equipment may cause traffic problems on Service Road East. As a result, the daily activities of the people living in Silver Oaks Apartments as well as the normal

traffic may be disturbed, which will require proper mitigation measures. This impact is temporary and minor negative in nature.

Mitigation Measures

- A traffic management plan will be prepared to avoid traffic jams/public inconvenience.
- Movement of vehicles carrying construction materials will be restricted during the night time to reduce traffic load and inconvenience to the local residents.

The management is required to maintain liaison between the Traffic Police, local residents/ travellers and the contractor to facilitate traffic movement during the construction stage.

7.5.9 Safety Hazards, Public Health and Nuisance

The project is located close in a residential area and may pose some safety hazards to the public.

The public health issues related to the project location are the possibility of contamination of local drinking water resources and dust emissions during the construction phase. The anticipated health impacts are classified into the following categories:

Dust and Pollen Allergy: One of the main problem people are facing here is of dust and pollen allergy.

Eye and Respiratory Diseases: Construction workers may be susceptible to the eye and respiratory diseases due to their routine exposure to dust and exhaust emissions on site. These effects could possibly be mitigated by routine health screening and training of contractor's employees.

Physical Injuries: Injuries could happen primarily by occupational-related accidents, animal bites, etc. Activities such as land clearing, tree felling, earthworks, and construction of facilities present various occupational hazards to the workers on site. These risks can be mitigated through the provision of appropriate training and emergency response procedures.

Psychological Disorders: Some workers may suffer from depression and anxiety disorders due to working and accommodation conditions, and their relationship with fellow workers. The psychological wellbeing of some members of the community may be affected due to disturbances created by the project activities. Mitigation measures for workers include the devotion to standards regarding working conditions.

Excessive illumination at the construction site may potentially cause light pollution, creating a public nuisance.

The unmitigated impacts related to the safety hazards; public health and nuisance are characterized as follows:

Nature:	Direct and indirect
Duration:	Short to medium term
Geo extent:	Local
Reversibility:	Reversible
Likelihood:	Likely
Consequence:	Major
Impact significance:	High.

Mitigation Measures

- Protected fencing will be fixed around the construction site. Unauthorized access within the construction area will not be allowed.

- The local community will be educated regarding the safety hazards at the site.
- The mitigation measures discussed under air quality deterioration, soil and water contamination will address the public health concerns as well.
- Defensive driving practices will be inculcated in the project drivers through training, posters and other similar measures.
- Vehicle speeds of 15 km/hr at the project site will be implemented.
- Appropriate light diffusers and reflectors will be used, if required, to minimize the public nuisance caused by light pollution.
- A traffic management plan will be prepared and implemented during the construction phase to control the accidents.
- The contractor will ensure better working conditions for its employees.
- Regular routine health screening of the staff should be carried out.
- Firefighting equipment will be made available at the camp.
- The camp staff will be provided with firefighting training.
- The construction camps and site offices will have first-aid kits.
- The construction crew will be provided with an awareness of the transmissible diseases (such as HIV/AIDS, hepatitis B, and C).
- All safety precautions will be taken to transport, handle and store hazardous substances such as fuel.
- Road signage will be fixed at appropriate locations to reduce safety hazard associated with project-related vehicular traffic.

Residual Impacts

There will be a moderate level of the residual impact of safety hazard associated with the vehicular traffic and construction activities.

The residual public health and nuisance issues will be quite negligible after the effective implementation of the mitigation measures.

7.5.10 Sites of Archaeological or Historical Significance

There are no reported sites of archaeological or historical significance at the land acquired for the project. However, in case an artifact of such significance is found during the construction activities, the Archeology Department, Government of Pakistan will be informed.

7.6 Operational Phase Impacts

The operation of The Garden Residence Project will interact with different components of the environment. This interaction may result in the following adverse impacts:

- Soil contamination
- Contamination of Surface and Groundwater
- Safety hazards, public health and nuisance

However, the magnitude of some of the above impacts is likely to be lesser as compared to the construction phase impacts.

To ensure the harmony of the project with the environment, the management will implement sound environmental management practices to handle the basic environmental issues effectively

- Landscaping and plantation
- Noise and another public nuisance abatement.

The potential environmental impacts of The Garden Residence Project during operational phase are discussed below:

7.6.1 Solid Waste Management

The solid waste generated during construction activities will be safely disposed at an approved waste disposal site in Islamabad. The management will prepare a solid waste management plan which details municipal waste collection and disposal as well as promotes recycling.

The unmitigated impacts related to solid waste management caused by the project are characterized as follows:

Nature: Direct to indirect

Duration: Medium-term

Geo extent: Local

Reversibility: Reversible

Likelihood: Certain

Consequence: Moderate

Impact significance: Medium

Mitigation Measures

Solid Waste Management will also be an important issue during the operational phase of The Garden Residence Project.

- A small secondary point should be available at the project site where segregation of recyclable and non-recyclable waste can take place. For this purpose, residents can be provided with different colour waste bins for different waste materials.
- All the solid waste from the building will be collected at one location and will be transported by CDA for disposal and the designed dumping site at Islamabad.

Residual Impact

The residual impacts of the implementation of the above measures will be low if Solid Waste is collected and disposed of properly.

7.6.2 Contamination of Surface and Groundwater

The nature of the impact of the project's operation activities on the surface and groundwater quality is expected to be quite similar to those predicted for the construction phase, except that the magnitude is likely to be lesser.

The unmitigated impacts on the surface and groundwater resources of the area are characterized below:

Nature: Direct

Duration: Short-term

Geo extent: Local

Reversibility: Reversible

Likelihood: Likely

Consequence: Major

Impact significance: High

Mitigation Measures

The mitigation measures against soil contamination discussed above for the operation activities will forestall any possible water contamination as well.

Residual Impact

After the effective implementation of the above measures, the residual impacts of the operation of The Garden Residence Project on the water resources of the area will be negligible.

7.6.3 Safety Hazard, Public Health and Nuisance

The nature impacts of the project's operation activities relating to safety hazards, public health and nuisance are expected to be quite similar to those predicted for the construction phase.

These unmitigated impacts are characterized below:

Nature: Direct and indirect

Duration: Short-term

Geo extent: Local

Reversibility: Reversible

Likelihood: Likely/possible

Consequence: Moderate

Impact significance: High to medium.

Mitigation Measures

The following mitigation measures will forestall any possible impact during the operation phase:

- The mitigation measures discussed under air quality deterioration, soil and water contamination will address the public health concerns as well.
- Appropriate solid waste disposal mechanisms will be implemented, as described earlier.
- Appropriate light diffusers and reflectors will be used where required to minimize the public nuisance caused by light pollution.
- Provision of firefighting arrangements in each floor of The Garden Residence Project.
- Provision of emergency health facilities.

Residual Impact

After the effective implementation of the above-mentioned measures, the residual impacts of the estate operation activities relating to safety hazards, public health and nuisance will be negligible.

7.7 Positive Impacts of the Project

The positive impacts of the The Garden Residence Project are as follows:

The Garden Residence Project will provide residential space with state of the art facilities and a peaceful work environment.

Keeping in view the rapid growth in population and the expansion of Islamabad as a result, the vertical expansion will save space and accommodate more people as compared to horizontal expansion, which has a very large footprint.

More offices will be accommodated on the plot, which means more people will be getting job opportunities at the same place.

The multi-dimensional impact of the proposed project will be to

- Provide sustainable development
- Provide more accommodation while covering less land.

Enhance economic activities and contribute to the promotion of skill applications and improved business practices.

7.7.1 Business Opportunity

With the start-up of operation of The Garden Residence Project project business opportunities in the area will be enhanced, thus, boosting up the local economy.

7.7.2 Employment

The operation of The Garden Residence Project will improve the employment opportunities in the project area. It is anticipated that the local community will get direct or indirect employment due to the project. Employment will have a positive impact on the local economy.

7.8 Summary of Impacts and their Mitigation Measures

The impacts, mitigation measures have been developed to minimize the likelihood, extent or duration of their occurrence and any associated adverse effects. **Table 7.5** summarizes potential impacts and proposed avoidance and mitigation measures associated with construction camps.

Table 7.7: Summary of Impacts and Mitigation Measures

Impact	Mitigation Measures
Pre-construction Phase Impacts	
Project Site, Land Use, and Design	Blue 09 Tower is being developed in an area which is located in an urban area and is accessible by Ibn-e-Sina Road. The land use and design of the project will be in line with the existing Capital Development Authority's bylaws.
Air Quality Deterioration	The project site should be monitored throughout to keep a record of air quality and any change in it. Vehicular traffic on unpaved track will be avoided as far as possible, and the track will be sprinkled with water to control dust.
Surface Water and Groundwater Contamination	Protection of the groundwater reserves from any contamination. Excavation should be done in the supervision of the site engineer so he can decide up to which limit excavation should be done. Prohibit the washing of vehicles and machinery in the project area.
Noise and Vibration	To mitigate these impacts noise barriers should be constructed in sensitive areas. Construction equipment and vehicles will have exhaust mufflers (silencers) to minimize noise generation.

Impact	Mitigation Measures
	Premix Concrete will be hauled in the reduce the noise that is generated due to preparation of concrete at the site.
Safety Hazards, Public Health and Nuisance	There should be proper check and balance on construction activities. There should be proper control on oil spillage and leakage of vehicles. Firefighting equipment will be made available at the camps. The camp staff will be provided for firefighting training.
Sites of Archaeological or Historical Significance	There are no reported sites of archaeological or historical significance at the land acquired for the project. However, in case an artefact of such significance is found during the construction activities, the Archaeology Department, Government of Pakistan will be informed.
Operational Phase	
Contamination of Surface and Ground Water	The mitigation measures against soil contamination discussed above for the operation activities will forestall any possible water contamination as well.
Solid Waste Management	Blue 09 Tower will have chute system for collection of solid waste. The Solid Waste will be handed to CDA for treatment and disposal.

8 Environmental Management Plan

8.1. Introduction

The EIA report has identified the potential impacts that are likely to arise during the project. The EIA report has identified both positive and negative impacts at each stage of the project.

To minimize the effects of adverse impacts, the EIA has recommended the mitigation measures. These mitigation measures include the use of alternative technologies, management and physical control or compensation in monetary terms. The proposed mitigation measures have been based on the understanding of the sensitivity and behaviour of environmental receptors in the project area. The legislation controls that apply to the project and a review of good industry practices while operating in sensitive environments.

For residual impacts (impacts remaining after applying the recommended mitigation measures) and for impacts in which there can be a level of uncertainty in prediction at the EIA stage, monitoring measures have been recommended ascertain these impacts during the course of the project.

For the effective implementation and management of mitigation measures, an environmental management plan (EMP) has been prepared. The EMP satisfies the requirement of the Pakistan Environmental Protection Act, 1997.

This chapter outlines the implementation mechanism for the EMP and defines the institutional arrangements required for the implementation of the plan. The EMP provides the implementation mechanism for the mitigation measures identified during the EIA.

8.2. Purpose and Objectives of EMP

An Environmental Management Plan (EMP) provides a delivery mechanism to address the adverse environmental impacts of a project during its execution, to enhance project benefits, and to introduce standards of best practices to be adopted for all phases of the project.

The primary objectives of the EMP are to:

- Facilitate the implementation of identified mitigation measures.
- Develop a proper monitoring mechanism and identify requisite monitoring parameters to confirm the effectiveness of the proposed mitigation measures.
- Define the responsibilities of the project proponent, design & supervision consultant and contractor, and provide a means of effectively communicating environmental issues among themselves.

8.3. Management Approach

8.3.1. Pre-Construction and Construction Phase

The organizational roles and responsibilities are summarized below:

a) Project Proponent

The overall responsibility for compliance with the Environmental Management Plan of The Garden Residence Project rests with the project proponent, M/s FG Investments.

b) Engineers, Contractors/Sub Contractors

The contractors will carry out field activities as part of their contract agreement. The contractors will be responsible for implementing various mitigation actions prescribed in the EIA report. The contractors will also be subject to certain liabilities under the environmental laws of Pakistan, and under their contracts with the M/s FG Investments. Furthermore, the Project Manager of the contractor will implement the Environmental Monitoring Plan, which has been prepared for the construction phase.

The Project Engineer will monitor the contractors and ensure the implementation of the EMP and the EIA.

8.3.2. Operational Phase

During the operational phase of the project, environmental management will become a routine function. The institutional set up for the operational phase should include M/s FG Investments and the staff involved with the main responsibility for the environmental performance of The Garden Residence Project.

8.4. Organizational Structure and Responsibilities

8.4.1. Construction Phase

The organisational structure for the construction phase EMP is described as follows:

Primary Responsibilities: The primary responsibilities for the environmental performance of the project proponent, design and consultant and the contractor will be assumed by their respective highest-ranking officers during the project.

The Project Manager, The Garden Residence Project, will be responsible for the compliance with the EMP of the project.

Project Engineer, Design & Supervision Consultant will be responsible for monitoring and ensuring the implementation of the EMP and EIA of the project.

Site Engineer of the Contractor will be responsible for the implementation of the EMP and EIA on the ground.

Field Management and Quality Control: The construction activities will be carried out in an environmentally sound manner during the construction phase of the project and will be the responsibility of the Site Engineer of the contractor. He will be responsible for implementing EMP and EIA recommendations.

The Project Engineer, Design & Supervision Consultant will be responsible for ensuring the overall environmental soundness of all construction activities. He will ensure the implementation of EMP and EIA.

Environmental Monitoring: M/s FG Investments will make the necessary arrangements to monitor the key environmental data during the construction phase.

These will include the number of trees cut, quantity of water used, record of waste produced, a record of waste disposal and project-related vehicular traffic.

8.4.2. Operational Phase

M/s FG Investments management staff will assume the main responsibility for the environmental performance of the building during the operational phase.

An environmental monitoring plan has been developed as part of M/s FG Investments management system. The key environmental parameters, such as water consumption, waste disposal, water quality, traffic count, noise, and status of implementation of the plantation plan, will be monitored on a regular basis. The environmental monitoring reports will be produced and shared with the Pak-EPA and M/s FG Investments management.

The Garden Residence Project management will be the focal point for all environmental matters associated with the operation of the facility. They will coordinate with the Pak-EPA, for any monitoring and/or reporting requirement.

8.5. Legislation and Guidelines

The EIA of The Garden Residence Project has discussed national and international legislation and guidelines that are relevant. The proponent will ensure that his staff and all its assigned

design & supervision consultant and contractor are aware of this legislation and guidelines prior to the start of the project activities.

The Pakistan Environmental Protection Act, 1997 is the basic environmental legislation. The act also requires that no person shall emit pollutants or noise in amount, concentration or level that exceeds the National Environmental Quality Standards (NEQS). The NEQS will be followed throughout the construction and operational phases of the project.

8.6. Environmental Improvement Cell and Responsibilities

The Garden Residence Project will form up an Environmental Improvement Cell, which will be responsible for the environmental management and supervisory affairs during the construction and operational phases of the proposed Project.

The responsibilities of the Environmental Improvement Cell are as follows:

- To ensure implementation of all the proposed mitigation measures during and after the proposed project.
- Capacity building of the staff regarding environmental improvement and awareness.
- To develop operational guidelines and implementation schedule.
- Receiving complaints from the local community and other people and assisting the local environmental authority.
- To ensure that the proposed project is implemented in an environmentally friendly manner, causing the least harm to the existing environment, including flora and fauna.
- To make sure that the business and affecters of the proposed project are relocated or compensated in the most judicious manner.

8.6.1. Approvals

The management and project contractor will obtain all the relevant clearances and necessary environmental approvals required by the Pakistan Environmental Protection Agency, Islamabad.

8.6.2. Contractual Provisions

Adherence to the requirements of the EIA and EMP in terms of environmental mitigation will be required from all project contractors, and thus EMP will form part of their contracts with the management of M/s FG Investments.

The contractor shall be responsible for implementing the mitigation measures and monitoring of various environmental parameters. The management shall monitor the contractor's performance with respect to EMP implementation.

8.7. Environmental Mitigation Matrix

For The Garden Residence Project, an Environmental Management Matrix has been developed, which is given in **Table 8.1**.

This mitigation matrix provides details about the type of activity of the project, type of impact, the potential of the impact, location or extent of the impact, duration of the impact, its magnitude, and possible mitigation measures for the impact, and the institutional responsibilities for the implementation and supervision for each of the activity of the project.

Table 8.1: Environmental Matrix of The Garden Residence Project

Project Activities	Type(s) of Impact	Potential Impacts on Environment	Where the impact is likely to happen	When the impact is likely to occur	Magnitude of impacts	Mitigation Measures	Institutional Responsibility		Parameters for Monitoring
							Implementation	Supervision	
Pre-construction/Design Stage									
Drainage	Environmental	Aesthetic, water pond, a breeding ground for mosquitoes	At The Garden Residence Project	During and after rains	Major	Properly designed drains along the roads to avoid the formation of water ponds. Proper design and maintenance.	Engineering Consultant	M/s FG Investments	Stormwater runoff
Cultural Properties	Impact on Mosque, Graveyard, and archaeological sites	Social Impacts	To be checked at the project site	At the planning stage	-	Construction activities avoid any interference with cultural heritage sites.	Design & Supervision Consultant	M/s FG Investments	Social issues
Location in an area with the seismic background	Seismic activities may damage structures, environment, health, and lives	Health, food quality, jobs, safety	At The Garden Residence Project	After an earthquake with intensity higher than design.	Can be serious at times	The Garden Residence Project will be designed in accordance with the revised seismic code for Islamabad.	Engineering Consultant	M/s FG Investments	Land
Construction Phase									
Site Office and construction works									

Project Activities	Type(s) of Impact	Potential Impacts on Environment	Where the impact is likely to happen	When the impact is likely to occur	Magnitude of impacts	Mitigation Measures	Institutional Responsibility		Parameters for Monitoring
							Implementation	Supervision	
Site selection of construction site office, materials storage, human activities on-site, travel to and from the construction camp	Socio-cultural, environmental,	Sanitary waste disposal, solid (kitchen) waste disposal, fuel leakage, noise and additional traffic, water usage and pollution	Contractor's Site for Construction	Throughout the construction period	Minor if Recommendations are followed	Camp Site construction to be supervised. Proper storage and fencing, locking of storage rooms containing hazardous material. Construction site office will be located in a stable and flat area, requiring minimal vegetation removal and levelling. Camp Site construction to be supervised. Proper storage and fencing, locking of storage rooms containing hazardous material.	Contractor	Engineering Consultant	Land Analysis

Project Activities	Type(s) of Impact	Potential Impacts on Environment	Where the impact is likely to happen	When the impact is likely to occur	Magnitude of impacts	Mitigation Measures	Institutional Responsibility		Parameters for Monitoring
							Implementation	Supervision	
Sanitation and waste disposal facilities at the campsite	Sanitation and waste disposal problems	Workers health may impair which may result in slow progress	At all solid and liquid waste collection areas, latrine sites of camp	Throughout the construction period	Moderate	Contractor to provide a proper waste management plan for campsite waste. Sewerage system at the site office to be properly designed (septic tank with soakage pit) to receive all sanitary wastewaters.	Contractor	Engineering Consultant	Waste Management
Movement of vehicles in a construction site and along haulage routes	Environmental impact, impacts from the temporary haul and access roads	Soil compaction and alteration of percolation and vegetation pattern, Dust emissions	At the project site	During the construction period	Low	Construction vehicles, machinery, and equipment shall move or be stationed in the designed right-of-way to avoid unnecessary soil compaction. Air, water, and soil quality to be regularly monitored as in EMP. The existing road will be used to the extent possible for hauling materials	Contractor	Engineering Consultant	Air and Soil Quality
Movement, maintenance, and fuelling of construction vehicles	Environmental pollution and contamination	Contamination of soil, surface and groundwater from fuel and lubricants, air pollution due to dust and exhaust from vehicles movement	Fuelling and maintenance sites near construction camp, seasonal waterways present near the project site	During the construction period	Low	Slopes of the embankment to be designed so that pollutants do not enter water bodies. Construction vehicles and equipment to be properly maintained and fuelled so that oil and diesel spillage does not contaminate the soil.	Contractor	Engineering Consultant	Air, Soil and Water Quality

Project Activities	Type(s) of Impact	Potential Impacts on Environment	Where the impact is likely to happen	When the impact is likely to occur	Magnitude of impacts	Mitigation Measures	Institutional Responsibility		Parameters for Monitoring
							Implementation	Supervision	
						Fuel storage and refuelling sites to be kept away from drainage channels. Oil and grease traps to be provided at fuelling locations to prevent contamination of water. Unusable debris shall be dumped at the designated site in Islamabad.			
Creation and burning of waste at/or near the campsite	Solid waste generation and air pollution associated with burning	Eyes irritation for workers and public, nuisance, deteriorated air quality, smell from organic wastes	Around Campsite	Throughout the construction period	Moderate	Devise a plan for safe handling, storage, and disposal of harmful materials. Waste burning not allowed. Introduce re-use and/or recycle. Discourage use of disposables	Contractor	Engineering Consultant	Solid Waste Management
Health and safety at the workplace	Health risks for workers if unfavourable working conditions prevail	Workers progress may impair which will result in the slow progress of the project	Throughout construction area and construction campsite	Throughout the construction period	High	Obligatory insurance against work accidents for labourers Provide basic medical service and supplies to workers. Layout plan for a campsite is indicating safety measures taken by the contractor (e.g., firefighting equipment, safe storage of hazardous materials, first aid, security, fencing, and contingency	Contractor	Engineering Consultant	Workers Health

Project Activities	Type(s) of Impact	Potential Impacts on Environment	Where the impact is likely to happen	When the impact is likely to occur	Magnitude of impacts	Mitigation Measures	Institutional Responsibility		Parameters for Monitoring
							Implementation	Supervision	
						measures in case of accidents). Work safety measures and good workmanship practices to ensure no health risk for labourers. Proper maintenance of facilities for workers. Regular pest control measures in the site camp.			
Soil and Burrow Material, Blasting and Cutting, Cut and Fill									
Disposal of Surplus material, storing material for reuse	Physical environment	Water pollution from runoff of discarded asphalt, loss of productive land due to dust	Along the full length of the service roads around FG Investments	At the start of construction	Low	Construction waste to be collected for reuse. Waste disposed of in existing Dump Site. Water spraying to reduce dust.	Contractor via bid documents	Engineering Consultant	Water
Excavation for the foundation of the building	Changes of topographic characteristic, loss of topsoil, soil erosion, loss of vegetation, loss of habitat	Aesthetic, water storage, seepage, soil erosion, water contamination, vegetation clearing, loss of habitat for various faunal species	Designated Borrow areas, and at all sites where high embankments are required	Long-lasting	Medium	Remove topsoil and reintroduce for returning to nature. Concrete retaining walls at high embankments in critical areas.	Contractor	Engineering Consultant	Soil erosion and Water

Project Activities	Type(s) of Impact	Potential Impacts on Environment	Where the impact is likely to happen	When the impact is likely to occur	Magnitude of impacts	Mitigation Measures	Institutional Responsibility		Parameters for Monitoring
							Implementation	Supervision	
Acquisition of construction materials	Landscape degradation by use of quarries and borrow areas in the immediate vicinity of the Project site.	Accelerate erosion at the site	Quarries and borrow areas	Long-term effects	Low	No use of any quarries for construction material from inside Islamabad.	Contractor	Engineering Consultant & M/s FG Investments	Soil erosion
Storage, handling, and transport of hazardous construction materials	Work safety and human health risk	Health risk for workers, impair their progress	At all construction sites at The Garden Residence Project	Throughout the construction period	Low	Provision of protective items for labourers handling hazardous materials (e.g., helmets, adequate footwear for bituminous pavement works, protective goggles, gloves, etc.). Proper training for workers by HSE staff.	Contractor	Engineering Consultant & M/s FG Investments	Construction material storage
Creation of construction waste material and spoil management	Contamination of soil and water from waste and/or quarry materials, and impact on landscape value	Air, water, and solid waste generation	All construction site.	During construction	High	All spoils to be disposed of in an environmentally friendly manner and sites to be restored to original conditions.	Contractor	Engineering Consultant & M/s FG Investments	Water and Soil analysis
Transporting materials to the site	Physical environment	Creation of noise, fumes, and dust	Throughout the Project	During construction	Medium	All vehicles are carrying loose, friable material to be properly covered.	Contractor	Engineering Consultant & M/s FG Investments	Noise and Air Quality

Project Activities	Type(s) of Impact	Potential Impacts on Environment	Where the impact is likely to happen	When the impact is likely to occur	Magnitude of impacts	Mitigation Measures	Institutional Responsibility		Parameters for Monitoring
							Implementation	Supervision	
Planting trees	Ecological	Introduction of Indigenous trees species	In green areas and green belts	After construction	Medium	Implement Plantation Plan.	Contractor	Engineering Consultant & M/s FG Investments	Site restoration
Closure Plan									
Clearing site	Damage not restored on departure	Air, soil and water pollutions in future, a nuisance for the residents	where construction took place	After completion of construction activities	Low	Construction site should be restored according to the proper Site Restoration Plan. Compliance monitoring of the restoration.	Contractor	Engineering Consultant & M/s FG Investments	Site restoration
Utility Disruption									
No utility except electricity is available	Affected utilities create a disruption of public services and economics	Disruption in utilities may create problems for adjoining buildings	To be checked	Construction period	None, if organized in a timely manner and implemented; otherwise Intermediate.	Timely notifications and consultations with respective departments, especially with IESCO.	Contractor	Engineering Consultant & M/s FG Investments	Electricity supply management
Water Issues									
Use of water for construction and consumption for human use	Conflict with local water demand under very limited supply	Water shortage	In the immediate vicinity of the project site	During construction	Low	The contractor will arrange required water for construction in such a way that water availability and supply nearby to the community remain unaffected.	Contractor	Engineering Consultant & M/s FG Investments	Water management

Project Activities	Type(s) of Impact	Potential Impacts on Environment	Where the impact is likely to happen	When the impact is likely to occur	Magnitude of impacts	Mitigation Measures	Institutional Responsibility		Parameters for Monitoring
							Implementation	Supervision	
Spillage of liquid waste	Environmental and Social Impacts	Risk of polluting surface and groundwater from spillage, drainage, and runoff from construction sites.	The Garden Residence Project site	During construction	Low	Regular water quantity monitoring according to the determined sampling schedule. Contractor shall ensure that construction debris does not find its way into the drainage.	Contractor	Engineering Consultant	Water quality
Earthwork, stonework, and, other construction activities	Environmental and Social Impacts	Contamination of water due to construction waste, health risks for public	The Garden Residence Project site	During construction	Low	Construction works close to water bodies to be avoided, especially during the monsoon period. Waste must be collected, stored, and taken to the existing Dump Site.	Contractor	Engineering Consultant	Social Issues
Air Pollution Control									
Vehicular movement and operation of machinery	Environmental and Social Impacts	Emission from construction vehicles and machinery, causing a public health risk, nuisance, and other impacts on the biophysical environment	Workshops of contractor construction site, Construction sites	Throughout the construction period	Low	All temporary service and access roads to be regular water sprayed be carried out to minimize the dust generation. All vehicles, equipment and machinery used for construction to be regularly maintained to ensure that pollution emission levels conform to National Environmental Quality Standards (NEQS) of Pakistan.	Contractor	Engineering Consultant	Air Quality

Project Activities	Type(s) of Impact	Potential Impacts on Environment	Where the impact is likely to happen	When the impact is likely to occur	Magnitude of impacts	Mitigation Measures	Institutional Responsibility		Parameters for Monitoring
							Implementation	Supervision	
						Air quality parameters to be monitored, as determined.			
Transportation of materials and other construction activities that create dust and emissions	Environmental and Social Impacts	Dust and emissions from machines causing a health risk to operators; Impacts on the biophysical environment	Service Road East	During construction	Low	Vehicles are delivering loose and fine materials, like sand and fine aggregates, shall be covered to reduce spills on the existing road. Ambient air quality monitoring will be carried out in accordance with the EMP. If monitored parameters are above prescribed NEQS limits, suitable control measures must be taken.	Contractor	Engineering Consultant & M/s FG Investments	Air quality and workers health
Noise Pollution									
Operation of construction machinery,	Noise from vehicles, asphalt plants, and equipment;	A nuisance for workers and public	At construction site; built-up areas;	During construction	Medium	Vehicles, and equipment to strictly conform to NEQS specified noise standards. Vehicles and equipment used will be fitted, as applicable, with silencers and properly maintained. In accordance with EMP, noise measurements to be carried out at locations and schedules specified to ensure the effectiveness of mitigation measures.	Contractor	Engineering Consultant & M/s FG Investments	Noise
Fauna and Flora									

Project Activities	Type(s) of Impact	Potential Impacts on Environment	Where the impact is likely to happen	When the impact is likely to occur	Magnitude of impacts	Mitigation Measures	Institutional Responsibility		Parameters for Monitoring
							Implementation	Supervision	
No sensitive area is present	Ecological Impacts	Disturbance to Local flora and fauna	Throughout the proposed project	Throughout the construction period	Low	Use of firewood for cooking and execution of work to be prohibited. No open fire is allowed. Restoration of damaged vegetated areas. Strict instructions to contractors' staffs (particularly the cooks) with respect to poaching wildlife. Assist in the public awareness program.	Contractor	Engineering Consultant & M/s FG Investments	Ecological sensitive area
Road Safety and Community Life									
The risk associated with construction activities	Accident and health risks, Social Impacts	Road accidents may occur to general public and workers; social problems may arise, the progress of the project may impair	Project Site	Throughout the construction period	Low	Ensure safely code for work staff is observed, including the provision, and wearing of safety equipment required for specific works (e.g., helmets, dust masks, earmuffs, safety goggles, etc.). At the construction site, a readily available and fully equipped first aid unit to be provided. Elaboration of contingency planning in case of major accidents. Adequate signage, lighting devices, barriers, persons with	Contractor	Engineering Consultant & M/s FG Investments	Health and safety of workers

Project Activities	Type(s) of Impact	Potential Impacts on Environment	Where the impact is likely to happen	When the impact is likely to occur	Magnitude of impacts	Mitigation Measures	Institutional Responsibility		Parameters for Monitoring
							Implementation	Supervision	
						flags during construction to manage traffic at a construction site.			
Archaeological Sites									
Encountering archaeological sites during earthworks and construction	Impacts of historically important sites and damage to fossils, artifacts, tombs, structure, and others, as defined in the Antiquity Act of 1975	If sites of special interest not identified and flagged, contractors may inadvertently cause damage	Near Project site	Throughout the construction period	Low	In case of finding any archaeological artifact structure, tomb, etc., the contractor must immediately halt all works and contact the Archaeological Department. In the event of such finding, the contractor has the duty to secure the site against any intrusion until an archaeological expert decides for further action.	Contractor	Engineering Consultant & M/s FG Investments	Sensitive area
Operation Phase									
Water and Soil									
Drainage of runoff from roads into water bodies	Physical and Environmental Impacts	Physical congestion of drainage structures, Localized flooding, water and soil contamination	At natural drainage points in and around the Project site.	When road operates and in the rainy season, as required	Medium	Adopt performance specified maintenance contracts. Ensure proper cleaning scheme for keeping the drainage structure clear of debris and blockage.	The Garden Residence Project Management	M/s FG Investments	Stormwater runoff
Vehicular movement	Environmental Impacts	Contamination from spills due to traffic and accidents	Project Site	As incidents occur	Medium	Accidental spillage to be cleared and disposed of immediately and properly.	The Garden Residence Project Management	M/s FG Investments	

Project Activities	Type(s) of Impact	Potential Impacts on Environment	Where the impact is likely to happen	When the impact is likely to occur	Magnitude of impacts	Mitigation Measures	Institutional Responsibility		Parameters for Monitoring
							Implementation	Supervision	
Ambient Air Quality									
Induced vehicular traffic movement	Environmental and Social Impacts	Adverse effects on public health risk, nuisance, and other impacts on the biophysical environment	Project area	At operation	Medium traffic generation will be for a short duration	Roadside tree plantation as applicable and feasible under harsh climatic condition; plants should be selected according to their abilities to absorb emissions. Regular road maintenance to ensure the good surface condition. Regular vehicle checks to control and ensure compliance with NEQS.	The Garden Residence Project Management	M/s FG Investments	Air Quality
Noise Level and Vibrations									
Induced vehicular traffic movement	Environmental and Social Impacts	Traffic-related noise pollution and vibrations from engines, tires, and use of(pressure) horns	Project area	At operation stage	Medium traffic generation will be for a short duration	Noise measurements to be carried out to ensure the effectiveness of mitigation measures, (e.g., speed limits at the Project site).	The Garden Residence Project Management	M/s FG Investments	Noise
Flora and Fauna									

Project Activities	Type(s) of Impact	Potential Impacts on Environment	Where the impact is likely to happen	When the impact is likely to occur	Magnitude of impacts	Mitigation Measures	Institutional Responsibility		Parameters for Monitoring
							Implementation	Supervision	
Roadside right-of-way plantation	Environmental and Social Impacts	Soil erosion if site not vegetated acts as a sound barrier against noise and dust, aesthetically valuable,	Along with service roads along The Garden Residence Project	Operation stage	Low	Plantation/Vegetative barriers to lessen visual and other impacts. Monitoring of survival of trees at the specified rate and suitable measures should be taken to protect trees. Indigenous flora should be preferred.	The Garden Residence Project Management	M/s FG Investments	Plantation
Road Safety									
Vehicular movement	Social Impacts	Road accidents may occur, life risk of the general public	Near populated areas	Operation stage	Low	Traffic management plan to be developed. Traffic control measures, including speed limit, to be enforced. Mass awareness regarding traffic rules.	The Garden Residence Project Management	M/s FG Investments	Social Issues

8.8. Solid Waste Management Plan

Construction Phase: Several solid waste bins will be placed at the site camp for the collection of solid waste.

M/s FG Investments will contract MCI for collection, transportation and disposal of solid waste generated by M/s FG Investments.

Empty chemical drums, iron cuttings, etc. will be collected separately at the project site within an area marked as "Scrap Yard". After a suitable timeframe, scrap will be sold to a recycling contractor.

The construction waste generated will be recycled to the extent possible. Open burning of solid waste will not be allowed.

Operational Phase: The internal collection of solid waste will be carried out by The Garden Residence Project management through door to door collection. The Garden Residence Project Management will contract MCI for collection, transportation and disposal of solid waste generated by The Garden Residence Project.

The internal collection of waste will be carried out by The Garden Residence Project Management. The waste will be collected daily and stored at a designated site where MCI collection crew will take the waste.

8.9. HSE Management Plan

- Health Safety and Environment (HSE) induction/orientation will be provided to all workforce at the project site.
- Assembly point will be established for the gathering of workforce regarding daily HSE Toolbox Talk at the project site.
- HSE Toolbox Meeting will be held by HSE Manager on a weekly basis.
- Special education sessions will be conducted properly at the site.
- The daily walkthrough will be conducted at the project site
- All the Mandatory PPE's (Safety Helmet, Safety Jacket, Safety Shoes, Coverall, Full body Harness, Safety Goggles, Earplug, Earmuff, Dust mask/Special, Safety Gloves, Masks etc.).
- Proper and safe scaffolding will be provided at the site for safe work at height.
- All the machinery will be inspected properly at the site.
- Inspection & Tagging system will be maintained at the project site.
- Safety signage will be provided at the project site.
- Fire posts will be established at the project site at easy approach location.
- Waste will be maintained properly.
- HSE Signboard will be installed at the project site for an Emergency response.
- Rest area & smoking zones will be established at the site.
- Regular First Aid Center, along with all required medicines 24/7, will be available at the project site.
- Paramedic (dispensers) will be deployed at the first-aid post for day & night shift
- Fully equipped Ambulance will be made available at the site for 24/7
- In-house training will be conducted on the project site.

The contractor will develop his HSE policy, roles, and responsibilities of HSE Manager and staff. It also provides information about HSE objectives, Personal Protective Equipment (PPE's) to be used at the site, first aid training and communication and documentation regarding HSE.

- First Aid Boxes : First aid boxes will be provided at all active construction sites to cope up the emergency situations. Usually, a typical first aid box mainly contains antibiotics, basic medicines, cotton, bandages, sunny plast, healing balms, pyodine, spirit, painkiller, etc.
- Dispensaries: Medical facilities will be established by the contractor. A dedicated room will be established as a dispensary and first aid services at the construction site.
- PPEs: Site Engineer and HSE Manager will be responsible for providing PPE to all workers.
- Safety Signs: Relevant safety signboards will be displayed on the worksites and labour camps to make aware / train workers about safety rules. Mainly safety signs include signs of speed limits, electric spark, etc.
- TBTs: Tool Box Talks (TBTs) will be delivered on a regular basis and when a new team of workers start a new activity like shuttering, steel fixing, steel cutting, steel bending, scaffolding, concrete pouring, mechanical works, electrical works, etc. at sites to promote safety culture.
- Water Sprinkling: Dust pollution will be controlled with water sprinkling and minimizes the risk of adverse impacts of dust on workers and surrounding areas. Water sprinkling will be carried out regularly to minimize dust pollution and avoiding creating slush.
- Barricading: The contractor will put up barricade tape at all the active work sites. Hard barricading (scaffolding pipes) will be used to cover exposed areas where excavation is more than 10 feet. Training: Safety training will be delivered by the HSE Manager to achieve its objectives. Training will be conducted for capacity building of employees/workers/labour/sub-contractors to make them well effective to respond to any kind of emergency situation.

The breakup cost for the safety of workers is described in **Table 8.2.**

Table 8.2: Estimated Cost for the Implementation of Environmental Monitoring Plan for The Garden Residence Project

Sr No	Item	Quantity	Unit Cost (Rs.)	Total Cost (Rs.)
Personal Protective Equipment (A)				
1	Dust Masks	19,200	10	192,000
2	Safety Shoes	400	4,000	1,600,000
3	Gloves	4,800	200	960,000
4	First Aid Box	4	3,000	12,000
5	Ear Plugs	2,400	60	144,000
6	Safety Helmets	400	3,000	1,200,000
7	Safety Jackets (Hi Vis)	400	700	280,000
Others (B)				
8	Provision of Dust Bins	25	1,000	25,000
9	Warning Tape	15	600	9,000
10	Safety Cones	20	1,000	20,000

11	Safety Sign Boards	10	1,000	10,000
12	Raincoat	100	1,500	150,000
Total (A + B)				**4,602,000**

Time Required for Construction Period = 4 years
Number of Labor Required for Construction = 100
Personal Protective Equipment PPEs
Dust Mask: 1 Dust Mask to be used in a week by each labourer
Safety Shoes: 1 Safety shoe for twelve months for each labourer
Gloves: A pair of gloves for each labourer for a month
First Aid Box 1 first aid box for every 50 labourers
Ear Plug 1 set of the earplug to be used for 2 months for each labourer
Safety Helmet 1 safety helmet for each labourer for 12 months
Safety Jackets 1 safety Jacket (Hi-Vis) for each labourer for 12 months
Dust Bin: Rough estimate
Water Sprinkling the whole construction period
Rain Cost: 1 Rain Coat for each labourer

8.10. Traffic Management and Construction Material Transportation Plan

- All the contractor's construction material will be transported to the project site via Jinnah Avenue and Service Road East.
- 5 km speed limited is being maintained at the project site.
- All the light vehicles cars, jeep etc. are being parked in a designated area.
- Speed breakers will be followed properly.
- All the experienced and license holders (drivers & operators) will be hired for transportation.
- All the heavy machinery will be checked properly and inspected on a regular basis.
- Speed limit signboards have been installed at the project site.
- All the (headlights, backlights, Indicator etc.) will be checked and maintained regularly.
- All the warning light, reverse back alarms will be maintained properly.
- All the routes within the project site will be marked and designated properly.

8.11. Emergency Preparedness, Response and Site Evacuation Plan

- The Contractor will always be ready for response in any kind of emergency at the project site.
- Special assembly points will be established at the project site (offices & site).
- The emergency siren will be installed at assembly points.
- Contact numbers of emergency response team will be circulated at the project site.
- Close coordination will be carried out in Rescue 15 in the case of any serious injury/accident.
- Close coordination will be carried out by all law enforcement agencies (police) in case of an aggressive mob of people in the shape of any kind of protest.
- Emergency response drill will be carried out once in a month for provision of awareness to the workforce at the project site.
- First Aid Boxes will be available at the project site around the clock.
- Experienced and qualified paramedic staff will be available at First Aid Post at the site under the command of HSE Manager.

- Fully equipped Ambulance will be available at the project site along with all mandatory items (Oxygen cylinder, Statures & First Aid Box)
- All the new entrants will be oriented by HSE Manager regarding the required awareness towards the hazardous and risky situation and control.
- The entire workforce will be provided with the all mandatory PPEs for the risk-free environment.
- Special in-house training (TBT) will be conducted by the HSE Manager regarding the awareness towards any emergency condition and control.
- Proper water sprinkling will be carried out on service road along with the project site for dust control.

8.12. Fire Fighting Plan

The construction site will be equipped with fire extinguishers as well as communication equipment for contacting the appropriate emergency response teams.

Throughout the construction site, emergency alarms will be installed. Persons will be nominated to ring the emergency alarm in case of an emergency or any emergency risk.

All the camp residents will be trained and well communicated how to respond to the emergency alarm and reach assembly point immediately. Workers will be trained to respond to an emergency alarm, as discussed below:

- If the alarm rings for 20 seconds, only once, then it is a less severe emergency;
- If it rings for 20 seconds thrice after intervals, then it is medium to a severe high emergency, but it can be much severe; and
- If it rings for 60 seconds or more continuously, then the emergency situation is most difficult so, everyone should respond to it immediately, evacuate the workplace and move towards the assembly point.

Proper evacuation routes will be designated, nominated, and well communicated to all. All the workers will be trained to follow the evacuation routes and reach the assembly point in case of an emergency.

8.13. Plantation Plan

The plot area does not have any tree. The practice of plantation of mature plants will be effective compensation against the expected damages to the existing vegetation. In this regard, CDA Environment Wing has made a policy, according to which, the proponents of development projects will plant trees on public lands allocated for plantation, thereby contributing towards Prime Minister Billion Trees Tsunami Project.

M/s FG Investments being a responsible and environment conscious proponent, will plant 5,000 trees at a public land under the assistance of CDA Environment Wing's designated area in D-12.

A plantation plan has been prepared for The Garden Residence Project. The plan has a mix of appropriate trees /bushes which will be raised within the available open spaces of The Garden Residence Project. Ornamental trees, bushes and climbers have been included to improve the scenic and aesthetic value of the building.

M/s FG Investments will ensure the provision of staff and budget for the implementation of the plantation plan at the project site.

The following species of Trees, Shrubs and Indoor Plants are recommended for green areas, parking, and gardens at the entrance of The Garden Residence Project:

Table 8.3: Recommended Plants for The Garden Residence Project

No.	Scientific Name	Common Name	Description
1	*Pinus roxburghii*	Cheer	Highly recommended for Islamabad regions, grows very well in
2	*Pongamia glabra*	Sukh Chain	Evergreen and historical shade tree
3	*Ficus spp.*	Ficus Spp.	Different varieties all evergreen for shade as well as beautification
4	*Cupressus sempervirens*	Saroo	Tall, hardy tree
5	*Cassia fistula*	Amaltas	The beautiful flowering tree grew in this region
6	*Cassia gulaca*	Small amaltas	Beautiful yellow flowers almost all year
7	*Thevetia peruviana*	Peeli Kanair	Thick foliage shrub with yellow leaves
8	*Juniper Spp.*	Junipers	Different varieties, do very well in high landscape areas
9	*Vinca difformis*	Periwinkle	An evergreen, flowering subshrub
10	*Lavandula spica*	Lavenderle ft) shrubs	ornamental plants for garden and landscape use.
11	*Gulphinum*	Gulphinium	Nice small shrub with a lot of flowers in season
12	*Epipremnum aureum*	Jade plant or money plant	An evergreen flowering vine
13	*Asparagus aethiopicus*	Asparagus Fern	An indoor ornamental plant
14	*Saintpaulia*	African violet	Indoor plant for decorative purposes
15	*Ficus elastica*	Rubber tree	An ornamental indoor plant
16	*Spathiphyllum*	Spath/ peace lilies	Evergreen herbaceous perennial plants with large leaves
17	*Aglaonema hybrids*	Chinese evergreen plant	An adaptable plant, and grow in low light and dry air
18	*Phoenix roebelenii*	Pygmy Date Palm	Medium size, slow-growing shady plant
19	*Aphelandra squarrosa*	Zebra Plant	Exotic, emerald green leaves with dramatic white veins

8.14. Plantation Plan Cost

The cost of plantation includes the cost of equipment, initial planting, and maintenance cost for the first four years of plantation. The total estimated cost of implementation of plantation (including both indoor and outdoor plants) plan **is Rs. 1.95 million.**

Table 8.4: Tentative Cost of Equipment

Sr.	Equipment	Numbers	Cost in PKR
1	Grub hoe (earth digging tool) and others	Lump sum	150,000
		Total cost of equipment	**150,000**

The cost break-up of plantation and maintenance for a period of four years is mentioned in **Table 8.5** to **Table 8.10.**

Table 8.5: Estimated Cost of Unit Plantation (5,000 Plants) for 1st Year

Sr. #	Activity	Quantity	Rate (PKR)	Amount (PKR)
1	Clearance of Site (5,000 plants)	5,000	5/plant	25,000
2	Layout/ unit	5,000	2/plant	10,000
3	Digging of Pits	5,000	50/pit	250,000
4	Average cost per unit plant	5,000 plants	215/plant	1,075,000
5	Carriage/unit of plants from Nursery to Site including loading/unloading	5,000 plants	10/plant	50,000
6	Plantation of plants with ball of earth/unit	5,000	30/plant	150,000
7	Addition of Manure 1 cft. / pit	5,000 cft.	Lump Sum	50,000
8	Hand watering 100 times Approx. x5,000=500,000	500,000	1/watering	500,000
9	Weeding 4 times 5,000x4=20,000	20,000	5/plant	100,000
10	Miscellaneous/ Contingencies	Nil	Lump Sum	50,000
Total				**2,260,000**

Table 8.6: Estimated Unit Cost of Plantation of (1,000 Plants) & Maintenance for 2nd Year in case of 20% Mortality

Sr. #	Activity	Quantity	Rate (PKR)	Amount (PKR)
3	Re-Digging of Pits	1,000	50/pit	50,000
4	Average cost per unit plant	1,000 plants	215/plant	215,000
5	Carriage/unit of plants from Nursery to Site including loading/unloading	1,000 plants	10/plant	10,000
6	Plantation of plants with ball of earth/unit	1,000	30/plant	30,000
7	Addition of Manure 1 cft. / pit	1,000 cft.	Lump Sum	25,000
8	Hand watering 100 times Approx. x1,000=100,000	100,000	1/watering	100,000
9	Weeding 4 times 1,000x4=4,000	4,000	5/plant	20,000
10	Miscellaneous/ Contingencies	Nil	Lump Sum	50,000
Total				**500,000**

Table 8.7: Estimated Cost of Plantation Unit (400 Plants) & Maintenance for 3rd Year

Sr. #	Activity	Quantity	Rate (PKR)	Amount (PKR)
3	Re-Digging of Pits	400	50/pit	20,000
4	Average cost per unit plant	400 plants	215/plant	86,000
5	Carriage/unit of plants from Nursery to Site including loading/unloading	400 plants	15/plant	6,000

6	Plantation of plants with ball of earth/unit	400	30/plant	12,000
7	Addition of Manure 1 cft. / pit	1,000 cft.	Lump Sum	25,000
8	Hand watering 50 times Approx. x400=20,000	20,000	1/watering	20,000
9	Weeding 3 times 400x3=1200	1,200	5/plant	6,000
10	Miscellaneous/ Contingencies	Nil	Lump Sum	50,000
Total				**225,000**

Table 8.8: Estimated Cost of Maintaining 5,000 plants for 4th Year

Sr. #	Activity	Quantity	Rate (PKR)	Amount (PKR)
1	Hand watering 50 times 5,000x50=250,000	250,000	1/time	250,000
2	Weeding	5,000	5/unit	25,000
3	Trimming/pruning of plants	5,000	5/unit	25,000
4	Miscellaneous			50,000
			Total	**350,000**

Table 8.9: Total Cost of Plantation Plan for Four years

Activity	Amount (PKR)
Estimated Cost of Unit Plantation (5,000 Plants) for 1st Year	2,260,000
Estimated Unit Cost of Plantation of (1,000 Plants) & Maintenance for 2nd Year in case of 20% Mortality	500,000
Estimated Cost of Plantation Unit (400 Plants) & Maintenance for 3rd Year	225,000
Estimated Cost of Maintaining 5,000 plants for 4th Year	350,000
Total	**3,335,000**

Table 8.10: Final Cost per Tree Planted

Activity	Amount (PKR)
Cost for maintenance of cultivated plants for 4 years	3,335,000
Cost of equipment	150,000
Total cost	3,485,000
Cost for raising one plant and its maintenance for 4 years	**687**

8.15. Restoration and Rehabilitation Plan

Restoration of the project site and associated facilities including access tracks and contractor's camp after construction activities is of utmost importance. Improper disposal of the waste left at the end of the construction activities would lead to extensive disturbance to the environment.

Following measures will be adopted for site restoration and rehabilitation:

- All equipment and machinery at the project site will be de-mobilized.
- All waste at the project site will be disposed of according to the requirement of EIA.
- Septic tank with soakage pit will be properly dismantled.
- All temporary concrete structures at the project site will be dismantled, and construction and demolition material will be handed over to MCI for reuse or disposal.
- All the un-necessary pits at the project site will be backfilled.

8.16. Grievance Redressal Mechanism

An attempt has been made during the present EIA to identify all potential impacts of the proposed project, to provide mitigation measures to address the potential impacts, and to chart out a mechanism to implement these mitigation measures.

Although this program does not involve any voluntary land acquisition, some social and environmental issues/grievances/disputes are likely to arise during the construction and operational phase of the project.

The proposed mechanism will be based on a simple grievance redress committee Members included in the committee will be from high officials of M/s FG Investments. There will be a complain box to address any complaints or conflict arise during construction, and operational phase of the project and the quarrels will be sorted out by the project manager of the project as a part of the redressal committee. If the issue could not be resolved at a lower level, then it will be addressed by the higher officials of the M/s FG Investments.

The proposed GRM will help to achieve the objectives of sustainability by dealing with the environmental and social issues of the Project in a timely manner.

8.17. Project Monitoring

M/s FG Investments will make the necessary arrangements to monitor the key environmental data during the construction and operational phases. These will include the number of trees cut as part of the project work, the quantity of water used, a record of waste produced, a record of waste disposal, and project-related vehicular traffic.

The Project Director of The Garden Residence Project shall monitor project activities while working in the project area. He will keep a record of all non-conformance observed and report these along with actions to M/s FG Investments for further action. He will also have to report any impacts anticipated, along with his recommendations for further action.

8.18. Environmental Monitoring Plan

Environmental Monitoring is normally undertaken during both the construction and operational phases of the project to ensure the effectiveness of the proposed mitigation measures.

In order to respond to unanticipated environmental concerns at an early stage and to determine the accuracy of impact, predictions are also required. Specific monitoring programs are outlined below as well as responsibilities for the collection and analysis of data and the reporting requirements.

The various purposes of the environmental monitoring plan are:

- To evaluate the effectiveness of mitigation measures.
- To respond to the unanticipated environmental impacts when the project is under implementation.
- To make regulations and improve management and environmental controls based on the monitoring data. Pak-EPA is entrusted with the overall responsibilities of monitoring the environment in Islamabad.

An Environmental Monitoring Plan for The Garden Residence Project has been provided in **Table 8.11**. The plan will be used as a management and monitoring tool for the implementation of the mitigation measures required by the EIA. The plan entails the required mitigation measures recommended in the EIA.

Table 8.11: Environmental Monitoring Plan for The Garden Residence Project

Environmental Component	Project Phase	Parameters	Locations	Frequency	Standards	Implementing	Supervision
Ambient air quality	Construction	SO_2, NO_x, CO PM_{10}	At the project site	PM_{10}, for continuous 8 hours, on a monthly schedule	NEQS	Contractor	Engineering Consultant
Ground Water Quality	Construction	pH, TDS, TSS, DO, coliforms, hardness, nitrate,chloride, sulphate	At the project site	Quarterly	WHO and NEQS	Contractor	Engineering Consultant
Noise Levels	Construction	dB (A)	At the project site	Twice in 8 hours at a selected site on a quarterly basis	EPA Ambient Noise standards	Contractor	Engineering Consultant
Roadside Plantation	Construction	Visual inspection of plant species survival rate and status of maintenance	At sites where the plantation was carried out on service roads and inside of The Garden Residence Project.	(1) One month after plantation (2) One year after plantation 1 month, 3 months, 6 months, and 12 months after planting	75 % survival rate	Contractor	Engineering Consultant
Indoor Plantation+	Operation	Visual inspection of plant species survival rate and status of maintenance	At sites where the plantation was carried out	(1) 2.5 years after plantation	75% survival rate	The Garden Residence Project Management	M/s FG Investments
Safety Rules Compliance	Operation	(1) Faulty, overloaded and speeding vehicles (2) Inspection of signage	All along with the estate, with spot check at accident-prone black spots	Quarterly basis, for 3 years	To be determined	The Garden Residence Project Management	M/s FG Investments

Key:

dBA = decibels (measured in the audible range)
EPA = Environmental Protection Authority,
NEQS = National Environmental Quality Standards
PM10 = Particulate Matter smaller than about 10 micrometers,
ROW = Right-of-Way
SPM = Suspended Particulate Matter
TSS = Total Suspended Solids

Table 8.12 shows the estimated cost for the EMP**.**

Table 8.12: Cost Estimates for Environmental Monitoring during the construction phase

Environmental Monitoring Activities	No. of Samples	Unit Cost specification	Cost (Rs)
Construction phase			
Ambient air quality monitoring Quarterly basis	15	@ 50,000 per sample for 24 hr monitoring.	750,000
Ambient water quality monitoring Quarterly basis	15	@ 20,000 per sample	300,000
Noise levels monitoring on Quarterly basis	15	@ 5,000 per sample	75,000
		Total (a–c)	**1,125,000**
Hiring of Internal HSE Officer	60	@ 175,000 per month	10,500,000
Consultant for Quarterly Environmental Monitoring Report	15 QEMRs	@ 250,000	3,750,000
G Total			**15,375,000**

Source: *PPI Estimates, 2023*

8.19. Training Program

Training programs are a necessary agenda that must be implemented to implement Environmental Management & Monitoring Plan effectively. The Environment, Health & Safety Officer will impart training to the contractor's staff. The key objective of the training program is to ensure that the requirement of EMP is clearly understood and followed throughout the project. The training shall cover the following areas:

- Environmental sensitivity of the project area.
- EMP communication and documentation requirement.
- Vegetation and community issues and their mitigation measures.
- Safe construction practices
- Use of personal protective equipment (PPEs)
- Environmentally sound construction practices
- Vehicular safety.
- Site restoration requirement.
- Solid Waste Disposal

M/s FG Investments will be primarily responsible for providing training to all project personnel. Lump-sum fees of Rs. 1,500,000/= should be kept for the training management plan. Framework for the environmental and social training program is being provided in **Figure 8.13.**

Table 8.13: Framework for Environmental & Social Training Program of The Garden Residence Project

Type of Training	Training Description	Period	Duration	Training By	Trainee
Occupational Health and Safety staff	Training should be provided to aware staff to conform to safety codes	Before Commencement of Project Activities	Full day	External Sources	EHS Manager
Environment & Social Laws, Regulations, procedure and guidelines of the government	The training should detail the laws and regulation concerning the environment, Labour laws and compliance with government regulation.	Before Commencement of Project Activities	Full day	External Sources	EHS Staff, Site Supervisors, Site Engineers.
Occupational Health & Safety for workers	Health, safety and hygiene. Proper usage of Personal Protective Equipment (PPE's), Precautions to be taken for working in confined areas.	Before Construction Activities	Full Day	EHS Manager	Workers
Solid Waste Management	Waste segregation, identification of Hazardous Waste, Use of PPEs and waste Handling	Before Commencement of Project Activities	Full Day	External Sources	Relevant workers and staff
Vehicular safety	Safe operation and maintenance of all vehicles, insurance in accordance with the applicable local and federal laws	Before Commencement of Project Activities	Full Day	EHS Manager	Relevant workers and staff
Vegetation and community issues and their mitigation measures	To analyze the community problems and how to cater to serious issues relevant to vegetation and agricultural land of the community	Before Commencement of Project Activities	Full Day	EHS Manager	Relevant workers and staff
Safe construction practices	To upgrade local craftsmen's skill in quality construction and develop skilful working human resources in hazard-resistant construction	Before Commencement of Project Activities	Full Day	EHS Manager	Relevant workers and staff
Health Safety and Environmental Auditing	Health Safety and Environmental Audits, Reporting Requirements	Before Commencement of Project Activities	Full Day	External Sources	Relevant Department
Implementation of environmental management and monitoring plan	Explanation of Environment Management and Monitoring Program	Quarterly. As soon as the project activities start	Full Day	External Sources	EHS Staff

8.20. Environmental Monitoring & Mitigation Cost

The cost required to implement the mitigation measures effectively is important for the sustainability of the project both in the construction and operational phases of the project.

The summary of the cost of monitoring environment and mitigation cost is shown in **Table 8.14**.

Table 8.14: Summary of Environmental Mitigation & Monitoring Cost

Activity	Basis	Cost (Rs)
Environmental Monitoring Cost	Ambient Air, Noise and Water Quality Monitoring & Cost of Hiring Environmental Consultant	15,375,000
Plantation Plan	Implementation of plantation plan	3,485,000
Health & Safety of Workers	For 100 employees for the provision of dust masks, safety shoes, gloves, first aid box, ear plugs, safety helmets and safety jackets (Hi-Vis) and Provision of dustbins, warning tap, safety cones, safety signboards and water sprinkling	4,602,000
Cost of Environmental Training	For the whole construction period	1,500,000
	Grand Total	**24,962,000**

8.21. Communication and Documentation

An effective program for storing and communicating environmental information during the project is an essential requirement of an EMP. This activity will be done by an independent monitoring consultant. The key features of such a mechanism are:

- Precise recording and maintenance of all information generated during the monitoring in a predetermined format.
- Communicating the information to a central location
- Storing the raw information in a central database
- Processing the information to produce periodic reports

Data recording and maintenance: All forms will be numbered, and a tracking system will be developed for each. Whenever a form is released for use in the field, its number will be recorded. The monitors will be required to account for each form after completion. In this manner, it will be ensured that all forms are returned to the office, be they filled, unused or discarded.

Storage of information: A database for information collected during the project will be prepared. The database may include information on training programs, staff deployment, non-compliance, corrective actions, water resources, results of effects monitoring.

Meeting: For effective monitoring, management and documentation, of the environmental performance during the operation, environmental matters will be discussed during a daily meeting held on-site. Environmental concerns raised during the meetings will be mitigated after discussions with the proponent site representatives.

Reporting: Monitoring body will produce daily, weekly, monthly and another periodic report, as well as a final report of the project based on the information collected. The proponent site

representative and the contractors will also prepare a weekly environmental report. Copies of the proponent will be provided to the proponent and contractor's higher management.

8.22. Post Project Monitoring

The Project Director of The Garden Residence Project or their representative shall prepare a brief post-project report describing the conduct of the actual operation, any changes from the operation for which approval was obtained, the degree to which the recommendations of the EIA were adhered to, any damages to the environment and the mitigation or compensation provided and monitoring information of scientific or environmental interest that is not propriety in nature. This report should be submitted to the Pakistan Environmental Protection Agency.

9. Conclusion and Recommendations

9.1. Introduction

This chapter presents the assessment of the possible environmental impacts of The Garden Residence Project, Sector F-10 Markaz, Islamabad. The study presents the purpose of the EIA as to the description of the site, the impact of the project during and after implementation, the mitigation measures and residual impacts.

The EIA also includes the justification and detailed description of the project, with an evaluation of the potential impacts and effects on the environment, including economic and social consequences. This chapter describes the conclusion and recommendation of the EIA study of the project.

9.2. Conclusions

The major conclusions of the EIA are:

- The Garden Residence Project is a project of M/s FG Investments.
- The objective of the project is to provide residential space to the community at the heart of the Capital, Islamabad with state-of-the-art amenities and a peaceful and scenic residential environment.
- The project site is located on Plot # 8, 10th Avenue, Opposite F-9 Park, Sector F-10 Markaz, Islamabad, on land measuring 105,750 sq. ft. (225'x470'). The project site can be accessed from Nazim-ud-din Road and Ibn-e-Sina Road from the south, through Service Road East in the West, and through Jinnah Avenue from the north side of the project site.
- The project consists of 2 towers. Tower A/B is a 28-storey residential building (3 basements + Ground + 24 Floors+ 2 Service Floors), with a height of approximately 318 ft. Towers A/B will cover an area of 10,390 sq. ft. Tower C is a 37-storey residential building (3 basements + Ground + 33 Floors+ 3 Service Floors) with a height of approximately 438 ft. Tower C will cover an area of 13,273.74 sq. ft. The project will be constructed on land measuring 21 kanals or 105,750 sq. ft (225'x470').
- The covered area of the building is 1,030,623.84 sq. ft and it will be an exclusively residential building.
- The Garden Residence Project will be equipped with state-of-the-art HVAC system for efficient ventilation and firefighting system, comprised of fire alarm system, automatic sprinklers, smoke extraction system, fire extinguishers and underground 232m^3 reserved specifically for firefighting.
- The total water requirement is 415 cubic meter/day considering all the units while the total electricity load of the building will be 1.5 MW. The source of water will be CDA supply line and ground water will be used as an auxillary water source, IESCO will provide the electricity connection.
- The total cost of the project is Rs. 5 billion and will be completed in 4 years.
- The project construction phase can potentially affect the natural resources of the area. These adverse impacts can be largely reduced by implementing the appropriate mitigation measures, which has been discussed in this report.
- The project siting is likely to result in some aesthetic issues, which can be reduced with the help of astute planning.
- The potential impacts during construction phase include increased traffic load on Service Road East, deterioration of ambient air quality caused by the exhaust emission and

kicked up dust, noise pollution, safety hazards and public health concerns for the nearby community.

- The significant environmental management issues during the operation phase include solid waste and vehicular traffic.
- The mitigation measures have been identified in chapter 6 for impacts expected during the different phases of the project.

Based on the recommended mitigation measures in chapter 7, the impacts identified will be reduced with residual impacts having insignificant levels.

9.3. Recommendations

- A plantation plan has been proposed in the EIA report, which must be developed and implemented for The Garden Residence Project.
- With the development of this project, there will be a rise in traffic on Service Road East. Capital Development Authority should construct a pedestrian bridge that will connect residents of Sector F-10 Markaz to F -9 Park.
- There is very less space for plantation, so the vertical gardening approach should be adopted.

On the basis of the overall impact assessment, more specifically, nature and magnitude of the residual environmental impacts identified during present EIA, it is concluded that The Garden Residence Project project is likely to cause environmental impacts mainly during its construction phase. However, these impacts can be mitigated provided the proposed activities are carried out as mentioned in the report, and the mitigation measures included in this report are completely and effectively implemented.

There are no remaining issues that warrant further investigation. This EIA is considered adequate for the environmental and social justification of the project.

Annexure-1: List of Names, Qualification and Roles of EIA Team Members

Name	Project Position	Qualification and Experience	Tasks Assigned
Mr. Saadat Ali	Team Leader/ Environmental Engineer	Postgraduate Diploma in Sanitary Engineering, International Institute for Hydraulic and Environmental Engineering, 1984 B. Sc. Civil Engineering, Engineering College, University of Peshawar, 1978	▪ Overall management of the project (Supervision, site visits, guidance, inputs and suggestion, recommendation and discussion and report presentations). ▪ To review overall environmental issues and mitigation measures. ▪ To finalise the draft and final study reports.
Mr. Ali Abdullah	Environmental and Civil Engineer	M. Sc. Environmental Engineering, Newcastle University (2016) B. Sc. Civil Engineering, The University of Lahore, Lahore (2010-2014)	▪ To overview draft report ▪ Suggest mitigation measures for impacts that affect the environment. ▪ Identification of site for baseline data collection for water, wastewater, noise, soil, traffic and ambient air quality.
Ms. Ayesha Hanif	Environmental Scientist	Bachelor's in Environmental Science, International Islamic University Islamabad, (IIUI), H-10, Lahore, 2023	▪ Secondary data collection for desk review ▪ Research tools preparation for field study ▪ Fieldwork for baseline data collection in the area under study ▪ Public Consultation
Ms Amna Saeed	Environmental Engineer	Bachelor's in Environmental Engineering, University of Engineering and Technology (UET), Lahore, 2022	▪ Fieldwork for baseline data collection in the area under study ▪ Stakeholders consultation ▪ Secondary data collection

Annexure-2: Terms of Reference

An EIA will be carried out for all stages of the projects, i.e. preconstruction, construction and post-construction with the following objectives:

- Establishing the environmental baseline in the study area and identifying any significant environmental issue.
- Assessing these impacts and providing for the requisite avoidance, mitigation and compensation measures.
- Integrating the identified environmental issues in project planning and design.
- Developing appropriate management plans for implementing, monitoring and reporting of the environmental mitigation and enhancement measures suggested.
- Give presentation during a public hearing of the EIA of The Garden Residence Project and respond to queries generated by Pak-EPA until issuance of the NOC.

Annexure-3: References

ADB, 2003. Environmental Assessment Guidelines. *Asian Development Bank.*

Nasir, E. & Ali, S. I., 1973. Mimosaceae Flora of Pakistan no.1-210, Department of Botany, University of Karachi.

IUCN, 1998, Environmental Profile of Pakistan.

MOE, *Environmental Legislation in Pakistan*, Ministry of Environment, Government of Pakistan.

MOE, 2005, *Pakistan Strategic Country Environment Assessment*, The World Bank/ Ministry of Environment, Government of Pakistan.

Pak-EPA. *Pakistan Environmental Assessment Procedures*, Pakistan Environmental Protection Agency, Islamabad, Government of Pakistan.

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Roberts, T.J., 1997. *Mammals of Pakistan*, Oxford University Press, Oxford

Islamabad District Census Report, Government of Pakistan

S.M. Ali, R.N. Malik **Spatial patterns of vegetation with underlying soil properties prevailing along with the drain side areas in Islamabad city** Pakistan J. Bot., 42 (2010), pp. 2397-2410

Pak-EPA. *DIGITAL ENVIRONMENTAL ATLAS OF ISLAMABAD (2016)*: Establishment of Geometric Centre for Climate Change and Sustainable Development Pakistan environmental Protection Agency Ministry of Climate Change.

Annexure-4: Glossary

Air pollution	Air is made up of a number of gases, mostly nitrogen and oxygen and, in smaller amounts, water vapour, carbon dioxide and argon and other trace gases. Air pollution occurs when harmful chemicals and particles are emitted to the air – due to human activity or natural forces – at a concentration that interferes with human health or welfare or that harms the environment in other ways.
Ambient air quality	Ambient air quality refers to the quality of outdoor air in our surrounding environment. It is typically measured near ground level, away from direct sources of pollution.
Archaeology	The study of human history and prehistory through the excavation of sites and the analysis of artefacts and other physical remains.
Biodiversity	The variety of plant and animal life in the world or in a particular habitat, a high level of which is usually considered to be important and desirable.
Bye-law	A rule made by a local authority to govern activities within the area it controls. Examples include bye-laws covering waste disposal, traffic or public events or signs.
Carbon dioxide (CO_2)	A colourless gas that is naturally produced by animals and people in the exhaled air and the decay of plants.
Carbon monoxide	A highly poisonous, odourless, tasteless and colourless gas that is formed when carbon material burns without enough oxygen.
Climate	The pattern of weather in a particular region over a set period of time, usually 30 years.
Conservation	Preserving or protecting animals and resources such as minerals, water and plants through planned action (such as breeding endangered species) or non-action (such as not letting taps run unnecessarily).
Effluent	Liquid wastes such as sewage and liquid waste from industries.
Energy efficiency	Actions to save fuels, for example, better building design, changing production processes, developing better transport policies, using better road vehicles and using insulation and double glazing in homes.
EIA	An environmental impact assessment (EIA) is an analytical process that systematically examines the possible environmental consequences of the implementation of projects, programs and policies.
EMP	An environmental management plan (EMP) is a site-specific plan developed to ensure that all necessary measures are identified and implemented in order to protect the environment and comply with environmental legislation.
Fauna	The animals of a particular region, habitat, or geological period.
Flora	The plants of a particular region, habitat, or geological period.
Habitat	The area occupied by a community or species (a group of animals or plants), such as a forest floor, desert or seashore.
Initial Environmental Examination	Initial environmental examinations describe the environmental condition of a project, including potential impact, formulation of mitigation measures, and preparation of institutional requirements and environmental monitoring.
Landfill	A site that is specially designed to dispose of waste and operates with a license granted by the Environmental Protection Agency (EPA).
NEQS	The Pakistan Environmental Quality Standards (NEQS) are quality standards to regulate the air emissions and effluents of industry and other big polluters.

Noise Pollution	Noises that disturb the environment and people's ability to enjoy it, for example, continually sounding house alarms, loud music, air conditioning or other electrical units and aircraft or motor engines.
Seismology	The branch of science concerned with earthquakes and related phenomena.
Topography	The arrangement of the natural and artificial physical features of an area.

Annexure-5: List of People Met During the EIA

No.		Name of Person	Designation
1.	Stakeholders	Mr. Ahmad Naeem Qamar	CEO, M/s FG Investments
2.		Lt. Col.(R) Saeed Akhter Khan	Project Coordinator, The Garden Residence
3.		Mr. Baber Malik	Architect, Artec Design
4.		Dr. Sofia Khalid	Chairperson, Department of Environmental Science, Allama Iqbal open University
5.		Mr Akhtar Rasool	Director, Environment Wing, CDA
6.		Ms. Kubra Munir	Shift Manager, McDonald's F-9
7.		Mr. Sher Afzal	Deputy Manager Environment, E&SS, PMU, IESCO
8.		Mr. Ghulam Mustafa Khan Niazi	Project Director, Silver Oaks
9.		Mr. Karam Khan	Deputy Director, PMD
10.		Mr. Danish Rafique	Safety Officer, M/s FG Investments

		Name	Age	Gender	Education	Profession
11.	Public Consultation	Mr. Shakir	30	Male	Primary	Steel Fixer
12.		Mr. Muhammad Muneed	25	Male	Primary	Steel Fixer
13.		Mr. Nizam Khan	43	Male	Matric	Carpet Seller
14.		Mr. Muhammad Arif	34	Male	Middle	Carpet Seller
15.		Mr. Mohammad Ilyas	51	Male	Masters	Project Manager
16.		Mr. Ibrahim	43	Male	Primary	Private Job
17.		Ms. Maryam	23	Female	F. Sc	Student
18.		Mr. Malik Munir	68	Male	Primary	Unemployed
19.		Mr. Sardar Mohammad Malik	70	Male	Illiterate	Unemployed
20.		Ms Saima	28	Female	F. A	Housewife
21.		Mr. Bhutta	70	Male	Illiterate	Unemployed
22.		Tabish Akram	26	Male	F.Sc	Private Job
23.		M. Amyn	49	Male	C.A	Private Job

Annexure-6: Structural Stability Certificate

Design House
CONSULTING ENGINEERS

Ref. No: DH/Artec/ 07
Dated: 17-05-2021.

License No: CDA/D-Struct
(Bldgs)42(220)(252)/12/56
Tel:#0333-5259694.

SOUNDNESS AND STABILITY CERTIFICATE

This is to certify, that the structure of the proposed building **The Garden Residence (Luxury Apartment) at Plot No. 08, 10th Avenue, opposite Capital Park F-10 Markaz Islamabad.** has been designed by the undersigned, after incorporating all the design requirements.

Necessary safety factors against natural calamities / hazards such as earthquakes, wind loads, heavy storms, etc: have been taken into consideration, while designing the structure of the said building.

Hence soundness and stability of the structure to be constructed on the said plot is ensured, and I shall be responsible for any detrimental effects which shall occur at any stage in the structure due to the inadequacy of the design. The details of proposed building is given as below;

Tower A & B = 03 Basements + Ground + 2 MEP Floors + 25 Floors
Tower C = 03 Basements + Ground + 3 MEP Floors + 33 Floors

Engr. Abdul Naseem
Structural Engineer
PEC Consult. 1582, CDA 42(220)(252)
Mob. 0333-5259694

Abdul Naseem
Principal Engineer
M/s Design House

■ Project Design ■ Planning ■ Supervision

17, Main Double Road 786, G-13/4, Islamabad, Pakistan. **Tel:** 051-2154726
Cell: 0333-5259694, **E-mail:** designhouse2003@gmail.com

Annexure-7: Lab Reports of Ambient Air Quality and Noise Monitoring

ESPAK

ENVIRONMENTAL SERVICES PAKISTAN

CHEMICAL ANALYSIS TEST REPORT (AMBIENT AIR)

Reference Number: ESPAK/0042I/23/AA/0903/00096 **Date:** 27/02/2023
Name of Industry/Client: Project Procurement International
Address: Office #26, 2nd Floor, Silver City Plaza, G11 Markaz, Islamabad
Telephone No.: ---

Nature of Sample: Ambient Air **Monitoring Location:** Garden Residence, Islamabad (GPS: 33°41'24.93"N, 73°0'57.36"E)
Date of Sample Collection: 25/02/2023
Sample Collected/Sent By: Shahzaib Ali, Analyst (Field), ESPAK **Grab / Composite:** Continuous- 24 Hours
Date of Completion of Analysis: 26/02/2023

S. No	Parameters	Limit Values (NEQS-24Hours)	Concentration	Method / Equipment Used	Remarks
1	Carbon Monoxide (CO)	5 mg/m³ (8 Hours)	0.9 mg/m³	Non-Dispersive Infrared Absorption (NDIR)	Within Prescribed Limits
2	Sulfur Dioxide (SO_2)	120 µg/m³	12.6 µg/m³	UV Fluorescence (UVF)	Within Prescribed Limits
3	Ozone (O_3)	130 µg/m³ (1 Hour)	8.2 µg/m³	Non-Dispersive UV Absorption	Within Prescribed Limits
4	Oxides of Nitrogen as NO	40 µg/m³	7.3 µg/m³	Chemiluminescence Detection	Within Prescribed Limits
5	Oxides of Nitrogen as NO_2	80 µg/m³	15.8 µg/m³	Chemiluminescence Detection	Within Prescribed Limits
6	Particulate Matter $PM_{2.5}$	35 µg/m³	33.0 µg/m³	Particulate Sensor	Within Prescribed Limits
7	Particulate Matter PM_{10}	150 µg/m³	126 µg/m³	Particulate Sensor	Within Prescribed Limits
8	Suspended Particulate Matter (SPM)	500 µg/m³	432 µg/m³	Particulate Sensor	Within Prescribed Limits

NEQS: National Environmental Quality Standards for Ambient Air, 2010

- Uncertainty of Measurement (UoM) data will be provided on request, where available. The statement of conformity, if provided in the report, is based on the decision rule of simple acceptance or rejection with equal shared risk due to measurement uncertainty.

Note:

- **The report should be reproduced as a whole and not in parts.**
- **The responsibility of the ethical use of this report lies with the client.**
- **The values represent sample conditions when monitoring/testing was carried out.**
- **The report data is not intended to be used legally by the client.**
- **Only parameters marked with asterisk (*) are ISO 17025:2017 accredited.**

1. **Sample Analyzed By:** Shahzaib Ali, Analyst (Field)
2. **Name of Chief Analyst with Seal:** Muhammad Arfan
3. **Signature of Incharge of the Environmental Laboratory:**

Name: Imran Malik
General Manager
Date: 27/02/2023

---------- End of Report ----------

Page 1 of 1

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ENVIRONMENTAL SERVICES PAKISTAN

ESPAK

Client Name	Project Procurement International
Client Address	Office 26 , 2nd Floor, Silver City Plaza Islamabad
Location GPS	33°41'24.93"N 73°0'57.36"E
Monitoring Location	Garden Residence
instrument Used	AQMS(Envirmnment S.A) , Sound Level Meter
Monitored by	Syed Shahzaib Ali
Sampling interval	60 minutes
Sampling duration	24 hours

Date - Time	CO	SO_2	O_3	NO	NO_2	$PM_{2.5}$	PM_{10}	TSP
	mg/m^3	ug/m^3	ug/m^3	ug/m^3	ug/m^3	ug/m^3	ug/m^3	ug/m^3
25/02/2023 11:22	0.742	12.524	8.221	7.042	15.406	38.806	128.202	
25/02/2023 12:22	0.863	11.911		6.281	16.875	39.207	129.533	
25/02/2023 13:22	1.102	12.862		7.232	15.854	38.803	128.183	
25/02/2023 14:22	1.041	12.620		8.776	15.613	35.269	116.515	
25/02/2023 15:22	0.803	11.673		8.411	16.314	35.813	118.313	
25/02/2023 16:22	0.979	12.371		6.493	15.364	33.560	110.868	
25/02/2023 17:22	0.740	11.425		8.036	16.389	32.810	108.396	
25/02/2023 18:22	0.998	12.446		6.605	16.147	29.218	119.445	
25/02/2023 19:22		11.499		8.149	15.197	31.439	95.809	
25/02/2023 20:22		12.312		6.401	15.304	23.345	102.523	
25/02/2023 21:22		12.572		6.794	15.241	23.923	131.692	
25/02/2023 22:22		12.507		6.696	16.209	33.203	144.440	
25/02/2023 23:22		12.767		7.088	16.468	31.575	118.007	432.168
26/02/2023 0:22		13.024		7.478	16.017	34.009	147.108	
26/02/2023 1:22		13.746		6.774	16.600	33.604	124.716	
26/02/2023 2:22		14.275		6.743	16.536	32.778	132.510	
26/02/2023 3:22		14.028		6.064	16.794	32.999	133.226	
26/02/2023 4:22		13.477		6.377	15.786	34.450	116.971	
26/02/2023 5:22		13.620		6.504	16.044	32.696	132.232	
26/02/2023 6:22		13.762		6.284	16.303	32.814	132.615	
26/02/2023 7:22		11.270		10.135	16.445	32.947	143.604	
26/02/2023 8:22		11.556		11.181	14.410	32.385	131.204	
26/02/2023 9:22		11.484		4.232	14.930	32.712	132.278	
26/02/2023 10:22		11.984		8.435	13.442	33.201	133.905	
Average	0.908	12.571	8.221	7.259	15.820	32.982	125.512	432.168
Minimum	0.739717983	11.27031	0	4.23176	13.44188	23.34539	95.8089	0
Maximum	1.101825439	14.27479	0	11.181	16.87486	39.20743	147.1079	0

Environmental Services Pakistan ESPAK

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PAK EPA & PUNJAB EPD CERTIFIED

NOISE MONITORING REPORT

Reference Number: ESPAK/0042I/23/N/0904/00106 **Date:** 27/02/2023
Name of Industry/Client: Project Procurement International
Address: Office #26, 2nd Floor, Silver City Plaza, G11 Markaz, Islamabad
Telephone No.:

Nature of Sample: Noise
Date of Sample Collection: 25/02/2023 **Grab / Composite:** Continuous - 24 Hours
Sample Collected/Sent By: Shahzaib Ali, Analyst (Field), ESPAK
Date of Completion of Analysis: 26/02/2023
Method/Equipment Used: Sound Level Meter

S. No	Measurement Point	Limit Values (NEQS)	Noise Level in dB(A) Leq	Remarks
1	Garden Residence, Islamabad (GPS: 33°41'24.93"N, 73°0'57.36"E)- Day Time	65 dB(A)	**66 dB(A)**	Exceeding Prescribed Limits
2	Garden Residence, Islamabad (GPS: 33°41'24.93"N, 73°0'57.36"E)- Night Time	55 dB(A)	**59 dB(A)**	Exceeding Prescribed Limits

NEQS: National Environmental Quality Standards for Noise in Commercial Area, 2010 Day Time Hours (6:00 am to 10:00 pm) Night Time Hours (10:00 pm to 6:00 am)

- Uncertainty of Measurement (UoM) data will be provided on request, where available. The statement of conformity, if provided in the report, is based on the decision rule of simple acceptance or rejection with equal shared risk due to measurement uncertainty.

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- **The values represent sample conditions when monitoring/testing was carried out.**
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- **Only parameters marked with asterisk (*) are ISO 17025:2017 accredited.**

1. **Sample Analyzed By:** Shahzaib Ali, Analyst (Field)
2. **Name of Chief Analyst with Seal:** Muhammad Arfan
3. **Signature of Incharge of the Environmental Laboratory:**

Name: Imran Malik
General Manager
Date: 27/02/2023

---------- End of Report ----------

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CHEMICAL ANALYSIS TEST REPORT (GROUND WATER)

Reference Number: ESPAK/0042I/23/DW/0902/00220 **Date:** 04/03/2023
Name of Industry / Client: Project Procurement International
Address: Office #26, 2nd Floor, Silver City Plaza, G11 Markaz, Islamabad
Telephone No.: ---
Nature of Sample: Ground Water from Garden Residence (GPS: 33°41'26.6"N, 73°0'57.36"E)
Date Sample Received: 27/02/2023 **Grab / Composite:** Grab
Date of Sample Collection: 26/02/2023
Sample Collected / Sent By: Shahzaib Ali, Analyst (Field), ESPAK
Date of Completion of Analysis: 03/03/2023

S. No	Parameters	Limit Values (NSDWQ)	Concentration	Method / Equipment Used	Remarks
1	Total Coliforms	----	ND	SMWW 9221 B	----
2	Fecal Coliform Bacteria	Must not be detectable in any 100mL sample	ND	SMWW 9221 F	Within Limits
3	E. Coli	Must not be detectable in any 100mL Sample	ND	SMWW 9221 F	Within Limits
4	Color	≤15 TCU	ND	SMWW 2120 C	Within Limits
5	Taste	Non Objectionable / Acceptable	Acceptable	Organoleptic	Within Limits
6	Odor	Non Objectionable / Acceptable	Acceptable	Organoleptic	Within Limits
7	Turbidity	<5 NTU	1.4 NTU	SMWW 2130B	Within Limits
8	Total Hardness as $CaCO_3$*	<500 mg/L	420 mg/L	SMWW 2340C	Within Limits
9	Total Dissolved Solids (TDS)*	<1000 mg/L	643 mg/L	SMWW 2540C	Within Limits
10	pH*	6.5-8.5	7.1	SMWW 4500H+B	Within Limits
11	Aluminum (Al)	≤0.2 mg/L	ND	U.S. EPA-200.7	Within Limits
12	Antimony (Sb)	≤0.005 mg/L	ND	U.S. EPA-200.7	Within Limits
13	Arsenic (As)	≤0.05 mg/L	ND	U.S. EPA-200.7	Within Limits
14	Barium (Ba)	0.7 mg/L	0.1 mg/L	U.S. EPA-200.7	Within Limits
15	Boron (B)	0.3 mg/L	0.02 mg/L	U.S. EPA-200.7	Within Limits
16	Cadmium (Cd)	0.01 mg/L	ND	U.S. EPA-200.7	Within Limits
17	Chloride (as Cl^-)*	<250 mg/L	33 mg/L	SMWW 4500Cl^-B	Within Limits
18	Chromium (Cr)	≤0.05 mg/L	ND	U.S. EPA-200.7	Within Limits
19	Copper (Cu)	2.0 mg/L	ND	U.S. EPA-200.7	Within Limits
20	Cyanide (CN^-)	≤0.05 mg/L	ND	SMWW 4500 CN^- F	Within Limits
21	Fluoride (F^-)*	≤1.5 mg/L	0.3 mg/L	U.S. EPA 9214	Within Limits
22	Lead (Pb)	≤0.05 mg/L	ND	U.S. EPA-200.7	Within Limits

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CHEMICAL ANALYSIS TEST REPORT (GROUND WATER)

Reference Number: ESPAK/0042I/23/DW/0902/00220 **Date:** 04/03/2023

Name of Industry / Client: Project Procurement International

S. No	Parameters	Limit Values (NSDWQ)	Concentration	Method / Equipment Used	Remarks
23	Manganese (Mn)	≤0.5 mg/L	0.03 mg/L	U.S. EPA-200.7	Within Limits
24	Mercury (Hg)	≤0.001 mg/L	ND	U.S. EPA-200.7	Within Limits
25	Nickel (Ni)	≤0.02 mg/L	ND	U.S. EPA-200.7	Within Limits
26	Nitrate (NO_3^-)	≤50 mg/L	22.6 mg/L	SMWW 4500NO_3^-B	Within Limits
27	Nitrite (NO_2^-)	≤3 mg/L	ND	SMWW 4500NO_2^-B	Within Limits
28	Selenium (Se)	0.01 mg/L	ND	U.S. EPA-200.7	Within Limits
29	Residual Chlorine	0.2-0.5 mg/L	ND	SMWW 4500-Cl B	----
30	Zinc (Zn)	5.0 mg/L	0.02 mg/L	U.S. EPA-200.7	Within Limits
31	Phenolic Compounds (as Phenols)	NGVS	ND	SMWW 5530 C	----

NSDWQ: Pakistan National Standards for Drinking Water Quality, 2010
SMWW: Standard Methods for the Examination of Water and WasteWater 23rd Edition, American Public Health Association, American Water Works Association, Water Environment Federation USA (2017)
USEPA: United States Environmental Protection Agency
NGVS: No Guideline Value Set
ND: Not Detected

- Laboratory tests and measurements were carried out at 25 ± 2 °C and 50 ± 10 % Relative Humidity conditions unless stated otherwise.
- Uncertainty of Measurement (UoM) data will be provided on request, where available. The statement of conformity, if provided in the report, is based on the decision rule of simple acceptance or rejection with equal shared risk due to measurement uncertainty.

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1. **Sample Analyzed By:** Waqas Ahmad (Analyst (ICP-AES)); Abdul Aziz (Analyst (Chemical)); Muhammad Shahid (Analyst (Chemical)); Khizra Bano (Analyst(Microbiology)); Ghulam Mustafa (Analyst (Chemical))
2. **Name of Chief Analyst with Seal:** Muhammad Arfan
3. **Signature of Incharge of the Environmental Laboratory:**

Name: Imran Malik
General Manager
Date: 04/03/2023

---------- End of Report ----------

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