



Environmental Impact Assessment (EIA)

***Revised & Extended
Layout Plan of
Gulberg Residencia
Zone V, (Phase-III)
Islamabad***



**A Project
Intelligence Bureau
Employee's Cooperative Housing
Society (IBECHS)**

**Submitted to:
Pakistan
Environmental
Protection Agency
(Pak-EPA)**

ENVIRONMENTAL IMPACT ASSESSMENT

REVISED & EXTENDED LAYOUT PLAN OF GULBERG RESIDENCIA (PHASE-III), ZONE V, ISLAMABAD

1.	INTRODUCTION	1-1
1.1.	GENERAL	1-1
1.2.	THE PROJECT	1-1
1.3.	NAME OF PROJECT	1-2
1.4.	AIMS & OBJECTIVES OF ENVIRONMENTAL IMPACT ASSESSMENT	1-2
1.5.	SCOPE OF EIA	1-3
1.6.	EIA METHODOLOGY	1-4
1.7.	PROJECT JUSTIFICATION	1-5
2.	POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK	2-1
2.1.	GENERAL	2-1
2.2.	NATIONAL POLICY AND ADMINISTRATIVE FRAMEWORK	2-1
2.3.	POLICIES AND LEGISLATION RELATED TO ISLAMABAD	2-1
2.4.	ENVIRONMENTAL LAWS AND REGULATIONS	2-3
2.5.	ASSOCIATED LAWS AND REGULATIONS	2-5
2.6.	NATIONAL ENVIRONMENTAL QUALITY STANDARDS (NEQS)	2-7
2.7.	REGULATIONS FOR ENVIRONMENTAL ASSESSMENT AND REPORTING	2-7
2.8.	RELATED INTERNATIONAL CONVENTIONS, TREATIES & GUIDELINES	2-8
2.9.	IUCN RED LIST (2000)	2-8
2.10.	CONVENTION ON BIOLOGICAL DIVERSITY	2-8
2.11.	CONVENTION ON CONSERVATION OF MIGRATORY SPECIES	2-9
3.	DESCRIPTION OF PROJECT	3-1
3.1.	GENERAL	3-1
3.2.	PROJECT DESCRIPTION	3-1
3.3.	SILENT FEATURES	3-2
3.4.	PROJECT COMPONENTS AND ACTIVITIES	3-3
3.5.	LOCATION OF THE SITE	3-4
3.6.	SCHEDULE OF RESIDENTIAL PLOTS	3-9
3.7.	RETAIL FACILITIES AND COMMERCIAL CENTERS	3-9
3.8.	PUBLIC FACILITIES AND AMENITIES	3-10
3.9.	EXTERNAL DEVELOPMENT WORK	3-10
3.10.	UTILITIES	3-11
3.11.	ROADS AND CIRCULATION	3-11
3.12.	POPULATION DENSITY	3-12
3.13.	EXTERNAL ELECTRIFICATION	3-12
3.14.	GAS DISTRIBUTION NETWORK	3-13

3.15.	WATER SUPPLY	3-13
3.16.	WATER REQUIREMENT FOR GULBERG RESIDENCIA	3-14
3.17.	WATER SUPPLY NETWORK	3-19
3.18.	WATER CONSERVATION STRATEGY	3-21
3.19.	SEWAGE & SEWERAGE DISPOSAL	3-22
3.20.	SEWERAGE NETWORK	3-23
3.21.	STORM SEWERAGE SYSTEM	3-25
3.22.	LANDSCAPING	3-27
3.23.	ESTIMATED COST OF THE PROJECT	3-28
3.24.	TIME SCHEDULE	3-28
3.25.	CONSTRUCTION ASPECTS	3-28
3.26.	SITE RESTORATION	3-31
4.	DESCRIPTION OF BASELINE ENVIRONMENT	4-1
4.1.	GENERAL	4-1
4.2.	PHYSICAL ENVIRONMENT	4-1
4.3.	WATER RESOURCES	4-3
4.4.	CLIMATIC CONDITIONS	4-5
4.5.	EXISTING BASELINE ENVIRONMENTAL CONDITION	4-6
4.6.	ECOLOGICAL ENVIRONMENT	4-8
4.7.	SOCIO-ECONOMIC AND CULTURAL ENVIRONMENT	4-12
4.8.	HISTORY AND BACKGROUND	4-12
5.	PUBLIC CONSULTATION	5-1
5.1.	GENERAL	5-1
5.2.	CONSULTATION WITH STAKEHOLDERS	5-1
5.3.	CONSULTATION WITH COMMUNITY	5-2
6.	SCREENING OF POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES	6-1
6.1.	GENERAL	6-1
6.2.	APPROACH ADOPTED FOR IMPACT IDENTIFICATION	6-1
6.3.	IMPACTS DURING PROJECT DESIGN & PRE CONSTRUCTION PHASE	6-1
6.4.	IMPACTS DURING CONSTRUCTION PHASE	6-3
6.5.	ENVIRONMENTAL IMPACTS DURING PROJECT OPERATION PHASE	6-9
7.	ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN	7-1
7.1.	GENERAL	7-1
7.2.	STRUCTURE OF EMMP	7-2
7.3.	LEGISLATION, GUIDELINES AND ENVIRONMENTAL STANDARDS	7-2
7.4.	ROLES AND RESPONSIBILITIES	7-4
7.5.	ENVIRONMENTAL MITIGATION MANAGEMENT MATRIX	7-7

7.6.	ENVIRONMENTAL MONITORING PROGRAM.....	7-36
7.7.	ENHANCED EMMP PROVISIONS: THIRD-PARTY AUDIT, MILESTONE-BASED REPORTING, AND ENFORCEMENT MECHANISMS	7-41
7.8.	COMMUNICATION AND DOCUMENTATION PLAN.....	7-45
7.9.	CHANGE MANAGEMENT PLAN.....	7-47
7.10.	TRAINING PROGRAM	7-50
7.11.	ENVIRONMENTAL MANAGEMENT AND MONITORING COST	7-52
8.	Climate Risk Assessment, Greenhouse Gas Emissions and Carbon Management Plan	8-1
8.1.	INTRODUCTION.....	8-1
8.2.	GREENHOUSE GAS (GHG) EMISSIONS ASSESSMENT	8-1
8.3.	CLIMATE RISK AND RESILIENCE ASSESSMENT	8-3
8.4.	CARBON FOOTPRINT ASSESSMENT.....	8-4
8.5.	CLIMATE RESILIENCE AND LOW-CARBON ACTION PLAN	8-5
8.6.	MONITORING, REPORTING, AND INSTITUTIONAL ARRANGEMENTS	8-5
9.	ENVIRONMENTAL PLANS	9-1
9.1.	OVERVIEW OF SOLID WASTE GENERATION.....	9-1
9.2.	NATIONAL SOLID WASTE MANAGEMENT CONTEXT	9-1
9.3.	ENVIRONMENTAL IMPACTS OF POOR SOLID WASTE DISPOSAL.....	9-1
9.4.	CONSTRUCTION PHASE SOLID WASTE STREAMS	9-2
9.5.	OPERATIONAL PHASE SOLID WASTE STREAMS.....	9-3
9.6.	ESTIMATED SOLID WASTE GENERATION	9-3
9.7.	SOLID WASTE MINIMIZATION AND MANAGEMENT MEASURES.....	9-3
9.8.	TRAFFIC AND TRANSPORTATION MANAGEMENT PLAN.....	9-4
9.9.	HEALTH AND OCCUPATIONAL SAFETY	9-7
9.10.	EMERGENCY AND FIRE-FIGHTING PROTOCOLS.....	9-9
9.11.	CUMULATIVE TRAFFIC IMPACT ASSESSMENT	9-10
9.12.	TRAFFIC IMPACT ASSESSMENT (TIA)	9-10
10.	CONCLUSIONS AND RECOMMENDATIONS	10-1
10.1.	CONCLUSIONS.....	10-1
10.2.	RECOMMENDATIONS.....	10-2
11.	REFERENCES.....	11-1
12.	ANNEXURES.....	12-1

LIST OF FIGURES

FIGURE 3-1: LOCATION MAP TO GULBERG RESIDENCIA, ISLAMABAD	3-5
FIGURE 3-2: GOOGLE IMAGERY OF LOCATION OF GULBERG RESIDENCIA (REVISED & EXTENDED)	3-6
FIGURE 3-3: LAYOUT PLAN OF GULBERG RESIDENCIA (REVISED & EXTENDED).....	3-7
FIGURE 3-4: DETAILS OF PUBLIC BUILDING	3-10
FIGURE 3-5: WATER SUPPLY DISTRIBUTION PLAN	3-20
FIGURE 3-6: SEWERAGE SYSTEM OF GULBERG RESIDENCIA	3-24
FIGURE 3-7: STORMWATER DRAINAGE PLAN	3-26
FIGURE 4-1 VIEW OF NALLAH MALAL KAS	4-4
FIGURE 4-2 KORANG RIVER IN THE PROJECT AREA	4-4
FIGURE 4-3: RECORDING OF ENVIRONMENTAL BASELINE.....	4-8
FIGURE 4-4: ACCACIA NOLITICA.....	4-9
FIGURE 4-5: PARATHENIUM	4-9
FIGURE 4-6: CALOTROPIS PROCERA	4-10
FIGURE 4-7: CANNABIS SATIVA	4-10
FIGURE 4-8 DOMESTIC CAT	4-10
FIGURE 4-9: LOCAL DOG	4-10
FIGURE 4-10: HAWK	4-11
FIGURE 4-11: MOUNTAIN CROW.....	4-11
FIGURE 4-12: BULBUL	4-11
FIGURE 4-13: MYNA.....	4-11
FIGURE 4-14: HOUSE SPARROW.....	4-11
FIGURE 4-15: WHITE CHEEKED BULBUL	4-11

LIST OF TABLES

TABLE 3-1: PROJECT COMPONENTS	3-3
TABLE 3-2 LAND USE STANDARDS SET FORTH IN THE ZONING REGULATION OF CDA	3-8
TABLE 3-3: PLOTS DISTRIBUTION	3-9
TABLE 3-4 DESCRIPTION OF ROADS IN PROJECT AREA	3-12
TABLE 3-5: AVERAGE WATER DEMAND IN THE PROJECT AREA	3-13
TABLE 3-6: STORAGE & BULK DISTRIBUTION	3-14
TABLE 3-7: SUMMARY OF PLANTATION	3-27
TABLE 3-8: LIST OF EQUIPMENT	3-29
TABLE 4-1: LITHOLOGY OF RAWALPINDI-ISLAMABAD	4-3
TABLE 7-1 RECOMMENDED COMPLIANCE MONITORING PROTOCOL FOR PHYSICAL, BIOLOGICAL AND SOCIAL ENVIRONMENT	7-39
TABLE 7-2 RECOMMENDED EFFECTS MONITORING PROTOCOL	7-41
TABLE 12: THIRD-PARTY AUDIT, MILESTONE-BASED REPORTING, AND ENFORCEMENT MECHANISMS	7-42
TABLE 7-4 TRAINING PROGRAM	7-51
TABLE 7-5: ESTIMATED BUDGET COST FOR THE IMPLEMENTATION OF EMMP OF THE PROJECT	7-52
TABLE 9-1: VEHICULAR ACTIVITY AT THE PROJECT	9-6

ABBREVIATIONS

CDA	Capital Development Authority
EMMP	Environmental Management and Monitoring Plan
EMP	Environmental Monitoring Program
EPA	Environmental Protection Agency
EPC	Environmental Protection Council
IUCN	International Union for Conservation of Nature
LAA	Land Acquisition Act
NEQS	National Environmental Quality Standards
NGOs	Non-governmental Organizations
NO ₂	Nitrogen Dioxide
PAPs	Project Affected Persons
MMM	Mitigation Management Matrix
SC	Supervisory Consultants
EO	Environmental Officer
MER	Monthly Environmental Report

EXECUTIVE SUMMARY

The Revised & Extended Layout Plan of Gulberg Residencia (Phase-III), Zone-V, Islamabad has been proposed by M/s IBECHS (Pvt.) Ltd. to address the growing demand for planned, regulated, and serviced residential development in the Islamabad Capital Territory. The project is located within the revenue estates (mozas) of Darwala, Katheril, Sher Dhamiyal, and Dhalyala in Zone-V and falls within an area designated for private housing development under the ICT Zoning Regulations 1992 (amended). Proposal further expanded, and environmental approval for a total area of 3,940.32 kanals has been formally submitted.

In compliance with the requirements of Section 12 of the Pakistan Environmental Protection Act (PEPA), 1997, and the Pakistan IEE/EIA Review Regulations, 2000, an Environmental Impact Assessment (EIA) has been conducted to evaluate the potential environmental and social impacts associated with the proposed development. The EIA aims to ensure that the project is planned and implemented in an environmentally sound manner, integrates sustainable design principles, and adheres to applicable national and local environmental regulations.

The project has been designed as a secure, self-contained, and modern residential precinct, incorporating controlled access, perimeter security, and a comprehensive internal circulation system. The layout includes residential plots of varying sizes to cater to different income groups, along with commercial areas, public buildings, educational and healthcare facilities, mosques, recreational spaces, and landscaped parks. Modern infrastructure standards have been adopted, including underground electricity, gas, telecommunications, water supply systems, and a dedicated sewerage and stormwater drainage network supported by sewerage treatment plants (STPs) to ensure environmentally responsible wastewater management.

Baseline environmental studies were undertaken to assess existing conditions of the physical, biological, and socio-economic environment. Ambient air quality, noise levels, and groundwater quality were monitored and found to be largely within the applicable National Environmental Quality Standards (NEQS), with localized particulate matter levels reflecting typical peri-urban conditions of Islamabad's southern zone. Ecological assessment confirmed the absence of protected or critically sensitive habitats within the project area, while socio-economic analysis highlighted the need for planned housing and supporting infrastructure in the region.

Potential environmental impacts associated with the project were identified for the pre-construction, construction, and operational phases. These include temporary impacts such as dust emissions, noise generation, increased traffic movement, solid waste generation, and localized disturbance to soil and vegetation during construction. Operational phase impacts relate primarily to wastewater generation, solid waste management, water demand, and traffic load. All identified impacts are manageable and non-significant, provided that appropriate mitigation measures are implemented.

To address these impacts, a comprehensive Environmental Management and Monitoring Plan (EMMP) has been developed. The EMMP outlines institutional roles and responsibilities, mitigation measures, environmental monitoring protocols, reporting mechanisms, training requirements, and cost estimates to ensure effective environmental management throughout the project lifecycle. The plan emphasizes compliance with NEQS, CDA regulations, and best environmental management practices.

The EIA concludes that the Revised & Extended Layout Plan of Gulberg Residencia (Phase-III) is environmentally feasible and socially beneficial, and is expected to contribute positively to Islamabad's urban development by providing planned housing, improving infrastructure provision, generating employment opportunities, and enhancing overall living standards. With the effective implementation of the proposed mitigation and monitoring measures, the project is not anticipated to cause any significant adverse environmental or social impacts. Accordingly, the project is recommended for environmental approval, subject to compliance with the EMMP and all applicable regulatory requirements.

1. INTRODUCTION

1.1. GENERAL

This report presents the findings of the Environmental Impact Assessment carried out for the proposed project titled ***Revised & Extended Layout Plan Of Gulberg Residencia (Phase-III), Zone V, Islamabad.***

This EIA report has been prepared to conform to the requirements of Section 12 of the Pakistan Environmental Protection Act 1997 (PEPA), the Pakistan Initial Environmental Examination and Environmental Impact Assessment Review Regulations, 2000 and the guidelines provided in the Pakistan Environmental Assessment Procedures, 1997.

1.2. THE PROJECT

Following the establishment of the Capital Development Authority (CDA) on June 14, 1960, it soon became apparent that the rapidly growing residential needs of Islamabad would be difficult to meet solely through public-sector development. Land acquisition challenges and frequent litigations further constrained CDA's ability to keep pace with the city's expansion plans.

- 2011: Environmental approval granted through an IEE for an area of 3,799 Kanal land (NoC attached as Annexure-A);
- 2021: Environmental approval granted through an EIA for 11,186.68 kanals. (NoC attached as Annexure-A)
- 2025 Update: Proposal further expanded, and environmental approval for a total area of 3,940.32 kanals has been formally submitted.

To address this, CDA opted to encourage private sector participation in urban development. Acting under the powers granted through Section 51 of the CDA Ordinance 1960 (XXIII of 1960), read with Section 11, the Islamabad Capital Territory (ICT) Zoning Regulations, 1992 were introduced. These regulations divided Islamabad into five distinct zones and permitted private developers to acquire land and establish residential schemes within Zone II and Zone V. All such developments

were required to adhere to prescribed planning standards, ensuring consistency with the sector layout and urban design principles of Zone I.

In line with these regulatory provisions, IBECHS Islamabad has acquired valuable land holdings in Zone V specifically in Moza Darwala, Khaterial, Sher Dhamial, and Dhalyala spanning approximately 3,940.32 kanals has been formally submitted. Development works for the scheme will commence upon receipt of the requisite approvals from CDA. Strategically located just 0.5 kilometers from Airport Chowk along the Islamabad Expressway, the project enjoys excellent accessibility and a prime growth corridor within the capital city.

1.3. NAME OF PROJECT

The name of the Project under this Study is *“Revised & Extended Layout Plan Of Gulberg Residencia (Phase-III), Zone V, Islamabad”*.

1.4. AIMS & OBJECTIVES OF ENVIRONMENTAL IMPACT ASSESSMENT

This report serves two purposes. Firstly, it provides necessary information to the Pakistan Environmental Protection Agency to determine whether the project poses any environmental threat. Secondly, it shall serve as a ready-reckoner for the proponents to manage the project during construction and operation in an environment-friendly manner and abide especially by recommendations of the Environmental Management Plan and the Environmental Monitoring Programme.

The main **aims and objectives** of this Environmental study are to identify baseline environmental, physical and socio-economic conditions pertaining to the project, examine project alternatives, and discuss potential impact, along with formulation of suitable mitigation measures for environment-friendly implementation of the project. These are summarised as follows:

- ✓ Identification and assessment of all environmental impacts or social sensitivity, whether major or minor, caused during the operational stage in order to formulate an effective Environmental Management Plan;
- ✓ Suggest measures required to mitigate any possible adverse environmental impact through minimisation, elimination, reversal or compensation of such impact;
- ✓ Pinpoint and assess all possible impacts of project operation on the natural, physical, biological and socio-economic environment of the project area and evaluate these both qualitatively and quantitatively, wherever possible, and determine their significance in light of technical and regulatory concerns, as well as those relating to public perceptions, and

- ✓ Prepare an Environmental Impact Assessment report presenting recommendations for effective implementation of the project in a manner that it does not compromise the environment existing at the project site or pose any environmental threat in the immediate foreseeable future.

In order to ascertain possible environmental impacts posed by the project, the study has been divided into the following sub-tasks:

- ✓ Identification of various legal and statutory requirements as set forth by the Pakistan Environmental Protection Act, 1997, and guidelines for preparation and review of environmental studies;
- ✓ Collection and scrutiny of data related to physical, ecological and socio-economic aspects of the project site and surrounding areas;
- ✓ Identification and evaluation of salient environmental impacts;
- ✓ Identification of mitigation measures required to minimise negative externalities of the project, and
- ✓ Preparation of an Environmental Management Plan and an Environmental Monitoring Programme.

1.5. SCOPE OF EIA

The scope of the Environmental Impact Assessment (EIA) for the Revised & Extended Layout Plan of Gulberg Residencia (Phase-III), Zone-V, Islamabad encompasses a comprehensive evaluation of the project's potential environmental and social impacts throughout its pre-construction, construction, and operational phases, in accordance with the requirements of the Pakistan Environmental Protection Act, 1997, the IEE/EIA Review Regulations, 2000, and relevant CDA planning and zoning regulations. The EIA covers assessment of baseline physical environment (air quality, noise, soil, surface and groundwater resources, geology and drainage), biological environment (flora, fauna, and ecological sensitivity), and socio-economic conditions (population, livelihoods, land use, infrastructure, and public services) within the project area and its zone of influence. It includes identification and evaluation of potential impacts related to land development, construction activities, utility provision, traffic and transportation, water demand, wastewater and solid waste generation, and occupational health and safety. The scope further incorporates analysis of regulatory compliance, public consultation outcomes, and

development of appropriate mitigation measures, monitoring protocols, and an Environmental Management and Monitoring Plan (EMMP) to ensure environmentally responsible implementation and sustainable operation of the proposed housing development.

1.6. EIA METHODOLOGY

Key steps followed while conducting the study were screening, scoping, data collection and compilation, environmental screening and impact assessment, documentation and consultation. Environmental samples were collected by laboratory technicians and analysed at Green Crescent, Islamabad a certified laboratory. Screening comprised compilation and review of information on the project. Most of this information was obtained from the proponents and added to data on relevant legislation, regulations, guidelines and standards.

Scoping involved a review of collected information and identification of potential environmental issues. Data collection and compilation was necessary to develop an environmental baseline of the project area. Review of secondary sources as well as primary and field data was also carried out. Environmental screening and impact assessment process of this study determined potential impacts of the project through examination and testing of environmental, socio-economic, and project information.

Subsequently, potential impacts were characterised in order to analyse significance. Mitigation measures were identified where required to minimise environmental impacts. A management framework was also developed in the form of an Environmental Management Plan for implementation of identified mitigation measures.

Consultation with the proponents and other stakeholders, such as local residents and persons that might be affected by the project was carried out at the same time essentially to establish public concerns about the project and pinpoint any aspect that may have been overlooked during preparatory work.

Documentation was the last step of the study, which comprised collation of data and preparation of the report along with requisite appendices in proof of the study and its findings. Accordingly, this report includes a brief description of the project, an overview of environmental legislation relevant to the project, a description of baseline environmental and socio-economic conditions in the project area, and potential project impacts and mitigation measures.

The environmental consultants also remain in touch with all government agencies involved in regulation of projects of such nature. These include authorities responsible for traffic regulation, civil defence, water and sanitation, forestry, environment, traffic engineering and planning, housing and drainage in the Islamabad Capital Territory administration and the Capital Development Authority.

1.7. PROJECT JUSTIFICATION

Pakistan's housing sector is under acute stress due to rapid population growth, accelerated urbanisation, and a widening gap between housing demand and supply, particularly in major urban centres such as Islamabad and Rawalpindi. With an annual housing shortfall of approximately 270,000 units and nearly half of the urban population residing in informal or substandard settlements, the absence of planned and affordable housing has led to environmental degradation, encroachment on state and private land, and excessive pressure on existing civic infrastructure. The situation is further aggravated by rising land prices, aging housing stock, limited access to affordable housing finance, and declining public-sector investment in housing development. In the Rawalpindi–Islamabad region, Islamabad's status as the national capital and its superior urban services have intensified in-migration, resulting in unregulated expansion, congestion, and increased strain on natural and municipal resources.

Against this backdrop, the proposed Gulberg Residencia Housing Scheme, located in Zone-V of Islamabad, is justified as a planned and regulated residential development aimed at addressing these systemic housing and urban management challenges. The project represents a structured intervention to provide serviced plots and residential infrastructure within a controlled planning framework, thereby discouraging informal settlements and promoting orderly urban expansion in the peripheral zones of the capital. The project has been further expanded, and environmental approval has been formally submitted for a total project area of 3,940.32 kanals, reflecting the scale and significance of the development within Islamabad's evolving urban landscape.

The project is designed to ensure provision of essential urban infrastructure, including water supply, sewerage and wastewater management, stormwater drainage, energy supply, internal road networks, and community services, in compliance with applicable planning and environmental regulations. By offering environmentally compliant and adequately serviced residential development, Gulberg Residencia is expected to reduce pressure on informal and unregulated housing

areas, improve overall living standards, and contribute to sustainable spatial growth within Zone-V. In addition to its urban development role, the project is anticipated to generate positive socio-economic impacts through direct and indirect employment generation, stimulation of construction and allied industries, and enhanced public revenues through land development, utility services, and municipal charges, while supporting recovery of development costs and strengthening institutional capacity for urban governance.

2. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

2.1. GENERAL

This chapter presents an overview of the policy framework and national legislation governing environmental and social assessment guidelines applicable to the proposed project, aimed at managing potential environmental impacts. The Revised & Extended Layout Plan Of Gulberg Residencia (Phase-III), Zone V, Islamabad is required to adhere to all relevant national environmental laws and secure the necessary regulatory approvals.

2.2. NATIONAL POLICY AND ADMINISTRATIVE FRAMEWORK

The Pakistan National Conservation Strategy (NCS), endorsed by the federal cabinet in March 1992, serves as the country's primary policy document addressing environmental issues (EUAD/IUCN, 1992).

In 1997, the Government of Pakistan enacted the Pakistan Environmental Protection Act (PEPA). Two key institutions the Pakistan Environmental Protection Council (PEPC) and the Pakistan Environmental Protection Agency (Pak-EPA) are responsible for implementing the Act. The PEPC, comprising representatives from the government, industry, NGOs, and the private sector, oversees the activities of the Pak-EPA.

Pak-EPA is tasked with ensuring compliance with the National Environmental Quality Standards (NEQS) and establishing systems for environmental monitoring and evaluation. As the lead implementation agency, it also identifies legislative needs and initiates new regulations when necessary. Furthermore, Pak-EPA is authorized to delegate its responsibilities to provincial Environmental Protection Agencies or Departments (EPAs/EPDs). Among these delegated functions is the review and approval of environmental assessment reports for projects falling within the respective provinces.

2.3. POLICIES AND LEGISLATION RELATED TO ISLAMABAD

This section provides an overview of the policy framework, national legislation and other guidelines regarding environment. The study is organized in light of laws,

regulations and guidelines most relevant to scope of the project so that it becomes compliant with national legislation relating to the environment and CDA development laws.

2.3.1. ICT DEVELOPMENT LAWS AND REGULATIONS

The Capital Development Authority (CDA) has the responsibility for the overall planning, provision and supervision of public health services, covering adequate sanitation and garbage disposal within the territorial limits of the Islamabad Capital Territory (ICT). It also has the responsibility for the coordination of public health services with other relevant agencies. This includes collection, transportation and safe disposal of liquid and solid waste collected from residential areas, commercial areas, open spaces etc.

The CDA operations are governed generally by the provisions of the Islamabad Capital Territory Municipal Bye Laws, 1968 as amended from time to time; and specifically by the Islamabad Regulations 1979 (Upkeep of Cleanliness) as amended from time to time.

2.3.2. ISLAMABAD CAPITAL TERRITORY (ZONING) REGULATION, 2005

For administration and land use characterization, through this regulation the Islamabad Capital territory has been delineated into following five zones;

Zone-1

This zone constitutes sectors up to the existing alignment of the G.T. road from the point of intersection of G.T. road with Shah rah-e-Kashmir to the point of the Nicolson Monument inclusive of sector H-14, H-15, H-16, H-17, I-14, I-15, I-16, I-17.

Zone -2

The zone consists of an area bounded by G.T. road in the north & north east, north of Shah rah-e-Kashmir and Capital limits in the west, comprising residential sectors G-15 (part), G-16, G-17, F-15 (part), F-16, F-17, E-15 (part), E-16, E-17, D-16, D-17, C-17, AND B-17.

Zone-3

Margalla Hills National Park as notified under section 21 of the Islamabad Wildlife (Protection, Preservation, Conservation & Management) Ordinance 1979, Other

protected ranges, forest areas and un-acquired land falling between the Margallah Hills & north of Murree Road shall constitute this zone.

Zone-4

This zone comprises Islamabad Park and rural periphery wedged between Murree road towards north and Lehtrar road towards south and extending beyond Simly road up to the ICT limits in the north east. This zone excludes the part of Margalla Hills National Park and Rawal Lake.

Zone-5

This zone comprises areas falling south of Islamabad Park and extending up to outer limits of ICT towards south, south west and south east

2.4. ENVIRONMENTAL LAWS AND REGULATIONS

The enactment of environmental legislation covering multiple areas of concern is a relatively newly initiated process in Pakistan. Whereas, a basic policy and legislative framework for the protection of the environment and biodiversity in the country is now in place, detailed rules, regulations and guidelines required for the implementation of the policies and enforcement of legislation are mostly formulated. The following sections present a brief overview of the existing national policies, legislation and guidelines as well as a few international conventions to which Pakistan is a signatory.

2.4.1. PAKISTAN ENVIRONMENTAL PROTECTION ACT 1997

The Pakistan Environmental Protection Act, 1997 (PEPA) is the fundamental legislation empowering the government to formulate regulations for protecting the environment. It is broadly applicable to air, water, soil, marine and noise pollution, as well as to the handling of hazardous waste. Penalties have been prescribed for those contravening the provisions of the Act. The powers of the federal and provincial Environmental Protection Agencies (EPAs) have also been considerably enhanced under this legislation. In addition, the EPAs have been empowered to conduct inquiries into possible breaches of environmental law either upon the registration of a complaint or on their own accord. Under section 12 of PEPA (1997), no project involving construction activities or any change in the physical environment can be undertaken unless an Environmental Impact Assessment (EIA) or EIA, as required, is conducted and a report submitted to the federal or provincial EPA.

2.4.2. NATIONAL ENVIRONMENTAL ACTION PLAN (NEAP-SP)

The Government of Pakistan (GoP) and United Nations Development Program (UNDP) have jointly initiated an umbrella support program called the National Environmental Action Plan - Support Program (NEAP-SP) signed in October 2001 and implemented in 2002. The development objective supported by NEAP-SP is environmental sustainability and poverty reduction in the context of economic growth.

2.4.3. NATIONAL ENVIRONMENTAL POLICY, 2005

The National Environmental Policy (NEP) was approved by the Pakistan Environmental Protection Council (PEPC) in its 10th meeting on 27th December 2004 under the chairmanship of the Prime Minister of Pakistan. Thereafter, it was approved by the Federal Cabinet on 29th June 2005. NEP is the primary policy document of Government of Pakistan that addresses Pakistan's environmental issues. The broad goal of NEP is, "To protect, conserve and restore Pakistan's environment in order to improve the quality of life of the citizens through sustainable development". The NEP also provides the sectoral and cross-sectoral guidelines, listed in following paragraphs, for various sectors to achieve its goal of sustainable development:

Sectoral Guidelines - are available in the following areas:

Water Supply and Management; Air Quality and Noise; Waste Management; Forestry, Biodiversity and Protected Areas; Climate Change and Ozone Depletion; Energy Efficiency and Renewable Energy Resources; Agriculture and Livestock; and Multilateral Environmental Agreements.

Cross- Sectoral Guidelines

All environment related policies, programs and projects would be gender sensitive, integrate Poverty, Population and Health. Incorporate effective environmental management in Trade, Local Governance and Natural Disaster Management.

In addition to these sectoral and cross-sectoral guidelines, the NEP 2005 also suggests the following policy instruments to overcome the environmental problems throughout the country;

- ✎ Integration of environment into development planning
- ✎ Legislation and regulatory framework

- ✗ Capacity building of various institutions
- ✗ Economic and market based instruments
- ✗ Public awareness and education
- ✗ Public-private-civil society partnership

While NEP 2005 is a policy document and does not regulate individual projects, however, adopting policy guidelines ensure that the project does not add to the environmental problems identified in NEP. Moreover, adopted mitigation measures will minimize or avoid any contribution to the already existing environmental problems in the project area.

2.4.4. ISLAMABAD ENVIRONMENTAL IMPROVEMENT ACT, 1995

Islamabad Environmental Improvement (Green Areas) Act, 1995 was proposed to (1) prevent the existing green area in the Islamabad Capital Territory from being used for purposes other than those for which they are reserved and (2) ensure that at least 20 % of the total area of any new scheme is reserved for the development of green areas. For the purpose of this Act, “green areas” means land in the Islamabad Master Plan, or other schemes, reserved exclusively for parks, playgrounds, forests, nurseries, vegetative cover, green belts and open spaces on which no construction is planned.

2.4.5. ISLAMABAD WILDLIFE ORDINANCE, 1979

The Islamabad Wildlife (Protection, Preservation, Conservation and Management) Ordinance 1979 provides the protection, preservation, conservation and management of wildlife in Islamabad Capital Territory. Main aim of this act is the preservation and conservation of wildlife, flora and fauna for sustainable development to comply with the concept of national parks internationally.

2.5. ASSOCIATED LAWS AND REGULATIONS

This section outlines the statutes apart from Pakistan Environmental Protection Act, 1997, which are relevant to the project.

2.5.1. LAND ACQUISITION AND RESETTLEMENT REGULATIONS

At present, the only legislation relating to land acquisition and compensation is the Land Acquisition Act (LAA) of 1894. The LAA is, however, limited to a cash

compensation policy for the acquisition of land and built-up property, and damage to other assets, such as crops, trees, and infrastructure. The LAA does not consider the rehabilitation and resettlement of disrupted populations and the restoration of their livelihoods.

Experience with large-scale infrastructure development projects implementation has demonstrated the need for a cohesive national policy for resettlement due to reasons that the LAA does not consider the rehabilitation and resettlement of disrupted populations and the restoration of livelihoods and also does not provide any assistance to non-title holders and vulnerable groups. Following a national consultative process, a Draft National Resettlement Policy was prepared in 2002. Details of this policy are not under consideration as this policy is still in draft form. The Project may involve acquisition of private as well as government land. The land will be acquired under the LAA 1894.

2.5.2. FACTORIES ACT, 1934

The clauses of this Act relevant to the project are those that concern the health, safety and welfare of workers, disposal of solid waste and effluent, and damage to private and public property. The Factories Act also provides regulations for handling and disposing of toxic and hazardous materials. Given that construction activity is classified as 'industry' these regulations will be applicable to the project contractors.

2.5.3. PAKISTAN PENAL CODE (1860)

The Pakistan Penal Code (1860) addresses many offences that are liable to enforce levies, fines, imprisonment or both. The fouling of public springs or reservoirs that makes them less fit for ordinary use is also addressed as offensive. The current project is also to reduce violation of this code in case of surface water bodies.

2.5.4. THE BIODIVERSITY ACTION PLAN

Pakistan, being a signatory to the Convention on Biological Diversity (Rio, June 1992), is obligated to develop a national strategy for the conservation of biodiversity. The Government of Pakistan has constituted a Biodiversity Working Group under the auspices of the Ministry of Environment, Local Government and Rural Development to develop a Biodiversity Action Plan (BAP) for the country. The

project to protect water resources of Islamabad is quite supportive to conserve biodiversity in the downstream areas.

2.6. NATIONAL ENVIRONMENTAL QUALITY STANDARDS (NEQS)

The NEQS promulgated under the PEPA 1997 specify standards for industrial and municipal effluents, gaseous emissions, vehicular emissions, and noise levels. The PEPA 1997 empowers the Provincial EPAs to impose pollution charge in case of non-compliance to the NEQS.

2.7. REGULATIONS FOR ENVIRONMENTAL ASSESSMENT AND REPORTING

Under Section 12 (and subsequent amendment) of the 1997 Act, a project falling under any category specified in Schedule II require the proponent to file an EIA with the federal agency. Within ten working days of the IEE or EIA having been deposited, the federal agency will confirm that the document submitted is complete for the purpose of review. During this time, should the federal agency require the proponent to submit any additional information, it will return the IEE or EIA to the proponent for revision, clearly listing those aspects that need further discussion. Subsequently, the federal agency shall make every effort to complete an IEE review within 45 days and an EIA review within 90 days of filing.

2.7.1. PREPARING & REVIEW OF ENVIRONMENTAL REPORTS

The Guidelines for the Preparation and Review of Environmental Reports, Pakistan Environmental Protection Agency, 1997 specify:

- ✎ The nature of the information to be included in environmental reports
- ✎ The minimum qualifications of the EIA/IEE conductors appointed.
- ✎ The need to incorporate suitable mitigation measures at every stage of project implementation.
- ✎ The need to specify monitoring procedures.
- ✎ The terms of reference for the reports are to be prepared by the project proponents themselves. The report must contain baseline data on the project area, detailed assessment thereof, and mitigation measures.

2.7.2. GUIDELINES FOR PUBLIC CONSULTATION

These guidelines deal with possible approaches to public consultation and techniques for designing an effective program of consultation that reaches out to all major stakeholders and ensures that their concerns are incorporated in any impact assessment study.

2.8. RELATED INTERNATIONAL CONVENTIONS, TREATIES & GUIDELINES

This section outlines the international conventions, treaties and guidelines regarding Environmental Protection, which are relevant to the project. Pakistan, being a signatory to these international treaties and conventions on the conservation of the environment and wildlife protection, is obliged to adhere to the commitments specified in these treaties. The relevant international treaties and conventions and the provisions therein have been described in the following paragraphs.

2.9. IUCN RED LIST (2000)

The red list is published by International Union for Conservation of Nature (IUCN) and includes those species that are under potential threat of extinction. These species have been categorized as:

- ✎ **Endangered:** species that are considered to be facing a very high risk of extinction in the wild in near future, reduction of 50% or more either in the last 10 years or over last three generations, survive only in small numbers, or have very small populations.
- ✎ **Vulnerable in Decline:** species that are considered to be facing a risk of extinction in the wild, having an apparent reductions of 20% or more in the last 10 years or three generations.
- ✎ **Vulnerable:** species that are seen to be facing a high risk of extinction in the wild, but not necessarily experiencing recent reductions in population size.
- ✎ **Lower Risk:** species that are seen to be facing a risk of extinction that is lesser in extent than that for any of the above categories.
- ✎ **Data Deficient:** species that may be at risk of extinction in the wild but at present there is insufficient information available to make a firm decision about its status.

2.10. CONVENTION ON BIOLOGICAL DIVERSITY

The Convention on Biological Diversity was adopted during the Earth Summit of 1992 at Rio de Janeiro. The Convention requires parties to develop national plans for the

conservation and sustainable use of biodiversity, and to integrate these plans into national development programs and policies. Parties are also required to identify components of biodiversity that are important for conservation, and to develop systems to monitor the use of such components with a view to promoting their sustainable use.

2.11. CONVENTION ON CONSERVATION OF MIGRATORY SPECIES

The Convention on the Conservation of Migratory Species of Wild Animals (CMS), 1979, requires countries to take action to avoid endangering migratory species. The term 'Migratory Species' refers to the species of wild animals, a significant proportion of whose members, cyclically and predictably, cross one or more national jurisdictional boundaries. The parties are also required to promote or co-operate with other countries in matters of research on migratory species.

3. DESCRIPTION OF PROJECT

3.1. GENERAL

This Chapter provides an overview of the project including main components, infrastructure and other related developmental activities to be carried out in the project area. The Master Planning, detailed designing of infrastructure and buildings in the Zone-V have been designed in compliance. Master Planning in conformity with the **“Modalities and Procedures framed under ICT (Zone) Regulations 1992” issued by Capital Development Authority (CDA).** [See Annexure-B](#)

3.2. PROJECT DESCRIPTION

Gulberg Residencia (Revised & Extended) is redefining the future of affordable stylish living. A lifestyle that exceeds imagination, where there's nothing short of harmony and inspiration. Living in Islamabad within a friendly ambiance and experiencing a comfortable lifestyle is a dream which Gulberg Residencia is making a reality. With ready for construction plots already available at affordable rates, within the heart of Islamabad, Gulberg Residencia is poised to become a monumental success.

- [2011: Environmental approval granted through an IEE for an area of 3,799 Kanal land \(NoC attached as Annexure-A\);](#)
- [2021: Environmental approval granted through an EIA for 11,186.68 kanals. \(NoC attached as Annexure-A\)](#)
- [2025 Update: Proposal further expanded, and environmental approval for a total area of 3,940.32 kanals has been formally submitted.](#)

Gulberg Islamabad is a project of Intelligence Bureau Employee's Cooperative Housing Society society (IBECHS). There are many housing societies in Rawalpindi and Islamabad, But the beautiful location of Gulberg Islamabad is as beautiful as Islamabad . It is just 15 minutes drive from gulberg to other parts of Islamabad ,and 10 minutes drive towards airport and 5 minutes drive to G.T road.

M/s IBECHS (Pvt.) Ltd., Islamabad has acquired high-value land measuring 3,940.32 kanals for the development of the housing scheme. The projected population within the scheme area will be adequately catered for through provision of essential community and social infrastructure, including designated shopping areas, educational facilities, healthcare services, mosques, a marriage hall, a community club, and landscaped parks and playlots, ensuring a self-sustained and livable residential environment.

A sewerage treatment plant (STP) has been planned at a comparatively lower elevation within the project area to facilitate gravity-based flow. Following appropriate treatment, the treated effluent will be safely discharged into the nearby nallah in accordance with applicable environmental standards. A designated graveyard has also been incorporated into the layout plan and is accessible through 40-foot-wide roads, ensuring convenient access while maintaining functional segregation from residential areas.

The overall circulation plan has been carefully designed to ensure smooth and efficient traffic movement, minimize congestion, and reduce the risk of road accidents. The internal road network will be landscaped with ornamental trees and shrubs to enhance micro-climatic conditions, provide shade, and improve the visual and aesthetic quality of the development. Furthermore, the majority of residential plots have been oriented along a north–south axis, reflecting climate-responsive planning principles aimed at improving thermal comfort, natural ventilation, and energy efficiency within the built environment.

3.3. SILENT FEATURES

The Revised & Extended Layout Plan of Gulberg Residencia (Phase-III), Zone-V, Islamabad has been conceived as a secure, self-contained, and modern residential precinct, with strong emphasis on controlled access and resident safety. The scheme incorporates a comprehensive security framework, including defined entrance gateways, perimeter boundary walls, controlled security gates, CCTV surveillance, and guarded monitoring to ensure a safe and regulated living environment.

The project adopts contemporary urban infrastructure standards through fully underground utility networks, including electricity, gas, telecommunications, water supply supported by tube wells and storage reservoirs, and water filtration plants to ensure potable water availability. An integrated underground drainage and sewerage system, supported by sewerage treatment plants, has been planned to manage

wastewater in an environmentally responsible manner and protect groundwater resources.

A wide range of public, civic, and recreational facilities has been incorporated to ensure functional self-sufficiency and community well-being. These include mosques, police and fire services, postal and utility facilities, transport terminals, graveyards, as well as parks, walkways, jogging tracks, community centers, libraries, sports and cultural facilities. Commercial and mixed-use components such as business avenues, central and neighborhood commercial areas, healthcare and educational institutions are strategically distributed to enhance accessibility and minimize travel demand.

Comprehensive landscaping and arboriculture along roads, medians, parks, and open spaces forms a core element of the design, contributing to improved micro-climatic conditions, aesthetics, and environmental quality. Residential plots and housing units ranging from 200 to 1,000 square yards cater to diverse income groups, positioning Gulberg Residencia Phase-III as a sustainable and well-planned extension of Islamabad's urban fabric.

3.4. PROJECT COMPONENTS AND ACTIVITIES

Key components and activities of the project are shown in the matrix overleaf and described in detail in the ensuing paragraphs. These range from project conception to project operation.

TABLE 3-1: PROJECT COMPONENTS

Project Components:	Salient Feature(s):	Purpose(s):
Land acquisition	Land measuring 3,940.32 kanals is available with the proponents	To develop residential spaces for city residents at an affordable price
Surveying and site Investigations	Included topographical survey, soil investigations, environmental testing etc., which are non-intrusive in nature	To obtain necessary information for detailed design of the project
Designing various components of the project	Included preparation of plans, maps, layout, specification, engineering details and tender documents, and conduct of an environmental study	To provide design and engineering details of the project
Selection of Contractor	Includes transportation of equipment, setting up of site office, construction camp, and assembly of project implementation team	To carry out construction at the site
Site preparation	Includes removal of wild vegetation and land levelling	To facilitate construction activities
Laying of services	Includes water supply system, drainage, electricity, sewerage, storm water disposal etc.	To provide necessary services at the estate
Construction of the	Includes roads and streets and major	To provide necessary services

housing scheme	buildings, plantations, and landscaping of open areas	for future residents
Operation of the estate	Includes regular maintenance by the proponents	To provide quality living for residents

3.5. LOCATION OF THE SITE

The proposed project is situated within the revenue estates (mozas) of Darwala, Katheril, Sher Dhamiyal, and Dhalyala, located in Zone V of Islamabad Capital Territory. The site is positioned approximately 5.5 km from Islamabad Highway and is accessible primarily via Darwala Road, while Airport Chowk and Koral Chowk are located at an approximate distance of 7 km. The scheme benefits from a strategically advantageous location, with Islamabad Expressway in close proximity approximately 0.5 km from Airport Chowk providing efficient regional and intra-city connectivity.

The project area is surrounded by established residential developments and prominent natural features, which contribute positively to its overall planning and urban context. To the east, the site adjoins AJK Housing Scheme, Senate Employees Housing Scheme, and OPF Housing Scheme; to the south, it is bounded by the Parliamentary Enclave Housing Scheme and the Soan River; to the west, it is adjacent to the Anchorage Housing Scheme (Navy); and to the north, it is bordered by Zone IV, with the Al-Hamrah Hills located toward the north-eastern side of the project area.

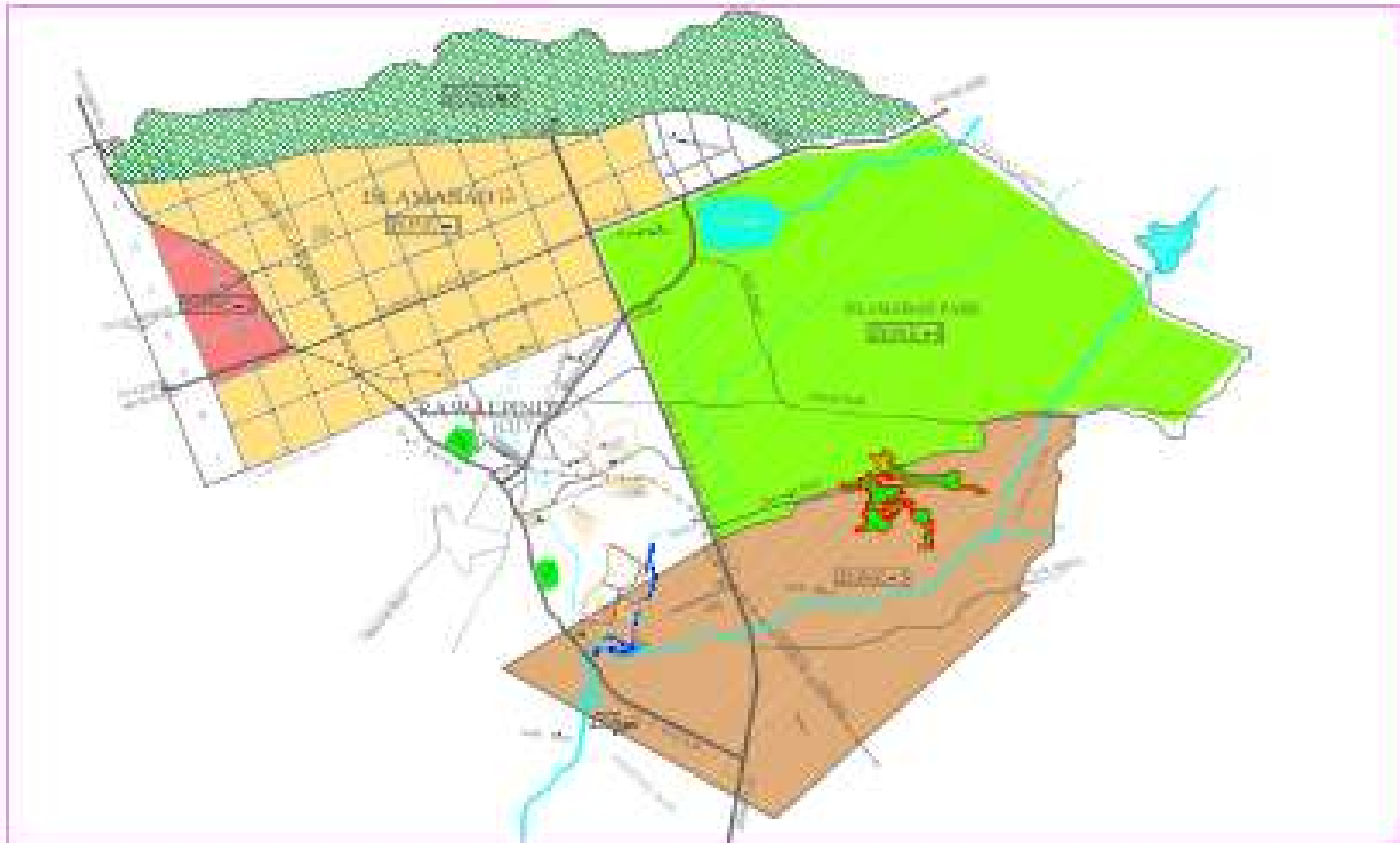


FIGURE 3-1: LOCATION MAP TO GULBERG RESIDENCIA, ISLAMABAD



Ch. 3-6

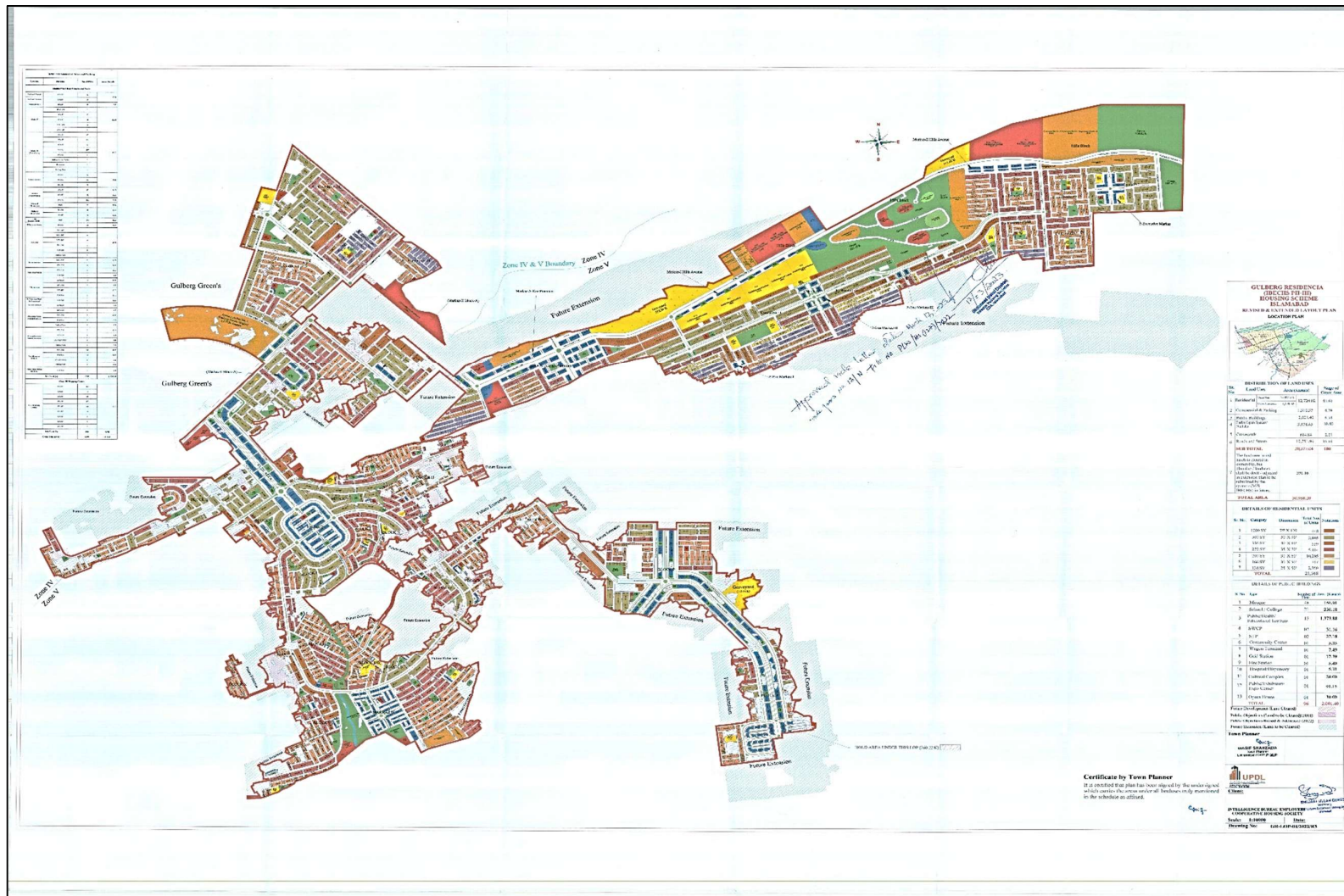


FIGURE 3-3: LAYOUT PLAN OF GULBERG RESIDENCIA (REVISED & EXTENDED)

3.5.1. LAND USE PLAN

The land use plan defines the overall functional structure of the scheme by organizing different activities according to their intended functions, interrelationships, and planned densities. Compatible activities have been clustered to ensure efficiency and functional harmony, while a wide range of facilities and amenities has been integrated into the design. Strong internal linkages, as well as connections with other sectors of the scheme, have been ensured so that the development functions as a cohesive and unified urban entity rather than as isolated components.

The physical plan provides a balanced and equitable distribution of land uses to support orderly and sustainable development. The proposed land use allocations are in accordance with the standards and requirements prescribed under the Capital Development Authority (CDA) zoning regulations, ensuring compliance with approved planning norms and facilitating balanced physical growth of the area.

TABLE 3-2 LAND USE STANDARDS SET FORTH IN THE ZONING REGULATION OF CDA

S. NO	DESCRIPTION	AREA IN KANAL	% AGE
1	RESIDENTIAL	12,720.02	41.60
2	ROADS & STREET	10,751.96	35.16
3	COMMERCIAL & PARKING	1,310.37	4.29
4	PUBLIC BUILDING	2,001.40	6.45
5	PARKS/OPEN SPACES/NULLAH	3,178.45	10.40
6	GRAVEYARD	614.84	2.01
7.	THE AREA BETWEEN RED HATCH IS CLEARED IN OWNERSHIP BUT PLANNING/LANDUSE SHOULD BE DEALT IN EXTENSION	391.16	
TOTAL		30,968.20	100

3.6. SCHEDULE OF RESIDENTIAL PLOTS

3.6.1. RESIDENTIAL PLOTS

Gulberg Residencia Community comprises of superior neighborhoods designed to house over 23,568 uniquely designed plots.

Proximity to amenities such as schools, mosque, shops, parks and community center make this an ideal living for families. Superior neighborhoods, excellent schools, preserved green spaces, diverse parks and recreational offerings make this residential development unique. The detail typology and quantification of plots of residential land use are as following:

TABLE 3-3: PLOTS DISTRIBUTION

Sr. No	Category	Dimension	Total Units
1.	1000 SY	75' X 120'	448
2.	500 SY	50' X 90'	3,805
3.	356 SY	40' X 80'	539
4.	272 SY	35' X 70'	5,414
5.	200 SY	30' X 60'	10,295
6.	166 SY	30' X 50'	717
7.	138 SY	25' X 50'	2,350
TOTAL			23,568

3.7. RETAIL FACILITIES AND COMMERCIAL CENTERS

Since the project is in isolation and no properly planned retail facility exists in it suburbs therefore a commercial hub is inevitable for the long terms sustainability of the project along with the convenience of its residents. Keeping in view the retail psychology and needs of the residents bulk commercial sites are provided within the site.

When it comes to the form of commercial areas, topography of the project leads to linear form of commercial along with Main Boulevards. However, wherever commercial activity is provided it is supported with its independent circulation and parking leaving minimum impact on Main Boulevards. Every plot owner will have liberty to design the internal spaces within prevailing bye laws; however the outer

façade of the buildings will be strictly controlled in order to provide a harmony in the proposed development.

3.8. PUBLIC FACILITIES AND AMENITIES

The development is designed with good public amenities and facilities to ensure convenience for all residents. Mosque are disturbed throughout the site with sample space parking space. A school of international standard primary will cater the student population of the development. The sites for community centers and public amenities have been provided.

FIGURE 3-4: DETAILS OF PUBLIC BUILDING

Sr. No	Type	Number of Plots	Area (Kanals)
1.	Mosque	48	156.91
2.	School/College	21	230.18
3.	Public/Health/Educational Institutions	15	1,373.88
4.	SWCP	02	31.16
5.	STP	02	27.18
6.	Community Center	01	5.35
7.	Wagon Terminal	01	7.49
8.	Grid Station	01	17.39
9.	Fire Station	01	5.40
10.	Hospital/Dispensary	01	5.31
11.	Cultural Complex	01	20.00
12.	Public/Exhibition/Expo Center	01	91.15
13.	Opera House	01	30.00
Total			2,001.40

3.9. EXTERNAL DEVELOPMENT WORK

The external development works for the project will comprise the provision of essential infrastructure systems required to support the planned development in a safe and sustainable manner. This includes the installation of a comprehensive sanitary sewerage network and a dedicated sewage treatment plant to ensure

effective collection, treatment, and disposal of wastewater in accordance with environmental standards. In addition, a storm water drainage network will be developed to manage surface runoff, prevent flooding, and protect the project area and adjoining localities from waterlogging and erosion.

The scope of external development will also include soft and hard landscaping to enhance the visual character of the area, improve environmental quality, and create a pleasant urban setting. A boundary wall will be constructed to clearly demarcate the project limits and provide security, while an electric transmission line will be laid to ensure a reliable power supply and integration with the existing grid infrastructure. Together, these components will facilitate orderly development and long-term operational sustainability of the project.

3.10. UTILITIES

The project will be supported by a comprehensive utility infrastructure designed to ensure reliable and efficient service delivery. A complete water supply network will be developed to meet the domestic and communal water requirements of the residents, ensuring adequate availability and distribution across the project area.

Electrical supply will be provided through an underground external electrification system, enhancing safety, reliability, and visual aesthetics while minimizing disruption and maintenance issues. In addition, natural gas supply will be provided by Sui Northern Gas Pipelines Limited (SNGPL), ensuring a dependable and standardized gas distribution system for residential and associated uses within the scheme.

3.11. ROADS AND CIRCULATION

The road hierarchy of the scheme has been carefully planned to ensure efficient traffic movement and strong connectivity within and outside the project area. Major roads have been designed as dual carriageways with right-of-way (ROW) widths of 100, 80, and 70 feet, functioning as primary traffic collectors and linking seamlessly with secondary roads at convenient locations. The 100-foot-wide dual carriageway serves as the main arterial route, providing direct and efficient connectivity between the scheme and Islamabad Expressway. To maintain uninterrupted traffic flow and enhance safety, the planning and design have minimized the number of intersections, thereby reducing congestion points and potential conflict areas.

Internal circulation has been designed to prioritize accessibility, safety, and neighborhood security. Fifty-foot-wide internal access roads have been provided to

ensure direct access to individual plots and premises, with cul-de-sacs introduced at appropriate locations. These cul-de-sacs restrict through traffic, enhance residential privacy, and offer added security benefits. The circulation plan emphasizes functional grouping of activities while avoiding crossroad intersections to the greatest extent possible. T-junctions have been preferred and strategically staggered to ensure smoother traffic flow and reduce accident risks, particularly during vehicle turning movements. A turbine road pattern has been adopted where feasible to accommodate landform constraints and facilitate efficient movement between different land uses. All roads will be landscaped with ornamental trees and shrubs, contributing to environmental enhancement, improved microclimate, and an aesthetically pleasing streetscape.

TABLE 3-4 DESCRIPTION OF ROADS IN PROJECT AREA

S. NO	TYPE OF ROAD	R.O.W (FEET)
1	MAIN ACCESS ROADS	100' 80' 70'
2	INTERNAL ROADS	50'

3.12. POPULATION DENSITY

Population density is a key planning parameter that directly influences land-use allocation, infrastructure provision, service capacity, and overall livability of a residential development. For Gulberg Residencia, population density has been estimated based on an average household size of 6 persons per residential unit, in line with prevailing planning assumptions for housing schemes in Islamabad. Applying this factor to the approved residential plot inventory yields a total projected residential population of 164,976 persons.

3.13. EXTERNAL ELECTRIFICATION

The distribution system HT shall be 3 phase, 11 KV 50 Hz supply; whereas the secondary LT distribution system shall be 415 volt 3 phase 4 wire or 220 volts 1-phase 50 Hz supply including street light.

Electricity shall be installed by IESCO itself after approving electricity design on the payment by the society. The street lights and the house connection shall be done by the Society itself. The process of approval for the electricity connection is under process with IESCO. [See Annexure- C](#)

3.14. GAS DISTRIBUTION NETWORK

Sui gas installation will be done by Sui Northern Gas pipeline Ltd department on payment by M/s IBECHS. The gas network system shall be designed by the department itself on payment of demand note to the department for installation of gas supply network in the scheme area. The main Sui gas pipe line already passes to the eastern part of site. [See Annexure- D](#)

3.15. WATER SUPPLY

The project site is located in the area where ground water potential is available. Resistivity survey of the site has been conducted to establish water availability within the project site. According to the findings of the resistivity survey, water is available where resistivity survey has been conducted. The anticipated yield is about 4,000-5,000 gallons per day.

3.15.1. AVERAGE DAY WATER DEMAND

The population in Gulberg Residencia (Revised & Extended) would be 164,976 persons based on 7 persons per household. The average day water demand is worked out as under by using design criteria set forth for private housing schemes under ICT Zoning Regulations 1992 (amended).

TABLE 3-5: AVERAGE WATER DEMAND IN THE PROJECT AREA

Description	Water Demand (MGD)
Residential	10.43
Commercial	5.00
Sub Total	15.43

PVC pipe shall be used in the water supply network. These pipes are easy to lay, non corrosive and long life when compared with G.I. and MS pipe. Sluice valve, double air valve & washout shall be installed at appropriate location in the network system. The loop system shall be designed in shape of network resembling a gridiron connected at interval to avoid dead ends. Water will be supplied from more than one direction for its circulation throughout the system. To maintain pressure of water, the

supply shall be made from over head tanks to be built at adequately suitable location for better water head. Surface tanks shall also be built for water storage.

3.16. WATER REQUIREMENT FOR GULBERG RESIDENCIA

The design population shall be computed by multiplying the ultimate number of household with household size of 7 people per household. Water demand for various uses has been estimated on the basis of CDA Modalities and Procedures. Water demands are mainly a function of water and sanitation service level provided in the community. A high service level will be provided for the project. It is also assumed that the consumers will be served through house connections and to public stand posts will be provided.

The consumer shall be served through house connection. Water shall be required for the following purposes:

- ✕ Domestic
- ✕ Nonresidential areas/green areas
- ✕ Institutional/ commercial water demand: school, college, hospital, offices, mosques, hotel, fire brigade need etc.

TABLE 3-6: STORAGE & BULK DISTRIBUTION

SR.	DESCRIPTION	NUMBERS
1	BULK STORAGE RESERVOIRS	17
2	OVERHEAD TANKS	37
3	UNDERGROUND TANKS	38
	TOTAL	92

3.17. HYDROGEOLOGICAL CONTEXT

The project area falls within the Potohar Plateau aquifer system, which is characterized by fractured rock formations with limited storage capacity and variable transmissivity. Groundwater recharge primarily occurs through rainfall infiltration, which is highly seasonal and increasingly uncertain due to climate variability.

Islamabad receives an average annual rainfall of approximately 1,000–1,200 mm, of which only a fraction contributes to groundwater recharge. Due to extensive urbanization and surface sealing, effective recharge in developed areas is typically limited to 10–15% of total rainfall, equivalent to approximately 100–180 mm/year.

Given the absence of large-scale managed aquifer recharge systems and the increasing footprint of impervious surfaces, the aquifer in Zone V is particularly vulnerable to over-extraction and long-term depletion.

3.18. BASELINE GROUNDWATER CONDITIONS

Baseline conditions indicate that groundwater levels in and around Gulberg Residencia are already under stress. Field observations and secondary data suggest that groundwater depths typically range from 150 to 250 feet, with increasing reliance on deeper aquifers over time. In several nearby housing schemes, borehole depths exceeding 300 feet have been reported, reflecting a declining water table.

Water quality is generally within acceptable limits for domestic use; however, localized issues such as elevated total dissolved solids (TDS) and potential contamination from inadequate sanitation systems have been observed. These conditions highlight the need for both quantity and quality management of groundwater resources.

3.19. PROJECTED WATER DEMAND AND ABSTRACTION ESTIMATES

The projected water demand for Gulberg Residencia Phase-III has been estimated based on standard planning assumptions:

- ✎ Average household size: 5–6 persons
- ✎ Per capita water consumption: 120–150 liters per capita per day (lpcd)

Based on these parameters, total water demand at full occupancy is expected to reach 2–5 million liters per day (MLD), depending on the final population size and occupancy rates. In the absence of a reliable surface water supply, a significant portion of this demand is likely to be met through groundwater abstraction via tube wells.

However, it is important to note that these abstraction estimates, as previously presented, are not supported by a corresponding aquifer recharge or sustainability analysis, which is a critical requirement for assessing long-term feasibility. This chapter addresses this gap by integrating abstraction estimates with recharge potential and sustainable yield analysis.

3.20. AQUIFER RECHARGE AND WATER BALANCE ANALYSIS

A water balance approach has been applied to assess groundwater sustainability, comparing estimated recharge with cumulative abstraction demand.

Recharge Estimation

- ✎ Annual rainfall: ~1,100 mm (average)
- ✎ Effective recharge rate: 10–15%
- ✎ Estimated recharge: 110–165 mm/year equivalent

For a given developed area, this translates into a finite recharge volume that must be shared among all groundwater users, including Gulberg Residencia and surrounding housing schemes.

3.20.1. ABSTRACTION VS RECHARGE

When cumulative groundwater abstraction from multiple developments exceeds this recharge threshold, the aquifer enters a negative water balance, resulting in:

- ✎ Progressive decline in groundwater levels
- ✎ Reduced well yields and increased pumping depths
- ✎ Long-term depletion of aquifer storage

Preliminary analysis indicates that, under current and projected development scenarios in Zone V, total abstraction is likely to exceed recharge, particularly during peak demand periods and dry seasons.

3.21. CUMULATIVE GROUNDWATER ABSTRACTION IMPACTS

The cumulative impact assessment considers:

- ✎ Existing housing schemes in Zone V
- ✎ Approved but undeveloped projects
- ✎ Incremental demand from Gulberg Residencia Phase-III

Given the absence of a coordinated groundwater management framework, individual schemes typically operate independent boreholes, leading to unregulated cumulative withdrawals. This has already resulted in observable declines in groundwater levels across the region.

Quantitatively, if multiple developments each extract 2–5 MLD, the combined abstraction can quickly surpass sustainable recharge limits. Over time, this results in:

- ✗ Increased energy costs due to deeper pumping
- ✗ Failure of shallow wells
- ✗ Reduced water availability during dry periods
- ✗ Potential land subsidence in extreme cases

3.22. GROUNDWATER SUSTAINABILITY ASSESSMENT

The sustainability assessment indicates that groundwater abstraction for Gulberg Residencia, in isolation, may appear manageable, but when considered cumulatively with surrounding developments, it contributes to a system that is already under moderate to high stress.

The key finding is that groundwater abstraction estimates must be directly linked to aquifer recharge and sustainable yield, and reliance on groundwater as the primary water source is not viable in the long term without significant mitigation measures.

3.23. MITIGATION AND SUSTAINABLE WATER MANAGEMENT MEASURES

a) Demand Reduction

Demand reduction will form the first line of intervention to minimize pressure on groundwater resources within Gulberg Residencia. The project will incorporate water-efficient fixtures, including low-flow taps, dual-flush systems, and efficient showerheads, with the objective of reducing per capita consumption from typical urban levels of 120–150 lpcd to approximately 90–110 lpcd where feasible. In addition, a proactive leak detection and maintenance system will be established within the water distribution network to minimize non-revenue water losses, which in similar developments can range between 15–25% if left unmanaged. Public awareness initiatives will also be undertaken to promote water conservation practices among residents, ensuring long-term behavioral change and reduced demand.

b) Rainwater Harvesting

Rainwater harvesting will be implemented as a key supplementary water source to offset groundwater abstraction. Given Islamabad's average annual rainfall of 1,000–1,200 mm, significant volumes of runoff can be captured, particularly during the monsoon season. The project will mandate the installation of rooftop rainwater harvesting systems at the household level, coupled with community-scale storage and recharge systems. Collected rainwater will be utilized for non-potable purposes such as gardening and cleaning, thereby reducing dependence on groundwater. At

the community level, storage tanks and recharge pits will be designed to capture stormwater runoff, enhancing localized recharge and contributing to aquifer sustainability.

c) Wastewater Recycling

Wastewater recycling will be a central component of the project's water management strategy. Sewage Treatment Plants (STPs) will be installed to treat wastewater generated within the development to levels compliant with National Environmental Quality Standards (NEQS). It is estimated that 80–90% of supplied water will be converted into wastewater, providing a substantial opportunity for reuse. Treated effluent will be reused for landscaping, greenbelt irrigation, and other non-potable applications, potentially offsetting 30–40% of total freshwater demand. This approach not only reduces groundwater abstraction but also minimizes environmental impacts associated with wastewater discharge.

d) Groundwater Recharge Enhancement

To counterbalance groundwater extraction, the project will implement a range of recharge enhancement measures. These will include the construction of recharge wells, infiltration trenches, and percolation basins, strategically located within open spaces and green areas. The use of permeable paving materials in parking areas and walkways will further facilitate infiltration of rainwater into the subsurface. In addition, natural drainage channels within and around the project site will be preserved and integrated into the design to maintain natural hydrological processes. Collectively, these measures aim to increase effective recharge rates beyond the typical 10–15% of rainfall, thereby improving the overall water balance.

e) Alternative Water Supply

Recognizing the limitations of groundwater as a primary water source, the project will explore alternative supply options to ensure long-term water security. This may include arrangements for bulk water supply from surface water sources, subject to regulatory approvals and infrastructure availability. Over time, the reliance on groundwater will be progressively reduced through a combination of recycled water use, rainwater harvesting, and supplementary supply systems. This diversified approach will enhance resilience to climate variability and reduce the risk of aquifer depletion.

3.24. MONITORING AND INSTITUTIONAL FRAMEWORK

A structured monitoring and institutional framework will be established to ensure effective implementation of groundwater sustainability measures. This will include the installation of dedicated monitoring wells to track groundwater levels on a monthly basis, enabling early detection of declining trends. In addition, abstraction volumes from each borehole will be systematically recorded, allowing comparison with estimated recharge and identification of potential over-extraction. Periodic water quality testing will also be conducted to monitor parameters such as TDS, microbial contamination, and chemical constituents.

The project proponent will be responsible for implementing the monitoring program, with oversight and coordination from the Capital Development Authority and other relevant regulatory agencies. The collected data will be analyzed to support an adaptive management approach, whereby corrective measures such as abstraction limits, additional recharge interventions, or demand reduction strategies can be introduced in a timely manner. This framework will ensure that groundwater use within Gulberg Residencia remains within sustainable limits and aligns with broader water resource management objectives for Zone V, Islamabad.

3.25. WATER SUPPLY NETWORK

For the water supply network, the society shall use PVC pipe. These pipes are easy to lay, non-corrosive and long life when compared with G.I. and MS pipe. Sluice valve, double air valve & washout shall be installed at appropriate location in the network system. The loop system shall be designed in shape of network resembling a gridiron connected at interval to avoid dead ends. Water will be supplied from more than one direction for its circulation throughout the system.

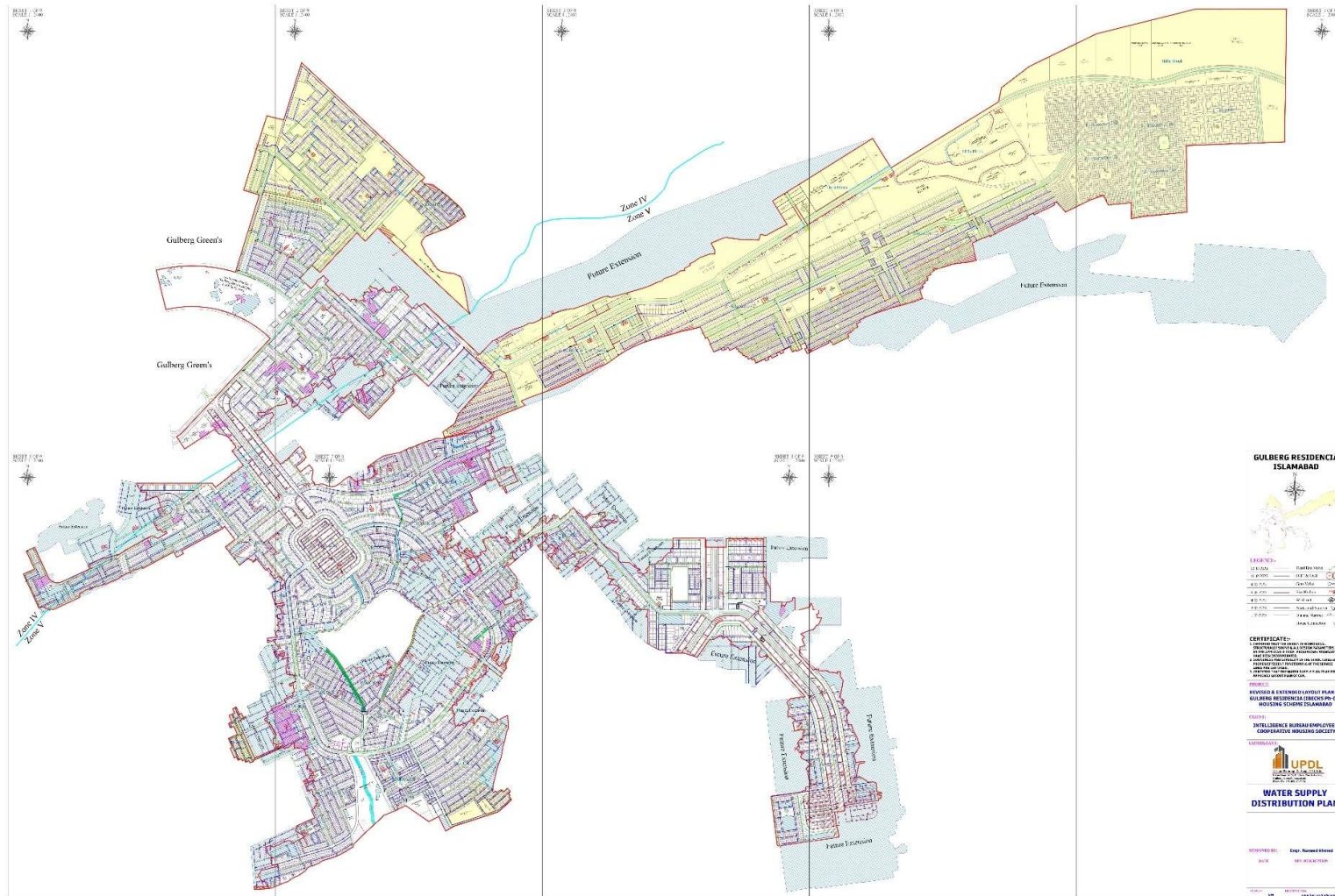


FIGURE 3-5: WATER SUPPLY DISTRIBUTION PLAN

3.26. WATER CONSERVATION STRATEGY

The project is currently in the detail design phase and possibilities of ensuring water conservation and rainwater harvesting through efficient design and water management system are being explored. here are a number of strategies that can be employed to reduce the amount of water consumed at a facility. In general terms, these methods include:

- ✎ System optimization (i.e., efficient water systems design, leak detection, and repair);
- ✎ Water conservation measures; and
- ✎ Water reuse/recycling systems.

More specifically, a wide range of technologies and measures can be employed within each of these strategies to save water and associated energy consumption. These include:

- ✎ Water-efficient plumbing fixtures (ultra-low-flow toilets and urinals, waterless urinals, low-flow and sensed sinks, low-flow showerheads, and water-efficient dishwashers and washing machines)
- ✎ Irrigation and landscaping measures (water-efficient irrigation systems, irrigation control systems, low-flow sprinkler heads, water-efficient scheduling practices, and Xeriscape)
- ✎ Water recycling or reuse measures (Gray water and process recycling systems), and

While not a design specification or technology option, obtaining the participation of building inhabitants in the water conservation program is a key to achieving water use reduction goals, and is often one of the simplest and most cost-effective strategies to employ. One of the first steps in implementing a water conservation program is to train employees on the use of new water-efficient technologies, as well as maintenance staff on O&M procedures; technologies that are not properly used or maintained will not achieve their maximum savings potential. For example, double flushing of ultra-low flush toilets may result in more water consumption than older, conventional devices. The following bullets summarize some of the activities that can be incorporated into a public information and education program:

- ✎ Establish hot line or other reporting mechanisms to report leaks and waste;
- ✎ Place signs on new equipment on how to use;

- ✎ Initiate a suggestion or incentive program;
- ✎ Distribute flyers and pamphlets to increase awareness of the facility's water management plan and educate inhabitants on wise water use practices; and
- ✎ Develop a display on water management highlighting the practices in use at the facility (i.e., Xeriscape, ULF toilets, water reuse, etc.) and its resultant savings and benefits and place in a highly visible area of the building.

The human factor is critical to obtaining the desired results from water conserving strategies, and development of an information and education campaign can help your facility in making the human factor work in favor of water conservation initiatives.

3.27. SEWAGE & SEWERAGE DISPOSAL.

To ensure environmentally sound management of wastewater generated from Gulberg Residencia, a dedicated sewage treatment system has been planned and designed in accordance with CDA requirements and prevailing environmental standards. The Sewage Treatment Plant (STP) is strategically located at the lowest elevation of the project area to facilitate gravity-based conveyance of sewage through trunk sewers, thereby minimizing pumping requirements and operational energy demand. The STP system has been designed to treat the entire sewage load generated from the residential, commercial, and community facilities of the scheme prior to disposal. The design is based on projected population growth, estimated wastewater generation (approximately 70–80% of domestic water supply), and anticipated future expansion of the residential area.

The treatment process comprises preliminary, primary, secondary, and tertiary treatment stages, employing a combination of anaerobic and aerobic biological processes to effectively reduce organic load, suspended solids, nutrients, and pathogens. Treated effluent will meet the applicable National Environmental Quality Standards (NEQS) prior to discharge and is proposed to be safely released into the nearby natural drainage channel (nallah), with provisions for reuse of treated wastewater for landscape irrigation where feasible. The STP has been designed as a modular and phased system, allowing capacity augmentation in line with population growth and occupancy rates, while ensuring protection of surface water bodies and groundwater resources in the project area. Detailed STP report is attached at [Annexure-E](#).

3.28. SEWERAGE NETWORK

The scheme shall have its own sanitary sewerage system. The sewerage from houses shall be collected in house connection chambers for flow at adequate gradient in RCC pipes for its final collection at centralized location. The sewerage so collected shall be treated in the STP for disposal of effluent into the Korang Nullah. The treatment of sewer shall be done in accordance with design criteria as per CDA zoning regulation. About 80% of total water supply quantum shall flow into the network system i.e. about 612,816 gallons plus 10% infiltration 61,282 gallons. The minimum pipe size shall be 9 inches in the system.

The detailed design for the water supply is underprocess and will be share with the authority once it is completed. The location of STP is mentioned in the approved layout plan.

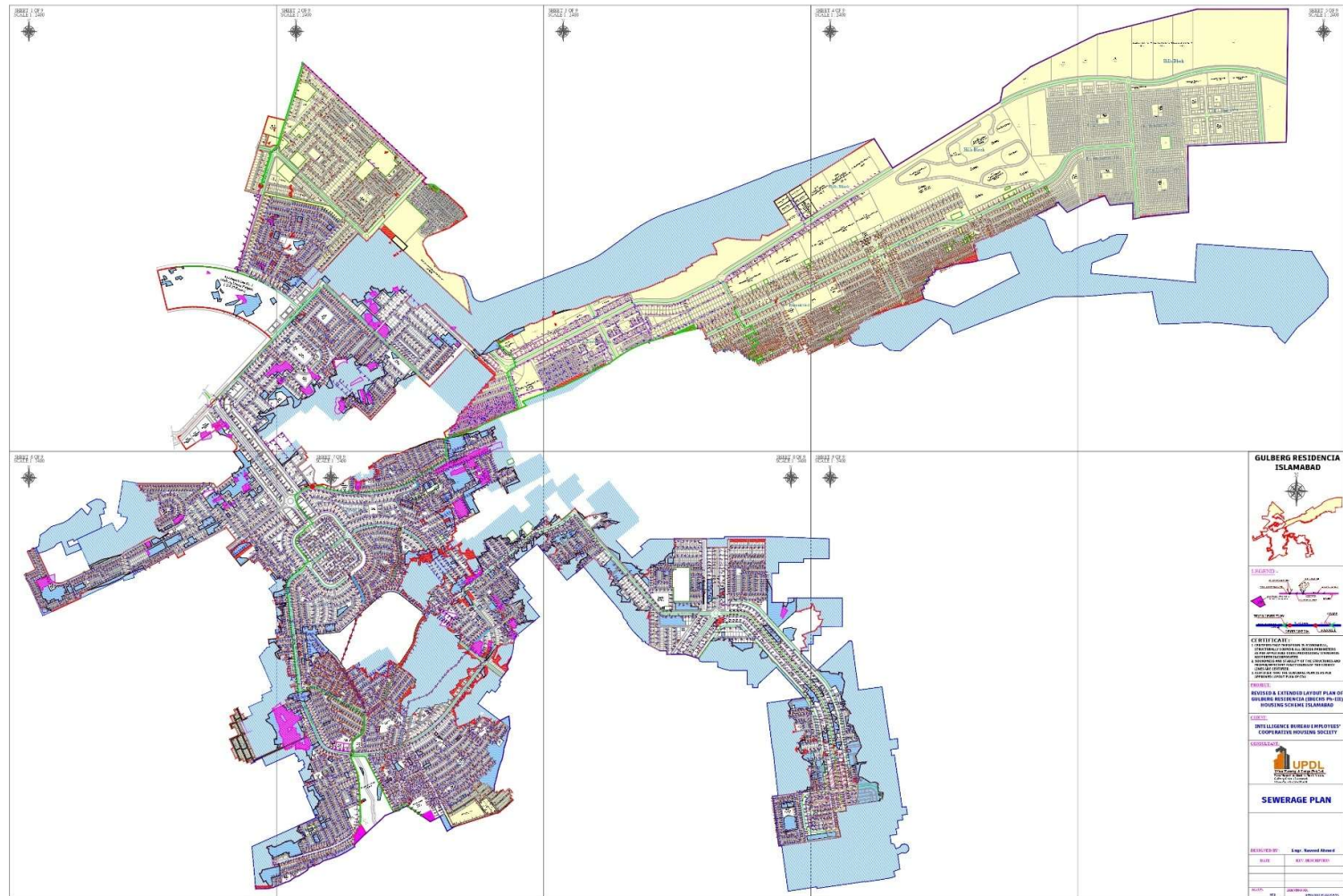


FIGURE 3-6: SEWERAGE SYSTEM OF GULBERG RESIDENCIA

3.29. STORM SEWERAGE SYSTEM

For the effective Surface drainage, the RCC storm water drains are provided at one side of road along the shoulder at the lower side of the road. Grit chambers converted to drain manholes are provided in storm water network. For purpose of calculations maximum rainfall intensity has been taken as 3 inches /hour Run off has been calculated and details are under:

3.29.1. FLOW DIRECTION

Based on the Contour plan, the flow direction shall be specified.

3.29.2. DRAINAGE SYSTEM

The existing watershed drainage pattern of the scheme has been generated by HEC, GEO Software after detail hydrological study. The road side drainage system will be planned and designed accordingly to design parameters mentioned in the CDA's Modalities and Procedures 1993.

3.29.3. DISPOSAL OF SURFACE RUNOFF

The RCC storm water drains are provided at one side of the road along the shoulder at lower side of the road for effective surface drainage. Grit chambers connected to drain manhole are provided in the storm water network. Drain outfalls near the Nullah at appropriate locations are provided for storm water disposal. Manholes and drop manholes are constructed at appropriate distances and location to catch road water through grit chamber.

A number of methods are in use to estimate the runoff. Rational & Hydrographic methods are more common. All the main cross drainage structures on the main ravines will be based on 25 – 100 years return period discharge data whereas, the entire normal roadside drains will be based on CDA's Design Criteria. Rational method is used for relatively small areas up to 3 km². SCS Curve No Technique will be used for larger drainage areas.

Capital Development Authority (CDA) recommends using 3 in/hour as maximum rainfall intensity for calculation of discharge. However, to ensure safety and sustainability of system, Gulberg Residencia uses value of rainfall intensity as 4 in/hour. Intensity Duration Curves will be used where required.



3.30. LANDSCAPING

A landscape Architect has been engaged by the Society to accord proper landscaping treatment to all the components like parks, play fields, Roads, Streets, Avenue, Medians of dual carriage way, Shopping center, Mosque etc. The landscaping plan is in process and as soon it is completed will be shared with Pak-EPA.

TABLE 3-7: SUMMARY OF PLANTATION

Sr No.	Plant Name	Quantity	Remarks
1	Alu Bukhara	10807	Fruit Tree
2	Arru	6952	Fruit Tree
3	Apple	5009	Fruit Tree
4	Arjun	5678	Shady Tree
5	Black Pepper	1464	
6	Channar	386	Shady Tree
7	Guvava	2588	Fruit Tree
8	Jacuranda	3344	Shady Tree
9	Japani Phal	5496	Fruit Tree
10	Kachnaar	476	Fruit Tree
11	Khobani	9104	Fruit Tree
12	Meletonia	4504	Shady Tree
13	Pilkan	6629	Shady Tree
14	Malta	3189	Fruit Tree
15	Nashpati	5375	Fruit Tree
16	Silver Oaks	4520	Shady Tree
17	Sukhchain	4070	Shady Tree
Total		79,573	

3.31. ESTIMATED COST OF THE PROJECT

The project is estimated to cost Rs. 2000 million that include the cost of land and development.

3.32. TIME SCHEDULE

The development work of project will start after necessary approvals from CDA and environmental clearance from Pak EPA. The estimated time of development is three years.

3.33. CONSTRUCTION ASPECTS

Various construction phase activities are briefed in the following sections.

3.33.1. SITE PREPARATION

Site preparation for the housing scheme will be carried out in a planned and systematic manner to create a stable and suitable base for subsequent development works. This will involve clearing of surface vegetation within the development footprint, removal of roots, organic matter, and unsuitable material from areas designated for roads, buildings, and utility corridors. Any isolated rocks, debris, or obstructions encountered on site will be removed, and resulting voids will be filled and compacted with suitable material to achieve the required ground stability. Earthworks will be undertaken to level the site in accordance with the approved layout plan, ensuring proper grading and formation levels. Adequate drainage arrangements will be provided during site preparation to safely manage storm water runoff, prevent waterlogging and erosion, and protect adjacent areas. Where feasible, stripped topsoil will be stockpiled for later reuse in landscaping and green areas, thereby minimizing environmental disturbance and supporting sustainable site development.

3.33.2. CONTRACTOR'S ARRANGEMENTS

As the Project is being considered as a state of art, so it is expected that Contractor will be selected through international contract bidding (ICB) and having the experience of construction of such type of quality and sophisticated projects.

3.33.3. LIST OF EQUIPMENTS

Following equipment will be used during the project construction period.

TABLE 3-8: LIST OF EQUIPMENT

Equipment	No.	Type
Plain Roller	2	Mobile
Grader	2	Mobile
Excavator/Jackhammer	3	Mobile
Dumper	6	Mobile
Water Bowzer	2	Mobile
Tractor with Blade	2	Mobile
Tractor with Trolley	2	Mobile
Generator 30 KV	3	Stationary
Block Factory	1	Stationary
Pipe Factory	1	Stationary
Concrete Plant	1	Stationary
Loader	1	Mobile
Transit Mixer	2	Stationary
Mixer Machine	4	Stationary
Bolan/Pickup/ Car	6	Mobile
Air Compressor	2	Stationary
Diesel Tank with Unit	1	Stationary
Welding Plant	1	Stationary
Motorcycle	1	Mobile

Note: The contractor shall be bound under the contract to employ the above equipment in order to ensure that the target completion date is met. The type and numbers of equipment or machinery could change or increase/decrease, subject to need.

3.33.4. CONSTRUCTION CAMPS

Camp sites will be located keeping in view the availability of an adequate area for establishing camps, including parking areas for machinery, stores and workshops, access to communication and local markets, and an appropriate distance from the sensitive areas in the vicinity. Final locations will be selected by the contractor with the approval of site Engineer's in-charge. While deciding the site for location of camp, all the measures will be kept in mind.

3.33.5. WORK FORCE

The Project involves many construction activities like excavation, construction of roads, general amenities, waste treatment plants, storm water drainage system, and other miscellaneous infrastructure. It is expected that project will involve a large number of professional, technical, skilled, semi-skilled and unskilled manpower directly and indirectly.

The total number of crew, skilled and unskilled labor to be employed will depend on the Contractor's activity schedule at the time when the contract is awarded. The Contractor will be advised to hire the skilled and unskilled labor from the local communities.

3.33.6. CONSTRUCTION MATERIAL

Large quantities of construction materials will be required for the phased development of Gulberg Residencia, as construction activities will be spread over an extended period. To support uninterrupted progress, a steady and reliable supply of construction materials will be ensured through locally available and established sources. The sourcing strategy has been planned to minimize transportation distances, reduce environmental disturbance, and utilize existing supply chains wherever possible.

Earth material will be required primarily for road embankments, leveling, and other filling works. Suitable earth fill material is available in the vicinity of the project area. As officially designated borrow areas are limited, contractors are expected to obtain earth material through short-term leasing of nearby private land. Prior to borrowing, the topsoil layer will be carefully stripped and stockpiled. Upon completion of borrowing activities, the stockpiled topsoil will be reapplied to restore the land for agricultural or original use, thereby minimizing long-term environmental impacts.

Fine and coarse aggregates will be required for concrete works across the project. These materials will be sourced from existing and approved quarry sites, including well-established quarries located in Sargodha, Chiniot, and the Margalla Hills near Taxila. Contractors will procure aggregates through licensed sub-contractors who hold leases for these quarry areas. As these quarry sites are already operational and accessible via existing road networks, no new haul roads will be required, thereby avoiding additional land disturbance.

Cement will be used extensively for building construction and structural works. Adequate supplies are readily available from cement manufacturing plants located

in Rawalpindi and Attock, ensuring timely procurement without logistical constraints. Similarly, steel required for reinforcement and structural components will be sourced from major suppliers and manufacturing units located in Islamabad, where availability is sufficient to meet project demands.

3.34. SITE RESTORATION

The estate is planned as a permanent residential housing complex and will be operated and maintained in accordance with high standards of health, sanitation, and municipal management to ensure comfort and safety for residents and visitors. Routine maintenance, timely repairs, and periodic upgrading of infrastructure such as roads, utility networks, and permanent structures will be carried out under a structured and well-defined maintenance schedule. As the development is a housing estate, large-scale land restoration or rehabilitation is not envisaged; however, selective removal or replacement of certain structures, such as roads or overhead water tanks, may be required over time to facilitate upgrading. Any dismantling activities will be undertaken strictly in line with municipal procedures, with full compliance to applicable rules and regulations, ensuring protection of surrounding infrastructure, private property, and public safety.

Demolition and decommissioning activities will be conducted using best practices to minimize environmental impacts and safety risks. All necessary precautions will be taken to prevent pollution, control dust through water sprinkling and wind shields, and safeguard workers and nearby communities. Debris generated from dismantling will be promptly removed and disposed of in an environmentally responsible manner, with recyclable or reusable materials recovered wherever feasible. Care will be taken to avoid damage to existing utilities such as sewerage systems, power and gas lines, and roads. Upon completion of the construction phase, all temporary facilities, including construction camps and waste pits, will be decommissioned and removed. Areas disturbed by temporary works will be restored and revegetated to reinstate ground cover and maintain the environmental integrity of the project area.

4. DESCRIPTION OF BASELINE ENVIRONMENT

4.1. GENERAL

This chapter describes the baseline conditions, which covers the existing physical, ecological and socio-economic environment of the Project Area as well as the Study Area. Information on these aspects has been derived from the desk study of available data, field visits to the Project/Study Area and information obtained through the visits to the Government departments and other agencies.

4.2. PHYSICAL ENVIRONMENT

Topography, geology, soil, water resources and climate have been included in physical environment as detailed below:

4.2.1. TOPOGRAPHY

A comprehensive topographic survey of the project site has been carried out at 5-foot contour intervals to accurately assess the existing ground profile and elevation variations. The survey results indicate that the site elevation ranges from approximately 1,670 feet to 1,820 feet above mean sea level. Overall, the terrain reflects a gently varying natural landscape, with gradual slopes and no abrupt elevation changes across the project area.

4.2.2. GEOLOGY

Islamabad is situated along the southern foothills of the Margalla Hills. The regional geology consists primarily of sedimentary formations, with rock units ranging in age from Jurassic to Paleocene. These formations are composed mainly of sandstone, limestone, and shale.

Within the project area, minor rockfall occurrences are observed along escarpment slopes where underlying shale layers undergo gradual erosion. This process is more evident along the central ridge, where shallow-dipping sandstone beds overlie the weaker shale strata. The subsurface geology of the site predominantly

comprises sedimentary deposits, including limestone, sandstone, conglomerate, siltstone, and clay, with ages extending from the Miocene to the Recent period.

Bedrock of the Murree Formation (Miocene age) is partially exposed within the site, while the remaining portions are overlain by alluvial soils. These alluvial deposits generally consist of silty to lean clay. The soil thickness varies from approximately 1–2 meters near areas of rock exposure and can reach depths of up to 6 meters in proximity to natural drainage channels and streambeds.

The sandstone layers in the area are representative of typical fluvial depositional environments, including levees, crevasse channels, floodplain channels, and broad sheet flood deposits, indicating a complex geological history shaped by ancient river systems.

4.2.3. SOIL

The soil profile within the project area predominantly comprises lean clay to sandy lean clay, silty clay, poorly graded sand with silt, and silty sand. The uppermost layer consists mainly of cohesive soil extending to a maximum depth of approximately 7 meters. Beneath this stratum, the sub-surface transitions into granular soils, ranging from loose to very dense conditions, and continuing down to the maximum investigated depth of 35 meters.

A comprehensive geotechnical investigation was conducted at the site, involving the drilling of five exploratory boreholes, in-situ testing, and laboratory analysis of collected soil samples. The overall site topography is relatively flat and even. Subsurface conditions exhibit deposits of lean to silty clay interbedded with gravel down to depths of 70–75 feet below the existing ground surface, beyond which thick gravel beds were encountered.

According to the Soil Survey of Pakistan, the soils at the site belong to a mixture of the Chakwal Soil Series and miscellaneous land types. Chakwal Series soils are typically characterized as silty clay loams to silty clays, exhibiting moderately developed structural properties.

The land within the project boundary has largely been developed, while remaining undeveloped patches are irregular, stony, and sparsely vegetated. The lithological composition of the project area is presented in the following section for reference and detailed interpretation..

TABLE 4-1: LITHOLOGY OF RAWALPINDI-ISLAMABAD

Name	Type Locality	Lithology	Age
Rawalpindi Group	Not Designated	Sandstone, shale of fresh water origin	Miocene
Leh-Conglomerate	Leh Nullah, west Islamabad	Siltstone, Eocene rocks	Pleistocene
Soan Formation	Areas around River Soan	Conglomerate, siltstone	Villafranchian Late Astian

Source: Soil Survey of Pakistan

4.2.4. **SEISMICITY**

Study of literature seismicity shows that active or likely to be active faults is located close to the area. History has recently witnessed a major epicenter of event magnitude 7.6 occurs in the area. Thickness of alluvium over bedrock at Margalla Hills is shallow and structure may be placed possibly on rock. Structure designs are recommended to be built should be earthquake resistance.

4.3. **WATER RESOURCES**

4.3.1. **SURFACE WATER**

Within the project area, five small seasonal watercourses are present, none of which have formally designated names. These channels collectively convey an estimated seasonal runoff of approximately 2,500 cusecs, primarily during periods of heavy rainfall. To establish baseline water quality conditions, groundwater sampling and laboratory analysis were undertaken within the project area, while surface water samples were collected from two major nearby drainage features Malal Kas Nullah and Korang Nullah to assess existing surface water characteristics and their potential influence on the local hydrological environment.

Recognizing the importance of groundwater availability and aquifer characteristics for the long-term water supply and environmental sustainability of the proposed development, a geo-electric resistivity survey was also conducted. This geophysical investigation enabled characterization of subsurface conditions and identification of potential groundwater-bearing zones. The survey results indicate that the underlying bedrock comprises siltstone, sandstone, and conglomerate, occurring at varying depths. The principal subsurface lithological units identified include clay and shale, silty sandy clay, sand, gravel, and consolidated sedimentary formations. This stratified sedimentary profile, characterized by

alternating cohesive and granular layers, suggests favorable conditions for groundwater storage within deeper sand and gravel horizons, supporting the feasibility of groundwater abstraction subject to sustainable management practices.



FIGURE 4-1 VIEW OF NALLAH MALAL KAS



FIGURE 4-2 KORANG RIVER IN THE PROJECT AREA

4.3.2. **GROUNDWATER**

Groundwater constitutes a primary water resource within the project area, with numerous operational tube wells currently abstracting water to meet existing domestic and commercial demands. The local aquifer system is mainly recharged by the Soan River and its interconnected drainage network, which play a vital role in sustaining subsurface water availability. Hydrogeological investigations indicate that a minimum drilling depth of approximately 450 ± 10 feet is required to obtain a reliable groundwater supply, at which an anticipated yield of not less than 5,000 gallons per hour can be achieved, reflecting the favorable potential of the underlying aquifers.

Notwithstanding this availability, ongoing and rapid land development within the river basin has begun to exert increasing pressure on the natural hydrological regime. Key concerns include alteration and diversion of natural river flows, fragmentation of aquatic and riparian habitats, heightened soil erosion, and deterioration of water quality resulting from deforestation, discharge of untreated sewage, and improper solid waste disposal. If left unaddressed, these pressures could adversely impact groundwater quality and the long-term sustainability of the aquifer system. Accordingly, adoption of responsible groundwater abstraction practices, along with strengthened environmental safeguards and effective

wastewater and solid waste management measures, is essential to minimize ecological degradation and ensure sustainable water resource management.

4.4. CLIMATIC CONDITIONS

The climate of the region is characterized by four distinct seasons: the summer season from April to June; the monsoon season from July to mid-September; the post-monsoon season from mid-September to November; and the winter season from December to March. June is typically the hottest month, while January is the coldest.

Temperature:

Meteorological data from the Islamabad Airport climate station indicates that mean monthly temperatures in the project area range from approximately 14.1°C in January to 28.6°C in June. During the winter months, particularly in December and January, minimum temperatures occasionally fall below the freezing point. Historically, the highest maximum temperature recorded in Islamabad is 46.1°C (June), while the lowest temperature recorded is -4°C (December–January).

Humidity and Rainfall:

The area experiences two major rainfall periods: the monsoon season (July to September) and the winter precipitation period (December to April). The majority of monsoon rainfall occurs in July and August, with long-term average values of 267 mm and 309 mm respectively. The highest monthly rainfall ever recorded in the region is 743 mm in July, while the maximum annual precipitation reported for Islamabad is 1,735 mm. Relative humidity levels remain fairly high throughout the year, particularly during the monsoon months.

Wind Direction and Speed:

Wind behavior across Islamabad shows no single prevailing direction during morning hours, with flow patterns distributed relatively evenly throughout the year. Westerly and north-westerly winds dominate during winter and spring, whereas southerly and south-easterly winds prevail in summer and monsoon months. Estate planning incorporates these wind patterns to promote optimum natural ventilation and fresh air circulation. Wind speeds are generally low during winter, gradually intensifying in spring and reaching their peak during the summer months. The maximum wind speed recorded in June is 90 knots. Seasonal variations show that May, June, and July tend to be the windiest months, while autumn and early winter experience calmer wind conditions.

4.5. EXISTING BASELINE ENVIRONMENTAL CONDITION

The baseline environmental conditions of the project area have been established through primary environmental monitoring complemented by site reconnaissance and secondary data review. Baseline data provides a reference against which potential project-related impacts can be assessed and appropriate mitigation measures designed. Environmental monitoring was conducted by Green Crescent Environmental Consultants Pvt. Ltd. during 05–06 December 2025 at Gulberg Residencia, Zone-V, Islamabad, in accordance with applicable NEQS and APHA standard methods. Reports are attached at [Annexure- F](#)

4.5.1. AIR QUALITY

Baseline ambient air quality monitoring was conducted at Gulberg Residencia (near Admin Block) over a 24-hour period from 05–06 December 2025. The monitoring covered key criteria pollutants including PM₁₀, PM_{2.5}, NO, NO₂, NO_x, SO₂, CO, and O₃. The results indicate that concentrations of NO₂ (46.01 µg/m³), NO (31.57 µg/m³), NO_x (77.59 µg/m³), SO₂ (35.88 µg/m³), CO (2.12 mg/m³), and O₃ (24.99 µg/m³) were all within the National Environmental Quality Standards (NEQS) for ambient air.

Particulate matter levels show that PM₁₀ averaged 141.47 µg/m³, which remains within NEQS limits, whereas PM_{2.5} averaged 104.03 µg/m³, marginally exceeding the NEQS guideline of 35 µg/m³. Elevated PM_{2.5} levels are consistent with prevailing regional background conditions influenced by vehicular traffic, construction activity, unpaved surfaces, and seasonal meteorological factors common in Zone-V and the wider Islamabad–Rawalpindi region. Overall, ambient air quality reflects a moderately impacted peri-urban environment, with gaseous pollutants remaining within acceptable limits. Reports are attached at [Annexure- F](#)

4.5.2. WATER QUALITY

Groundwater samples collected from Gulberg Residencia, Zone-V were analyzed for physical, chemical, and microbiological parameters. The results indicate that groundwater quality is generally good and suitable for domestic use, subject to routine disinfection. Key parameters such as pH (7.28), TDS (348 mg/L), turbidity (<1 NTU), hardness (<80 mg/L), chlorides (20.13 mg/L), nitrates (<0.01 mg/L),

fluoride (<0.01 mg/L), and sulphates (<50 mg/L) were all found to be well within NEQS and WHO guideline values. Reports are attached at [Annexure- F](#)

Heavy metals including arsenic, lead, cadmium, chromium, mercury, nickel, and zinc were either not detected or present at concentrations significantly below permissible limits. Microbiological analysis confirmed absence of total coliforms and *E. coli*, indicating no bacteriological contamination at the time of sampling. Overall, the baseline groundwater quality reflects a relatively unpolluted aquifer, typical of Zone-V, with no evidence of industrial or sewage-related contamination.

4.5.3. **NOISE LEVEL**

Baseline noise level monitoring was carried out at the same location over a 24-hour cycle, covering both daytime and nighttime periods. The daytime average noise level was recorded at 53.70 dB(A), while the nighttime average was 41.29 dB(A). These levels are within the NEQS permissible limits for residential areas, which are 55 dB(A) during daytime and 45 dB(A) at night. Reports are attached at [Annexure- F](#)

The noise environment is therefore characteristic of a low-to-moderate residential setting, with no significant influence from industrial operations or high-intensity traffic corridors at present. The baseline noise climate suggests that the area is currently suitable for residential development, subject to standard construction-phase noise management measures.





FIGURE 4-3: RECORDING OF ENVIRONMENTAL BASELINE

4.6. ECOLOGICAL ENVIRONMENT

In this section, the baseline environmental conditions pertaining to biological environment have been described on the basis of primary and the secondary data. An initial reconnaissance of the project area was carried out followed by a detailed biological survey by ecological experts.

4.6.1. FLORA

Islamabad is located in the Potohar Plateau at the base of the Margalla Hills, an area that supports a rich variety of native vegetation due to its diverse terrain and semi-arid subtropical climate. The natural landscape is a mosaic of rocky hill slopes, alluvial plains and stream corridors, each providing distinct ecological niches for different plant communities. The Margalla Hills National Park represents the most prominent ecological zone, where subtropical broad-leaved evergreen forests are interspersed with scrub vegetation. Common native tree species include Chir Pine (*Pinus roxburghii*) on upper slopes, Wild Olive (*Olea ferruginea*), Phulai (*Acacia modesta*) and Kikar (*Vachellia nilotica*), which are well adapted to dry conditions and play an important role in soil stabilization and wildlife habitat support. Several fruit-bearing and hardy shrubs such as Ber (*Ziziphus spp.*) and Sanatha (*Dodonaea viscosa*) are also common and locally valued for fodder, wood and traditional uses.

Lower elevations and plains of Islamabad exhibit dense shrublands dominated by drought-tolerant species that thrive in limited moisture conditions. These include Capparis, Prosopis and Carissa species which help prevent erosion and provide grazing material for livestock in peri-urban areas. The region also contains

extensive grasslands that resemble savannah ecology. Native grasses such as *Cenchrus ciliaris*, *Cynodon dactylon* and *Saccharum spontaneum* form important ground cover, protecting soil against erosion and supporting local pastoral livelihoods.

Along watercourses such as Korang and Malal Kas, the vegetation shifts to hydrophytic species capable of thriving in moist, periodically flooded conditions. Reeds, cattails and water vines flourish in these riparian zones, helping filter pollutants, stabilize stream banks and create micro-habitats for amphibians and birdlife. These wetland-associated plants contribute significantly to ecosystem services such as water regulation and biodiversity support.

Islamabad's flora also has cultural and medicinal value, with local communities traditionally relying on native plants for remedies, household uses and nutrition. Species such as *Adhatoda*, *Aloe vera* and *Withania somnifera* are still recognized for their herbal properties. However, rapid urban expansion, deforestation, wildfires, and the spread of invasive species such as *Lantana* and *Paper Mulberry* have put increasing pressure on natural vegetation. Conservation initiatives under Margalla Hills National Park and the Islamabad Wildlife Management Board continue to play an essential role in preserving these native plant communities and maintaining the ecological integrity of the capital city..



FIGURE 4-4: ACCACIA NOLITICA



FIGURE 4-5: PARATHENIUM



FIGURE 4-6: CALOTROPIS PROCERA



FIGURE 4-7: CANNABIS SATIVA

4.6.2. **FAUNA**

Islamabad and the surrounding Margalla Hills support a rich diversity of wildlife due to their varied natural habitats, including dry subtropical forests, rocky slopes, grasslands, and seasonal streams. These ecosystems provide shelter for numerous mammals, birds, reptiles, and smaller fauna, making the region an important ecological corridor in the Potohar Plateau.

Mammals commonly found in the area include the Indian Pangolin (*Manis crassicaudata*), Golden Jackal (*Canis aureus*), Wild Boar (*Sus scrofa*), Porcupine (*Hystrix indica*), Fox (*Vulpes vulpes*), and different mongoose species. Rhesus Macaques (*Macaca mulatta*) are frequently seen around recreational sites, while the Common Leopard (*Panthera pardus*) is occasionally reported from deeper forested zones of the Margalla Hills.



FIGURE 4-8 DOMESTIC CAT



FIGURE 4-9: LOCAL DOG

Avifauna is one of the most prominent features of Islamabad's biodiversity. The area hosts a wide range of resident and migratory bird species such as Peafowl (*Pavo cristatus*), Bulbuls (*Pycnonotus leucotis*), kites, doves, and woodpeckers.

Seasonal migrants traveling along the Indus Flyway significantly increase bird diversity during winter, particularly around Rawal Lake, nurseries, and riparian green belts.



FIGURE 4-10: HAWK



FIGURE 4-11: MOUNTAIN CROW



FIGURE 4-12: BULBUL



FIGURE 4-13: MYNA



FIGURE 4-14: HOUSE SPARROW



FIGURE 4-15: WHITE CHEEKED BULBUL

Reptiles such as lizards, geckos, cobras and vipers, as well as amphibians thriving in monsoon-fed water bodies, contribute to ecosystem balance by supporting pest control and maintaining the natural food chain. Freshwater turtles, native fish, and water birds inhabit the Nullahs and wetlands, benefiting from reed-covered stream banks and marshy zones.

However, habitat fragmentation, urban expansion, pollution, and increasing recreational pressure are posing threats to native fauna. Conservation efforts led by the Islamabad Wildlife Management Board and protected status of the Margalla Hills National Park are vital for maintaining biodiversity and ensuring sustainable coexistence between wildlife and human communities in the capital...

4.7. SOCIO-ECONOMIC AND CULTURAL ENVIRONMENT

Islamabad, the capital city of Pakistan, is a modern planned metropolis designed to serve as the administrative and political center of the country. It represents a diverse blend of socio-economic activity, cultural heritage, and contemporary urban development

4.8. HISTORY AND BACKGROUND

Islamabad was developed during the 1960's as the new federal capital of the country in place of Karachi. The Site Selection Commission was formed in February 1959 and in June 1959 the Government accepted the recommendations of the commission. In September 1959, the Federal Capital commission was formed to produce a master plan. The master plan was prepared in October 1960 which demarcated the site for successive stages of development, in relation with the surrounding areas, and division into various sectors. On May 24, 1960 preliminary master programme and master plan designed by the consultant were presented to the Government. After a meeting of the federal cabinet on Shakar-parian Hills, formal approval of the plan was accorded. Capital Development Authority (CDA) came into being on June 14, 1960 under the CDA Ordinance 1960 and ground breaking finally took place in October, 1961.

4.8.1. POPULATION AND DEMOGRAPHICS

Islamabad has a rapidly growing and diverse population that includes government officials, business professionals, expatriates, diplomats, and internal migrants from all parts of Pakistan. As the seat of federal institutions, the city attracts a highly educated and skilled workforce. Literacy rates are significantly higher than national averages, and a large portion of the population is engaged in formal sector employment.

4.8.2. ECONOMY AND LIVELIHOODS

The city's economy is driven primarily by the public sector, with a large number of people employed in federal ministries, national organizations, development agencies, and foreign missions. Alongside government employment, private sector activities have expanded considerably, including banking, real estate development, information technology, education, hospitality, and retail businesses. Small-scale commercial enterprises and service-based professions contribute to local livelihoods, while nearby rural peripheries maintain segments of the workforce engaged in agriculture, livestock rearing, and small-scale trading.

Islamabad-Rawalpindi together form a major economic hub, where Islamabad provides the formal administrative structure and Rawalpindi complements it through trade, industrial production, defense services, and labor markets. Institutional Facilities

4.8.3. EDUCATION, HEALTH, AND SOCIAL SERVICES

Islamabad has a well-developed network of educational institutions, including top-tier universities, research centers, schools, and training academies. The city also hosts a range of advanced public and private healthcare facilities, placing it among the best serviced regions of Pakistan in terms of medical infrastructure.

Access to basic amenities clean drinking water, electricity, sanitation, transportation, and telecommunication is generally better relative to other parts of the country, although challenges persist in informal settlements and suburban areas.

4.8.4. CULTURAL AND SOCIAL CHARACTERISTICS

Culturally, Islamabad is a cosmopolitan city influenced by diverse ethnic groups residing here Punjabi, Pashtun, Kashmiri, Hazara, Sindhi, Baloch, and others. The city maintains a relatively peaceful social environment, characterized by law-abiding communities, strong administrative oversight, and a high priority on public safety due to its political significance.

Islamabad celebrates national cultural values through museums, art galleries, literary events, and theaters, while also reflecting contemporary and global lifestyles. Despite its modern character, traditional norms rooted in religion and local customs remain strong and influence community life, family structure, and social behavior.

4.8.5. HOUSING, URBAN DEVELOPMENT, AND LIFESTYLE

Urban development in Islamabad follows a sector-based planning model with organized residential, commercial, and green spaces. The city is known for its aesthetically designed avenues, parks, and recreational areas, such as Daman-e-Koh, Rawal Lake, Shakarparian, and the Margalla Trails, which contribute to a high quality of life.

However, rapid urbanization has also led to rising property prices, expansion of informal settlements, and increased social disparities between high-income residents and low-income communities, including migrant laborers and domestic workers.

4.8.6. HERITAGE AND TOURISM

Islamabad is a city with a lot of green and open spaces. Green belts and buffer zones are provided along the main arteries. The city is filled with parks, botanical and flower gardens. These factors make the city one of the greenest cities of the world.

5. PUBLIC CONSULTATION

5.1. GENERAL

Public consultation is a systematic process which provides an opportunity for citizens, planners, managers and elected representatives to share their experience, knowledge and concerns and perceptions about the proposed Project. The objectives of the public consultation are as follows:

- ✎ Share information with stakeholders on proposed improvement works and expected impact on the socio-economic environment of the Project Area.
- ✎ Understand stakeholders concerns regarding various aspects of the Project, including the existing condition of the Project Area, upgrade requirements, and the likely impact of construction related activities and operation of the Project.

In order to meet the above mentioned objectives, at different locations, consultations including scoping sessions and focus group discussions were held. During consultations with the local community, main contents of the project were shared with community; they expressed their apprehensions about the Project in detail.

5.2. CONSULTATION WITH STAKEHOLDERS

The consultations were also held with Pak-EPA, Administration, ICT, Forest Department, Tourism Department, and Health Department, Contracts, Project designers/Developers (UPDL), Project Proponent (IBECHS) etc.

5.2.1. CAPITAL DEVELOPMENT AUTHORITY (CDA) OFFICIALS

Multiple consultation meetings were conducted with relevant officials of the Capital Development Authority (CDA) to discuss the proposed project design, associated construction activities, and the potential environmental and social impacts within the project area. These meetings provided a platform to present project information, gather technical input, and identify concerns that require integration into the Environmental Impact Assessment (EIA) and subsequent management plans.

During the discussions, CDA emphasized the need to ensure that environmental safeguards remain central to the project's implementation. A key concern highlighted was the effective management of solid and liquid waste, both during

construction and operational phases. Current waste disposal practices in the area are placing significant pressure on local land and water resources; therefore, the Authority stressed the importance of developing a comprehensive Waste Management Plan that includes proper segregation, collection, treatment and safe disposal mechanisms to prevent soil and water contamination.

Another major point raised was the requirement for a well-structured Plantation and Landscape Plan. CDA recommended that the project incorporate native tree and shrub species to enhance green cover, prevent soil erosion, and support local biodiversity. It was indicated that landscaping should not only align with Islamabad's environmental standards but also contribute positively to the aesthetic value and ecological resilience of the surrounding area.

These insights from stakeholder consultations are being fully integrated into the project planning process, and appropriate mitigation and enhancement measures will be reflected in the Environmental Management Plan (EMP) to ensure environmentally responsible and socially inclusive project implementation.

5.3. CONSULTATION WITH COMMUNITY

Consultations were also held with community representatives from nearby villages to understand their perceptions, expectations, and concerns regarding the proposed development. These discussions helped assess the project's potential social impacts and identify the priorities of the local population to ensure that project planning remains responsive and inclusive. The key points emerging from these interactions are summarized below.

The community expressed apprehensions about high noise levels during the construction phase. They anticipate that continuous use of heavy machinery, equipment, and increased vehicle traffic may cause discomfort, particularly for elderly residents, schoolchildren, and those working or resting near the project site. Similarly, residents were concerned that their general mobility would be constrained due to partial road closures, construction activities on access routes, and movement of heavy vehicles, leading to inconvenience in daily commuting and reduced accessibility to local services.

Another area of concern was related to security issues, including the potential for theft or criminal incidents involving temporary labor brought in for construction. The

community emphasized the need for strict security protocols and close monitoring of workforce movement to avoid social tensions and safeguard local properties.

The community also highlighted health risks associated with construction dust, especially during dry seasons. They stressed that dust suppression measures such as water sprinkling and proper covering of loose materials should be included in the construction plan to protect residents from respiratory and other health problems.

Environmental concerns were also a major focus of the discussions. Residents emphasized that solid waste must be responsibly managed to prevent littering, groundwater contamination, and visual pollution. They also recommended that the design of drainage channels should take into account climate change-induced extreme rainfall events to minimize flooding risks. The use of rainwater harvesting systems was strongly promoted to enhance groundwater recharge and reduce the burden on municipal water sources. Furthermore, the community advised that tree plantation along drain embankments should be undertaken to stabilize soil, reduce erosion, and improve local aesthetics and environmental quality.

Overall, local residents showed support for the project development but underlined the importance of adopting protective environmental and social measures during the construction and operational phases. These concerns have been incorporated into the Environmental Management Plan (EMP) to ensure that community wellbeing is safeguarded and project benefits are equitably shared.

5.3.1. MAJOR FINDINGS OF PUBLIC CONSULTATIONS

During stakeholder interactions, local residents shared a balanced set of concerns and expectations regarding the ongoing development activities. A primary issue repeatedly highlighted by the community was dust pollution arising from excavation, earth movement, and vehicle traffic. Residents mentioned that they had already communicated this concern to CDA authorities and urged the project team to implement effective dust-control measures to safeguard public health.

On the positive side, the community acknowledged that no significant loss of natural vegetation had occurred since the area was largely barren. This was perceived as a favorable environmental outcome, reducing concerns related to deforestation or habitat disturbance. Residents also expressed optimism regarding the employment opportunities generated during the construction phase. Large numbers of local people were hired for skilled, semi-skilled, and unskilled labor

roles, and the community is hopeful that additional jobs will be available during future expansion and operational phases, including more stable long-term employment.

Some respondents also raised complaints regarding noise and vibration caused by heavy machinery and construction activities, which they felt caused inconvenience and disturbed routine life. Despite such issues, the community observed notable economic benefits, including an increase in property values in the surrounding settlements due to improved infrastructure and urban development. Local businesses have similarly benefited, as contractors purchase daily supplies and food items from nearby shops and vendors. Additionally, project personnel renting residences in adjacent areas has created supplemental household income for local property owners.

Social services planned within the project, such as parks, mosques, commercial facilities, hospitals, and especially a government school, were highly appreciated. The lack of a nearby government school has been a longstanding issue, and residents expressed satisfaction that their children will gain access to affordable and quality education within close proximity.

However, community members also stressed that local mobility may be disrupted during peak construction activities due to partial road closures and increased movement of construction vehicles. Additionally, they emphasized the need for an efficient solid waste management system to prevent littering, environmental contamination, and public health problems during both construction and operation stages.

Overall, the community response reflects a mix of practical concerns and strong support for the project's socioeconomic benefits. Their feedback has been incorporated into the Environmental Management Plan (EMP) to ensure that local wellbeing, safety, and environmental quality remain key priorities throughout the project lifecycle.

6. SCREENING OF POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

6.1. GENERAL

This chapter identifies the potential impacts due to the implementation of the proposed project on the physical, ecological and socio-cultural environment of the Project Area. The chapter also identifies measures that will help to mitigate the Project's adverse environmental effects and enhance the positive impacts.

6.2. APPROACH ADOPTED FOR IMPACT IDENTIFICATION

Gulberg Residencia (Revised & Extended Phase-III) is currently under the planning phase, and detailed designs for the proposed amenities will be finalized during subsequent stages of the project. To systematically assess likely effects on the environment, expert-developed checklists were prepared covering the physical, ecological, and socio-cultural components of the project area. These tools were tailored to the nature of the proposed development and existing site conditions, enabling early identification of potential impacts and supporting informed decision-making..

6.3. IMPACTS DURING PROJECT DESIGN & PRE CONSTRUCTION PHASE

6.3.1. PHYSICAL ENVIRONMENT

Following is the description of the impacts envisaged during the design & pre-construction phase of the project:

6.3.1.1. TOPOGRAPHY

- ✎ Topography of the area will change, due to the construction of the Project related infrastructure, such as roads, sewerage network and infrastructure. Generally, slopes in the area are mild.
- ✎ The sites selected for the development of the Gulberg Residencia (Revised & Extended Phase-III) are mostly flat pieces of land available in the area. However, slight trimming of the land may be required during development and cut and fill procedure will

be followed. Therefore, there will not be any significant adverse impact on the topography of the area.

Mitigation Measures

- ✎ To minimize adverse impacts on the natural terrain, the development should be designed to follow existing land contours wherever feasible. This can be achieved by adopting suitable layout planning, selecting appropriate road alignments, and limiting excessive excavation or filling. Where land modification becomes unavoidable, the extent of leveling and cutting should be reduced, and engineered slopes should be stabilized using retaining structures, turfing, and vegetation cover to prevent erosion and visual scarring of the landscape.
- ✎ Furthermore, maintaining the **natural drainage pattern** of the area is essential to avoid disruptions to surface runoff and groundwater recharge. The design of stormwater channels, culverts, and embankments should ensure that natural water flow paths are preserved or appropriately diverted without causing stagnation, flooding, or erosion. Silt traps and sedimentation ponds may be installed during construction to prevent soil from washing into streams or depressions. Regular monitoring during construction will help ensure that drainage systems remain functional and free from blockage.
- ✎ By applying these measures throughout the planning and implementation stages, the project will help safeguard landform integrity, reduce environmental risks, and maintain the aesthetic quality of the area's landscape.

6.3.2. ECOLOGICAL ENVIRONMENT

Project Area particularly along roads contains good vegetative cover. Provision of new facilities may require clearing of vegetative cover that are present in spaces and this will cause an adverse environmental impact on the existing vegetation.

Mitigation Measures

To offset the loss of vegetation during site development, a comprehensive and well-planned tree plantation and landscaping program will be implemented alongside construction activities. Native and drought-resistant species should be prioritized to ensure better survival rates and support local biodiversity. Plantation will be carried out within designated green spaces such as proposed parks, along both existing and planned road corridors, and on the embankments of drainage

channels (nullahs), where vegetation will also help stabilize soil and reduce erosion.

Prior to site clearing, vegetation surveys will be conducted to identify and retain mature or ecologically valuable trees wherever possible. Any unavoidable removal of trees will be compensated through a defined replacement ratio, ensuring that the total green cover is enhanced rather than reduced. Plantation schedules should align with suitable climatic conditions—preferably during the monsoon season to maximize healthy establishment. Post-plantation care, including watering, mulching, and protection from grazing, must be ensured through a structured maintenance plan.

Through these measures, the project will not only mitigate vegetation loss but also enhance aesthetic quality, micro-climate regulation, and environmental sustainability within the development area.

6.3.3. SOCIO-CULTURAL ENVIRONMENT

- ✎ One of the major impacts related with the location of the proposed Project facilities and to be dealt at Design Stage level i.e. prior to construction activities is the acquisition of land. It is estimated that about 3,940.32 Kanals of land is acquired.
- ✎ Due to the proposed Project activities, no infrastructure may get disrupted.
- ✎ Due to the proposed Project activities, no religious properties may get disrupted.

Mitigation Meseasures

Utmost efforts should be made to minimize the acquisition of land. However, for acquisition of land, compensation would be made as per market value. For this purpose, a land acquisition committee should be organized in consultation with the potential PAPs.

6.4. IMPACTS DURING CONSTRUCTION PHASE

6.4.1. CONTRACTING ARRANGEMENTS

The success of a construction project depends to a very large degree on selection of an experienced construction contractor who possesses the necessary expertise, has machinery and equipment, and has access to sufficient financial resources, in addition to a reliable, experienced workforce.

Mitigation Measures

- ✎ The contractor was selected by the proponent through a rigorous screening process, in accordance with relevant government procurement procedures.
- ✎ The selection criteria ensured the contractor has a strong track record, relevant technical experience, and the capacity to deliver the project within the required timeframe while adhering to environmental safeguards.
- ✎ Any additional contractors required for future phases of construction will be hired using the same transparent and compliant procedure.
- ✎ At peak construction activity, an estimated workforce of around **1500 personnel** will be engaged at the project site.
- ✎ The project will engage a diversified workforce comprising project management and supervisory personnel, including a Project Manager, engineers, quantity surveyor, and surveyors responsible for overall planning, execution, and quality control. Technical staff will support construction activities through roles such as AutoCAD operators, laboratory technicians, and machinery operators to ensure technical accuracy and operational efficiency. In addition, administrative and support staff, including accountants, storekeepers, drivers, security guards, and cooks, will facilitate day-to-day site operations and logistical requirements. The core construction workforce will consist of skilled and semi-skilled labor such as masons, carpenters, steel fixers, general laborers, and helpers, who will undertake on-site construction activities throughout the project lifecycle. The contractor has been instructed to hire maximum local labour to enhance livelihood opportunities for surrounding communities, while also providing them with on-the-job training and technical skills development.
- ✎ As the majority of workers are from nearby areas, no construction camp has been established at the project site to date, minimizing associated land-use and environmental impacts.

6.4.2. CONSTRUCTION MATERIALS

Procurement of construction materials and knowing beforehand about the sources and quantities required is another major factor vital for the success of a construction project.

Mitigation Measures

- ✎ Construction materials (cement, sand, aggregates/crush, bricks, steel bars, paints, asphalt, tar, glass, etc.) will be transported to the site only on a need-basis to reduce stockpiling, wastage, and dust.

- ✗ Preference will be given to environment-friendly and fire-resistant materials, in alignment with green building standards, where such products are available and cost-effective.
- ✗ Quarry materials that meet the required quality and technical specifications will be sourced from the nearest licensed quarry to minimize transportation costs and reduce vehicle emissions.
- ✗ Cement and other bulk materials will be procured directly from certified manufacturers or authorised agents to ensure authenticity and compliance with standards.
- ✗ All construction materials will be tested before use and will require prior approval from the Project Manager to maintain quality assurance.
- ✗ Noise-absorbent materials will be considered for use in relevant locations, subject to market availability and cost-effectiveness.
- ✗ Sourcing materials from the nearest vendors will help lower environmental footprint, reduce travel distances, and minimize disturbance to local communities.

6.4.3. OTHER SUPPLIES

Projects do not require construction materials alone and acquisition of other supplies well in time is as important as procuring sand and cement.

Mitigation Measures

- ✗ The primary resources required during construction include water, fuel, electricity, and standard construction consumables.
- ✗ Water demand will vary with the pace of construction activities; peak usage is estimated at approximately 5,000 gallons per hour.
- ✗ Recent hydrogeological studies show that Islamabad's groundwater resources are under increasing stress. According to a 2023 assessment by PCRWR, while aquifer recharge potential remains present, rising demand and drawdown have caused notable lowering of the water table over recent decades. Moreover, a 2025 water-quality study highlighted spatial variability in drinking-water quality and localized contamination risks, suggesting that groundwater availability and safety cannot be taken for granted across the board.
- ✗ Diesel and petroleum fuels for machinery and vehicles will be sourced from nearby fuel stations, with peak consumption expected at around 5000 liters per day.
- ✗ A temporary grid electricity connection has been secured from the local utility company and will be supplemented by diesel generators to ensure uninterrupted power supply.

- ✎ Construction management will ensure timely procurement and consistent availability of all required supplies to prevent work delays and avoid inconvenience to the workforce.

6.4.4. VEHICLES AND EQUIPMENT

Vehicles and equipment deployed at a project must be in good condition and not become detrimental to the local environment in terms of noise and emissions. These must also be of good quality to ensure there are no breakdowns that can disrupt the process of project implementation.

Mitigation Measures

The contractor has been directed by the proponents to take all possible measures to see that works do not impinge on the environment. Construction vehicles and equipment at the project site. The exact number of vehicles and equipment in use at the site at any given time will vary according to work schedules and work momentum, and shall be bound by traffic regimes within the city. The contractor shall be advised to use new vehicles, machinery and equipment to maintain emissions and noise at lowest possible levels. During early phase of construction, two or three truckloads of different types of construction material shall be delivered to project site per day, increasing to about five to eight at peak of construction activity. Arrival timing of such equipment and construction materials will not be concurrent and shall take place when there is minimal disturbance for local population. In any case, Islamabad Capital Territory's commercial traffic regime forbids entry of trucks during daylight hours on working days without a permit, more recently due to security concerns.

6.4.5. EMISSIONS AND DISCHARGES

Construction equipment and vehicles can discharge exhaust emissions containing CO₂, CO, NO_x, SO₂, and particulate matter and generate dust emissions from earthwork. The primary source of emissions to air during construction activities will be diesel engine-driven generator exhaust. Other emission sources include construction machinery and project vehicles. Dust from construction activities and movement of vehicles could be another main source of air emissions.

Mitigation Measures

Since vehicles and equipment in use shall be in good working condition and under due maintenance, as per instructions to construction contractor from the

proponents, emissions shall be within acceptable limits, as is evident from environmental testing carried out at the project site at a time when work was in progress. The proponents shall monitor pollution levels regularly and instruct contractors to cover the perimeter with cordons to minimise dust pollution and sprinkle the grounds frequently to prevent dispersal of dust. Results of laboratory tests for ambient area whilst excavation was in progress indicate that the local area has not been impaired in terms of air quality due to dust dispersal.

6.4.6. NOISE

Unwanted noise can likewise be generated by machinery and equipment deployed during construction, causing annoyance and discomfort for users and neighbours.

Mitigation Measures

Noise levels were tested on 05–06 December 2025 while some works were being carried out and machinery was under deployment. Noise readings indicate that no excessive noise is being created from machinery, primarily because the equipment was new and under good maintenance. The construction crew assured that all machinery to be used during construction would be of high quality and thus prevent creation of excessive noise. Vehicles especially will be of recent vintage and fitted with silencers that reduces noise during operation.

6.4.7. WASTE STREAMS

Waste generated at site can be liquid as well as solid waste. Liquid waste consists of oils and oily water from maintenance of equipment and vehicles, accidental leakage or spillage from vehicles, equipment or storage, wastewater from construction activities and domestic sewerage from the project office and construction camp.

Mitigation Measures

No vehicles and equipment shall be repaired at the project site, thus eliminating spillage of oils or oily water that can damage sub-soil. The contractor has issued instructions to foremen and workers that any leaks from machines and equipment during use must be scooped up immediately and placed in dedicated bins. Alternatively, grey water will be sprinkled on unpaved sections within the construction site. Sieved substances, which will be dumped at municipal waste disposal sites, will not be of character injurious for the environment. Solid waste will

consist of excavated earth, excess or used or rejected construction materials, scrap, warehouse waste, workshop waste and domestic solid waste from the project office and construction camp.

It will be ensured that liquid and solid waste is minimised and that all form of waste is carried away from the project site and disposed in a manner whereby it does not impinge on local environment. All solid waste will be collected at the site at designated spots from where it shall be removed to municipal skips on a regular basis by the waste management contractor. Excavated earth will be used for landscaping or sold for reuse. No excavated earth shall be dumped either on adjoining properties. Complaints from neighbours, if any, regarding inappropriate disposal of solid waste shall be attended to on top priority. Recycling or reuse of waste material shall be the preferred option but when not practical, solid waste will be treated and disposed of appropriately.

6.4.8. WASTE MANAGEMENT CONTRACTOR

Construction projects involving estate development create a great deal of liquid as well as solid waste that can impair local environment. Steps thus need to be taken to ensure appropriate collection and disposal of all forms of waste.

Mitigation Measures

A waste management contractor shall be prearranged to carry away all forms of waste from the project site for disposal in an environment-friendly manner at the nearest garbage disposal sites, identified by municipal authorities.

6.4.9. GENERATION OF EMPLOYMENT

A substantial number of site and off-site, direct and indirect jobs shall be created during implementation and operation of the project. A brief explanation of anticipated job creation is as follows:

- ✎ Several temporary jobs for skilled and semi-skilled workers have been created by the proponents to assemble a project implementation team;
- ✎ Twenty permanent jobs shall be created during operation of the project, including both skilled and unskilled workers;
- ✎ During full-fledged construction, project implementation will involve just over one hundred and fifty workers, with a minimum of twenty-five;

- ✗ The estate shall have seven hundred and eighty-one residential units. Abiding by resident profile, there are expected to be at least 1.5 domestic workers (driver/cook/maid/valet/ayah/chowkidar as the case may be) on full-time/part-time basis for each household, which translates into about 1,172 domestic workers skilled and semi-skilled workers;
- ✗ Thirty large retail units shall have at least two full-time employees, while the smaller five shall have at least one employee each;
- ✗ The number of jobs likely to be created at the school and the club has not been taken into account as yet since this is dependent on the ultimate profile of the two sub-projects, and
- ✗ The total number of jobs expected to be generated thus comes to approximately twelve hundred and fifty-seven.

In addition to these, operation of the project will also result in business and additional work opportunities for multiple upstream and downstream businesses and maintenance staff/technicians.

6.5. ENVIRONMENTAL IMPACTS DURING PROJECT OPERATION PHASE

6.5.1. PHYSICAL ENVIRONMENT

- ✗ The Project operation will result into generation of substantial quantities of solid waste from the residential and commercial activities. This waste may have significant impact on soil if a proper arrangement for its disposal is not made. In addition it will enhance aesthetic pollution and unhygienic conditions. In order to assess the impacts and proper designing of disposal system, it is imperative to quantify the solid waste generation, to assess its characterization and preparation of waste management plan. Similarly, unmanaged disposal of liquid waste will also cause the contamination of land resources.
- ✗ On account of increased population (both local as well as visitors), there will be a significant increase in the sewage. It shall lead to further pollution of the available surface water resources.
- ✗ With the establishment of new neighborhood centers, new schools, colleges, hospitals and recreation centers, there will be an increased stress on the already scarce drinking water resources.
- ✗ Surface run-off from the impervious surface of the carriageway or hillside slopes can aggravate the flooding of embankment during the operation stage.

- ✗ If cross-drainage structures like culverts are not adequately maintained and cleaned, natural streams/nullahs tend to become choked with debris and eroded soil, adversely affecting the quality of surface water and pounding in the Project Area.
- ✗ Increased traffic load as a result of project operation will result in the emission of exhaust gases. This will in turn rise to some extent, the level of particulates and gaseous pollutants in the ambient air.
- ✗ The noise pollution will be lesser than the construction phase. However, it will definitely be more than pre-construction stage on account of increase in traffic on the newly constructed and widened roads there will be an increased noise. However, it is expected that resultant sound level will remain well within the NEQS limits.

Mitigation Measures

- ✗ To cater the existing and future solid waste management of the town, a separate solid waste management system needs to be developed and implemented.
- ✗ Proper monitoring of the soil erosion and landslide prone areas should be carried out during operation phase and soil conservation measures (if needed) will be carried out like provision of physical structures e.g. retaining walls, etc.
- ✗ Central wastewater treatment plant should be provided having the capacity for treatment of sewage of entire town and industrial estate.
- ✗ For air and noise quality, a monitoring system will be established by Gulberg Residencia to ensure that ambient air and noise levels are within permissible limits.
- ✗ To reduce noise levels, if deemed necessary, provision of thick tree plantation, noise barriers and double glazed windows will be assessed as per site conditions.

6.5.2. ECOLOGICAL ENVIRONMENT

- ✗ There will be no further damage to the vegetation of the tract during operation stage.
- ✗ As the flora and fauna are interdependent, improvement of the flora through plantation shall be a source of attraction for the fauna, especially the avifauna or the birds. The birds, who were scared away during the construction stage, shall return to the Project Area during this stage.

Mitigation Measures

- ✗ In order to rectify the loss of habitat due to cutting/removal of trees, extensive planting shall be carried out along the both sides of existing and proposed roads, in the

compounds of buildings, play grounds, parks and recreation centers, along nullahs and in all other available open spaces

- ✗ Fauna depends upon flora of a place. With the improvement of flora the fauna and especially the avi-fauna shall be attracted again to the site and negative impacts on fauna shall be mitigated to a great extent.

6.5.3. SOCIO-CULTURAL ENVIRONMENT

- ✗ Increased number of people will be a positive impact regarding the local business of the shopkeepers, hotels and food stalls. However, this increased number of visitors may become a threat to the available natural resources including water, fire wood, etc. This will also create uneasiness to the locals.
- ✗ There may be some cultural conflicts due to the visit of the Project Area by the outsiders particularly foreigners.

Mitigation Measures

- ✗ Provision of water supply and other resources should be made by assessing the potential visitors at operation stage.
- ✗ To protect the forest and other plantation of the Project Area, it is recommended that gas cylinders should be provided by the town management at subsidized rates.

7. ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

The goal of the Environmental Management and Monitoring Plan (EMMP) is to ensure that all the necessary corrective actions are carried out to counter any adverse environmental impacts and that enhancement measures are used where feasible and practical. One of the aims of the monitoring program is to actually observe and analyze these impacts, thereby providing the information to help in the modification of mitigation measures to reduce the risks, hazards and associated with this development Projects.

7.1. GENERAL

For the effective implementation and management of the proposed mitigation measures, it is necessary to develop an EMMP which basically provides a delivery mechanism to address the potential impacts of the Project activities and to develop a monitoring program in order to minimize the potential impacts during the construction and operational stages of the Project. The EMP has been prepared with an objective of:

- ✎ Outlining the mitigation measures required for avoiding or minimizing the potential impacts assessed in this study.
- ✎ Developing a monitoring mechanisms and identifying the requisite monitoring parameters to confirm effectiveness of the mitigation measures recommended in the EIA.
- ✎ Defining roles and responsibilities of the Project proponent for the implementation of EMP and identifying areas where these roles and responsibilities can be shared with other parties involved in the execution and monitoring of the Project.
- ✎ Defining the requirements necessary for documenting compliance with the EMP and communicating it to all the concerned regulatory agencies.
- ✎ Prescribing the mechanisms with which consultation with stakeholders during the Project will be maintained.

7.2. STRUCTURE OF EMMP

The Environmental Management and Monitoring Plan (EMMP) is designed to ensure that all environmental safeguards are properly implemented throughout the planning, construction, and operational phases of the project. The EMMP comprises several key components. It begins with a review of the applicable environmental legislation, regulatory guidelines, and national standards to ensure full compliance with all statutory requirements. An organizational structure is then defined, clearly outlining the roles and responsibilities of the project proponent, contractor, supervising consultants, and relevant authorities for effective environmental oversight.

A Mitigation Management Matrix (MMM) is developed to identify all potential environmental impacts along with corresponding mitigation measures, responsible parties, performance criteria, and timelines. This matrix serves as the core tool for managing environmental risks during project execution. In parallel, an environmental monitoring program establishes parameters to be monitored, methods of measurement, monitoring frequency, reporting formats, and corrective action procedures, ensuring that environmental performance remains within acceptable limits.

Effective communication and documentation protocols are included to maintain transparent information flow, proper record-keeping, and timely reporting to regulatory bodies. A change management plan is incorporated to address any unforeseen modifications in project scope or environmental conditions, enabling responsive and adaptive environmental control. Additionally, a training program is integrated into the EMMP to build the capacity of personnel involved in the project, ensuring they are fully aware of environmental obligations and are capable of carrying out all required mitigation and monitoring measures.

7.3. LEGISLATION, GUIDELINES AND ENVIRONMENTAL STANDARDS

The project will be implemented in full compliance with the environmental regulatory framework of Pakistan. Key legal instruments applicable to the project include the Pakistan Environmental Protection Act (PEPA), 1997, the Land Acquisition Act (LAA), 1894, the Forest Regulations, 1930, and the Wildlife Protection, Preservation, Conservation and Management Act, 1975. These laws collectively provide the basis

for environmental protection, land use regulation, biodiversity conservation, and responsible project development. All project activities will adhere to the requirements stipulated by federal and local authorities to ensure that the environment and surrounding communities remain protected throughout the project life cycle.

To verify compliance with legal and environmental obligations, relevant standards and guidelines from the National Environmental Quality Standards (NEQS) of Pakistan and international best practices (where applicable) will be applied across various environmental components. The following standards will be particularly adopted during the construction and operational phases:

7.3.1. EFFLUENTS

The NEQS for municipal and industrial effluents define permissible pollutant limits for wastewater discharged into natural water bodies or municipal sewers. These standards will be strictly followed for any effluents generated from project facilities or temporary construction activities. The detailed standards are provided in [Annexure-G](#).

7.3.2. AMBIENT AIR QUALITY

Project operations must ensure that ambient air quality remains within the limits prescribed under the NEQS. These standards regulate levels of particulate matter, nitrogen oxides, sulfur oxides, carbon monoxide, and other pollutants to protect public health and environmental quality. Standards are attached at [Annexure-G](#).

7.3.3. NOISE

Vehicle movement, construction machinery and equipment may generate noise. NEQS-prescribed limits for ambient noise and vehicle-generated noise will be applied. Necessary mitigation such as silencers, scheduling noisy activities during daytime and equipment maintenance will be implemented. Reference values are provided in [Annexure-G](#).

7.3.4. DRINKING WATER

Water supplied for labor camps and workers' consumption must meet safety criteria. The World Health Organization (WHO) drinking water guidelines will be

adopted as reference standards to ensure safe water quality. Relevant parameters are listed in [Annexure-G](#).

7.4. ROLES AND RESPONSIBILITIES

The following organizations would be involved in the implementation of the proposed Project: District Heads of various departments, such as CDA, Highways, Buildings, Public Health Engineering, who will be the executors of the EMMP, through the Project Contractors.

- ✎ Supervisory Consultants at Execution Stage as the monitor of the EMMP.
- ✎ Contractor (s) responsible for implementation of the EMMP.

7.4.1. IBECHS

The Project Proponent will hold primary responsibility for ensuring effective implementation of the Environmental Management and Monitoring Plan (EMMP) throughout the planning, design, and construction phases of the project. During construction, all contractors engaged under different work packages will be obligated to execute their activities in full compliance with the EMMP requirements and relevant national environmental regulations. It is recommended that a dedicated Environmental Officer (EO), be deployed on-site by the Project Proponent to oversee adherence to the approved environmental measures during both design and implementation.

In the operational stage, the respective operational departments will be accountable for applying all mitigation measures assigned to them, while the regulatory oversight including monitoring of operation and maintenance (O&M) activities will be carried out through the Environmental Officer to ensure continued compliance with the EMMP. The detailed allocation of responsibilities for each stage of the project is outlined in the following sections.

7.4.1.1. PLANNING AND DESIGN STAGE

- ✎ Setting up systems for environmental management.
- ✎ Ensuring that the terms of reference for each Project contractor adequately cover environmental and social issues and participate in short listing where appropriate.

- ✕ Ensuring that the Contractors develop and carry out environmental implementation plans that are consistent with the EMMP.
- ✕ Supervising environmental assessments, and providing substantial inputs and guidance.

7.4.1.2. PRE-CONSTRUCTION PHASE

- ✕ Identifying any problems due to restricted access during construction and verifying whether ramps/diversions have been provided where required.
- ✕ Establishing a grievance readdressal committee to ensure fairness and transparency during the resettlement process.
- ✕ Ensuring that the Contractor has prepared video of constructions sites as well as areas selected for establishing construction camp and other facilities like asphalt plant, etc. and copies of the same duly received.

7.4.1.3. CONSTRUCTION PHASE

- ✕ Liaising between Project staff of different departments including Capital Development Authority, Highway Department, Public Health Department, etc. and the Supervision Consultant's staff to monitor environmental compliance during construction.
- ✕ Supervising and providing technical support to Project and operations staff to help ensure compliance with the EMP.

7.4.1.4. OPERATION STAGE

- ✕ Coordinating with the operations staff working under the different departments including Health, Education, Forest and other relevant departments to monitor environmental compliance during operation of Project facilities.
- ✕ Reporting on the progress of environmental compliance to the Environmental Officer, EPA.
- ✕ Assessing the long-term environmental impact of operation of the Project facilities.

7.4.2. SUPERVISORY CONSULTANTS

Supervisory Consultant (SC) will be responsible for following activities:

- ✕ Supervising the Project's Contractors and ensuring that all contractual obligations related to design and construction, as well as environmental and social compliance are

met.

- ✗ Ensuring that day-to-day construction activities are carried out in an environmentally sound and sustainable manner.
- ✗ Assisting the Project management for coordinating with officials, community groups, government departments, etc. on environmental issues and obtaining the necessary clearances from the regulatory authorities.
- ✗ Monitoring of the environmental aspects of Projects during construction to ensure that the environmental requirements of the contract and the mitigation measures proposed in the EMP are implemented.
- ✗ Supervising contractors and preparing environmental input to the quarterly progress report.
- ✗ Developing and conducting environmental training activities for contractors and the supervision consultant staff.
- ✗ Ensure that asphalt plants, construction camps and other facilities are properly sited and installed in accordance with the contract.
- ✗ Determine the timing and exact locations of both baseline and routine air, noise and vibration, and water quality monitoring in accordance with the contract provisions (if any).
- ✗ Undertake critically important routine visual monitoring of construction, waste disposal and overall environmental management practices by the Contractors. Effective environmental management during construction will require frequent site visits and observation skills.
- ✗ Check that the Contractor backfills, compacts, and leaves the ground in the original condition after excavation of pits for subsurface investigations/borrow pits.
- ✗ Keep checks and controls so that the pollution of land and water resources due to the spills of lubricants, fuel, chemicals, and other wastes does not take place.
- ✗ To see that the Contractor keeps the damages to the minimum while making tracks for accessibility and that the damage is rectified properly.
- ✗ Monitor that the Contractor uses such working methodology so as not to cause disturbance to the communities by fugitive dust, noise, fumes, etc.
- ✗ Monitor that the Contractor adjusts his working hours during the construction activities in such a manner that it causes least inconvenience to the local population.

7.4.3. **CONTRACTOR**

As referred earlier, implementation of the EMP will be the sole responsibility of the Contractor. All the environmental measures related with construction activities will be implemented by the contractors.

7.5. ENVIRONMENTAL MITIGATION MANAGEMENT MATRIX

The environmental protection and enhancement are achieved in various ways. These approaches should begin right at the embryonic stage, i.e. i) Project location, ii) Design, specifications, iii) Construction activities and iv) Post completion activities i.e. operation and maintenance stage. Appropriate environmental management measures are required to be exercised in a cascade order by the Project proponent at each stage of the Project.

In this way, it is envisaged that the Project will achieve maximum ongoing cost-effectiveness, environmental sustainability and social soundness, far beyond the end of implementation of the Project. All the stages of the Project have to be managed by adopting the proposed environmental mitigation measures, where, besides engineering aspects, due importance is to be accorded to mitigation measures which make a perfect blending with the surrounding ecosystem.

The key environmental and social issues, which have already been discussed, are as under:

- ✎ Contamination of air, water and soil during the construction and operation stages
- ✎ Soil erosion and soil contamination at construction and operation stages.
- ✎ Impact of noise generated by vehicles, machinery and equipment during the construction activities
- ✎ Impact on community and work force safety as a result of accident hazards during the construction and operation of the project
- ✎ Gender Issues.

MMM is provided below, which establishes the linkages between the environmental and social impacts, mitigation strategy and the agencies responsible for execution. The MMM identify:

- ✎ The required mitigation measures recommended in EIA.

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- ✕ The person/organization directly responsible for adhering to or executing the required mitigation measures.
 - ✕ The person/organization responsible for ensuring and monitoring adherence to the mitigation measures.
 - ✕ The parameters which will be monitored to ensure compliance with the mitigation measures.
 - ✕ The timing at which the mitigation or monitoring has to be carried out.

ENVIRONMENTAL MANAGEMENT PLAN

Sr. No.	Project Component or Impact	Target	Action	Responsibility/ Action taken, if any
A. PRE-PROJECT STAGE				
1.	Selection of a project	To construct a Farm houses	Construction of a gated farm houses at a suitable site	Proponents (IBECHS)
2.	Site selection	To find a site suitable site to meet the proponents' objectives	Identification of a suitable site at a reasonable location, preferably away from congested parts of the city	Proponents (IBECHS) The proponents viewed a number of sites around the city and selected a site in Zone V with a rural setting
3.	Arrangement of financing for the project	To launch and implement the project without possibility of delays in execution due to funding issues	Line up finances for the project beforehand	Proponents (IBECHS) Funds are available with the proponents from advance sale of residential plots, which would be sufficient for completion of the project within the expected time-frame of the project
4.	Acquisition of land	To arrange land for the proposed project	Alternate sites should be considered	Proponents (IBECHS) Project site has been found as feasible. All other sites viewed by the proponents were not considered viable for a variety of reasons, mainly congestion and high cost of land and development. There has not been any adverse environmental impact on the local environment as a result of project location and there has not been

				any dislocation of previous owners of the project site. No important land-use or economic activity has been lost as a result of siting of the project
5.	Payment of compensation	Payment of compensation to landowners from whom the land has been acquired or purchased through private negotiations	Payment of compensation or price	Proponents (IBECHS) The land was acquired in 1968 and compensation was paid to the original owners as per yardstick approved by the government. There are no pending claims
6.	Change of land-use	To change of land-use of the site	Permissions to change the land-use	Proponents (IBECHS) Town planning of the city permits residential colonies in the project area subject to CDA permission. There was no change made to the landuse.
7.	Selection of a designer for the project	To design the project in a fully environment friendly manner	Selection of a project designer with sufficient expertise to design environment-friendly projects	Proponents (IBECHS) The proponents have in-house capability to design the project
8.	Selection of Contractor	To execute development works at the site without damaging the environment	Selection of a Contractor with sufficient experience, equipment and workforce to execute the project within the target date	Proponents (IBECHS) Selection of the Contractor has been carried out after careful screening and abiding by government procedures.
9.	Surveys and investigations	To conduct surveys and investigations to ensure that project activities do not	Surveys and investigations be carried out to determine existing conditions relating to waste generation, quality of	Environmental Consultants/Project Designer (UPDL)

		impinge on the environment	air, water, noise, soil, soil erosion and collect data relating to climate of the project area, wind speed and direction	Investigations have been carried out in respect of soil, ambient air, groundwater quality, traffic load and noise at the project site. No aberration has been found during environmental testing. Soil tests indicate that the project site is suitable for construction of roads and bridges, and the overhead water tanks
10.	Social impact of the project	To find out whether any social impacts would result from locating the proposed project at the selected site	A survey be carried out to assess what sort of social impacts can take place as a result of development works	Proponents (IBECHS) This environmental study has indicated that there shall not be any adverse social impact from project activities. On the contrary, it shall have a horde of benefits for the city as explained at various places in the report
11.	Measures for surrounding areas	To identify any measures that must be taken as mitigation for adverse effects resulting from locating the project at the proposed site	A study should be conducted to suggest measures that should be taken to compensate local population or environment in case the proposed project alters the environment. If considered expedient, the proponents should make contributions towards socio-economic uplift of the project area to the extent possible	Proponents (IBECHS) This environmental study concludes that no specific measures are necessary for surrounding areas

ENVIRONMENTAL MANAGEMENT PLAN

Sr.	Project Component or Impact	Target	Action	Responsibility/ Action taken
B. DESIGN STAGE				
13.	Designing of the proposed project	To design the proposed project in such a manner that the existing environment is disturbed to the least possible extent	Engage a team of professional architectural firm having experience of developing environment-friendly buildings	Project Designer (UPDL) Designing has been completed. Modifications in the designs shall be carried out on need basis with prior approval of the competent authority
14.	Intrusions on the privacy of residents surrounding the project site	To ensure privacy of the residents in the vicinity of the project site	There should be no intrusion on privacy of adjoining areas	Project Designer (UPDLmm) The design has preserved privacy of nearby properties in line with the relevant building regulations
15.	Soil Tests	To test the soil for sustainability of structures	A soil survey should be carried out by qualified consultants to determine soil characteristics and suggest foundations for large structures, if any	Proponents (IBECHS) Soil testing has been carried out. The soil has the requisite bearing capacity to sustain load of the proposed structure. The geo-technical consultants and structural engineers have accordingly proposed a suitable design for all foundations

ENVIRONMENTAL MANAGEMENT PLAN

Sr.	Project Component or Impact	Target	Action	Responsibility/ Action taken
B. DESIGN STAGE				
16.	Seismic hazard Analysis	To protect structures from seismic hazard	The roads, bridges and public buildings should be designed to withstand seismic hazards	Project Designer The structures have been designed to withstand seismic activity typical of the project area
17.	Traffic congestion and disturbance to people	To mitigate the traffic problem	A traffic count be taken to be aware of measures that need to be taken due to additional traffic load There should be ample parking space to cater for vehicles of residents as well as visitors	Environmental Consultants Traffic counts carried out by the Environmental Consultants shows that there is low traffic on local roads. Impact of additional traffic on these roads during design phase was virtually zero. Impact of traffic during construction shall be negligible whereas impact when the estate comes into operation shall be less than one percent at the most Project Designer There shall be sufficient parking spaces at all

ENVIRONMENTAL MANAGEMENT PLAN

Sr.	Project Component or Impact	Target	Action	Responsibility/ Action taken
B. DESIGN STAGE				
			Traffic emerging from the estate should meet traffic in an orderly manner by constructing proper on ramps and wide entrance	public facilities. All houses shall be built in line with building regulations so that residents' vehicles and those of visitors are parked inside dwelling units Project Designer /Proponents Project Designer has designed a wide entrance with a main gate, and wide access roads to Park Road and Kurri Road. Proponents shall post security guards to regulate movement of traffic into and out of the compound
18.	Safety measures	To ensure safety of the premises	Project design must incorporate all possible measures to ensure safety of the premises, including fire-fighting and security arrangements	Project Designer Adequate arrangements have been made for security, including perimeter fence, and fire-fighting in compliance of the town planning

ENVIRONMENTAL MANAGEMENT PLAN

Sr.	Project Component or Impact	Target	Action	Responsibility/ Action taken
B. DESIGN STAGE				
				regulations and as described in this report
19.	Flora and Fauna	To protect the fauna and flora of the Project Site	Trees and plants should be added to the site to enhance the environmental value of the area	Proponents (IBECHS) The proponents intend to plant a sufficient number of trees towards completion of development works. Suitable plantation, including 6,750 trees of different varieties, 28,250 shrubs of various species, and 500,000 square feet of Dhaka grass around the colony will more than compensate for losses in vegetation
20.	Services	To ensure that all applications are made for connections for services required during construction and operation of the project	Applications and arrangements for all utility connections and services, such as water, electricity, wastewater disposal, natural gas and solid waste disposal should be made well in time	Proponents (IBECHS) Most of the services are to be extended by the proponents themselves. Applications for utility connections shall be made at the appropriate time in consultation with the project designers to avoid delays in project implementation and project operation

ENVIRONMENTAL MANAGEMENT PLAN

Sr.	Project Component or Impact	Target	Action	Responsibility/ Action taken
B. DESIGN STAGE				
21	Reflection	To minimise reflections from all structures	Public buildings should be so designed that there is minimal reflection and that it does not cause inconvenience for residents or neighbours	Project Designers The building designs shall be in conformity with parameters laid down in the building regulations and by-laws relating to reflection and privacy of neighbours. Accordingly, all windows shall be placed where there is minimal intrusion for neighbouring properties. Moreover, it shall be ensured that the glass used does not create reflections that can cause a nuisance for neighbouring properties
22.	Heat	To adopt innovative techniques introduced under the Green Building and Sustainable Building regimen	Adoption of as many features of Green Building and Sustainable Building concepts to absorb heat during winter and protect buildings against heat during the summer	Project Designer As many features of the Green Building and Sustainable Building have been incorporated into the design as was possible keeping availability of green materials and resources in view

ENVIRONMENTAL MANAGEMENT PLAN

Sr.	Project Component or Impact	Target	Action	Responsibility /Action Taken
C. CONSTRUCTION STAGE				
23.	Employment of labour	Offer employment opportunities to local population	Maximum efforts should be made to ensure that ample employment opportunities are offered to the local workers	Contractor /Project Manager The contractor shall engage local labour to the maximum possible extent
24.	Traffic congestion and disturbance to the local people	To mitigate traffic problems during construction	Traffic count be taken to find the impact of construction-related vehicles on local roads Transportation of raw material and heavy machinery will be done at times	Environmental Consultants Traffic count shows that there is low traffic on local roads. The upper limit of additional traffic on these road during construction will be insignificant. Moreover, the contractor is bound the terms of his awarded contract to ensure that there is no interference with local traffic patterns. Moreover, vehicles are not being parked on the main roads Contractor

ENVIRONMENTAL MANAGEMENT PLAN

Sr.	Project Component or Impact	Target	Action	Responsibility /Action Taken
C. CONSTRUCTION STAGE				
			convenient to local residents	All deliveries of equipment and materials are being during off-peak hours and never at night
			As much as possible, raw material and equipment shall be brought to project site through main roads	Contractor Only main roads are being used and heavy project traffic is not passing through any residential area unless unavoidable
			Construction vehicles should not blow horns at the project site	Contractor Contractor has issued strong instructions to concerned drivers to abide by traffic laws and rules and to observe road courtesies
			Vehicles to be used at the project site should be in good working condition, if	Contractor

ENVIRONMENTAL MANAGEMENT PLAN

Sr.	Project Component or Impact	Target	Action	Responsibility /Action Taken
C. CONSTRUCTION STAGE				
			not new, to minimise noise pollution and smoke emissions	Contractor is using vehicles, machinery and equipment that are in good condition
25.	Transportation of Construction material	To ensure that transportation of material does not cause inconvenience	The contractor should transport construction material, as much as possible, without obstructing local traffic	Contractor Contractor is ensuring that local traffic is not put into inconvenience due to movement of project vehicles and is using routes that bypass local traffic
26.	Stocks of Construction material	To avoid soil erosion and pollution by an unnecessary stockpile of construction material	It should be ensured that construction materials are ordered subject to need only so that surplus material does not create an environmental hazard	Contractor Contractor is ordering construction materials strictly on need basis and these are not being unnecessarily piled up at the project site or on adjoining properties

ENVIRONMENTAL MANAGEMENT PLAN

Sr.	Project Component or Impact	Target	Action	Responsibility /Action Taken
C. CONSTRUCTION STAGE				
27.	Health and safety of workers and local public	To minimise health and safety related negative impacts on the project	Construction labour be trained in safety procedures for all relevant aspects of construction Hard hats be worn by workers at all time of work and everywhere on the project site Regular checks be made so that the contractor follows safe working procedures and practices Formal emergency procedures must be	Contractor Contractor has imparted requisite training to foremen and workers Contractor Hard hats are being worn at all times by the workers Contractor/Project Manager The contractor's work is being monitored on a regular basis to ensure that healthy and occupational safety standards are being enforced at all times

ENVIRONMENTAL MANAGEMENT PLAN

Sr.	Project Component or Impact	Target	Action	Responsibility /Action Taken
C. CONSTRUCTION STAGE				
			developed for construction site in case of an accident. First aid kits and other necessary equipment should be kept available at the project site along with a list of emergency phone numbers to be contacted in case of any emergency or accident. Arrangements be made with the local clinics for help in the event of an urgent need	Contractor/Project Manager All such arrangements have been made by the Contractor under supervision of the Project Manager through regular monitoring of the work executed
28.	Disturbance to the local people	To minimise disturbance to everyday life of local people, especially immediate neighbours	Residents of the area be informed about the detail of work, likely disturbances and their duration and to whom they should report complaints The local population to be advised on safety hazards posed by encroaching at the project site	Contractor/Project Manager A sign has been posted at the project site for information of the public of project activities. The proponents have been advised by the Environmental Consultants through this Environmental study to institute a Complaints Redressal Mechanism, preferably through their

ENVIRONMENTAL MANAGEMENT PLAN

Sr.	Project Component or Impact	Target	Action	Responsibility /Action Taken
C. CONSTRUCTION STAGE				
			Good community relationship be established so that any disruption can be resolved with due consideration for and involvement of local community	website Contractor/ Project Manager Public is not allowed entry to project site as a safety measure Contractor/Project Manager The Project Manager is available to entertain public objections, if any, about project activities. No complaints whatsoever have so far been received regarding project activities
29.	Surface and ground water contamination	To prevent surface and ground water contamination from oil based products and	Proper arrangement to be made for collection and disposal of oil-based products and construction waste	Contractor/ Project Manager A sub-contractor has been engaged for disposal of all forms of waste and eventual disposal in an

ENVIRONMENTAL MANAGEMENT PLAN

Sr.	Project Component or Impact	Target	Action	Responsibility /Action Taken
C. CONSTRUCTION STAGE				
		construction waste	Surface and groundwater quality be monitored every month during construction	environment-friendly manner at the municipal garbage disposal site Contractor/Project Manager Groundwater samples have been taken and tested. Further tests shall be carried out in due course to find out whether project implementation is in any way impacting on characteristics and quality of ground water. There is no surface water in the near vicinity of the project site that is under threat from project activities
30.	Wastewater discharges	To minimise wastewater discharges at worker's camps and prevent pollution from sanitary waste at site	Proper drainage of wastewater	Contractor/Project Manager Wastewater is being drained into the Nullah after appropriate sieving and the residue is being disposed separately through the sub-contractor.

ENVIRONMENTAL MANAGEMENT PLAN

Sr.	Project Component or Impact	Target	Action	Responsibility /Action Taken
C. CONSTRUCTION STAGE				
				Portable toilets have been arranged for workers' camp
31.	Disposal of mucking material	To dispose of excavated material in an environmentally friendly manner	Transportation of mucking material be done in closed containers Mucking material be filled in layers and properly rolled and sprinkled to avoid any negative environmental or visual impacts Utilisation of mucking material be done for construction of temporary acces	Contractor/Project Manager Excavated earth is being re-used at the site for landscaping and roads Contractor/Project Manager All mucking material is being covered and sprinkled with water to minimise dust dispersal Contractor/Project Manager Excavated material is being re-used at the site for landscaping
32.	Dust	To avoid problems resulting from dust	Excavation work be sprayed with water	Contractor/Project Manager

ENVIRONMENTAL MANAGEMENT PLAN

Sr.	Project Component or Impact	Target	Action	Responsibility /Action Taken
C. CONSTRUCTION STAGE				
		pollution	Stockpiles of excavated material be covered with tarpaulins Construction workers be provided with masks and trained in their use	The Contractor/Project Manager have ensured that there has been regular spraying of water on excavated materials Contractor/Project Manager All excavated material was well covered before disposal or re-use Contractor/Project Manager Dust masks are available at the site for use by workers whenever required or whenever the nature of work warrants
33.	Air Pollution	To minimise degradation of ambient air quality	Solid waste from the contraction camp and project site should not be burnt on site	Contractor/Project Manager Solid waste is not being burnt at the site and is

ENVIRONMENTAL MANAGEMENT PLAN

Sr.	Project Component or Impact	Target	Action	Responsibility /Action Taken
C. CONSTRUCTION STAGE				
			Appropriate measures to minimise exhaust emissions from construction machinery, vehicles and generators Air quality monitoring to be carried out on a monthly basis to assess if project implementation activities are impinging on the environment	being carried away for appropriate disposal by a waste contractor Contractor/Project Manager Use of good quality equipment, machinery and vehicles has ensured that there are minimal emissions and noise Contractor/Project Manager Environmental testing for ambient air has shown that there is no alarm for concern in this behalf in respect of project activities. Air monitoring shall be repeated at suitable intervals throughout project implementation
34.	Noise	To avoid noise pollution	Selection of new plants, machines,	Contractor/Project Manager

ENVIRONMENTAL MANAGEMENT PLAN

Sr.	Project Component or Impact	Target	Action	Responsibility /Action Taken
C. CONSTRUCTION STAGE				
			equipment and hand tools to be used for containing noise levels Noisy work be confined to normal daylight hours Suitable hearing protection and training be provided to construction workers Noise monitoring will be carried out every month	The contractor is using good quality equipment and machinery that create minimal noise Contractor/Project Manager No noisy work is being undertaken after normal working hours. In fact, noise from the project activities are well within acceptable limits Contractor Ear-muffs are available for workers if demanded Contractor/Project Manager Noise monitoring has been carried through the environmental consultants and shall be repeated whenever deemed necessary or should there be

ENVIRONMENTAL MANAGEMENT PLAN

Sr.	Project Component or Impact	Target	Action	Responsibility /Action Taken
C. CONSTRUCTION STAGE				
				public complaints
35.	Solid waste	To remove solid waste from site before it damages the environment	Measures to be taken to ensure that solid waste does not remain at the project site and that it does not mar either the soil or the surface environment	Contractor/Project Manager Solid waste is being removed regularly through arrangements with a sub-contractor for disposal in an appropriate manner. No complaints have so far been received about inappropriate disposal of solid waste
36.	Liquid effluents	To dispose of all liquid effluents in an environment friendly manner	It must be made sure that there are no liquid effluents on account of leakages from equipment and vehicles or the construction camp and that all such effluents are removed from the site before seeping into the ground	Contractor/Project Manager There have not been any such leakages, mainly because no repairs are being undertaken at the project site. Use of good quality machines and vehicles has reduced the possibility of such leakages. Liquid waste from the construction camp is being sieved and disposed of in the <i>Nullah</i>

ENVIRONMENTAL MANAGEMENT PLAN

Sr.	Project Component or Impact	Target	Action	Responsibility /Action Taken
C. CONSTRUCTION STAGE				
37.	Working hours	To avoid over-work	Construction workers should not be coerced to work beyond normal daylight hours	Contractor/Project Manager The contractor is required to observe all labour laws regarding wages and working hours. Any work beyond normal working hours shall be voluntary and subject to payment of overtime as per rates specified under the relevant labour laws
38.	Gender issues	To avoid any gender issues created by influx of construction workers	Construction workers should not be allowed to enter adjoining areas unless absolutely necessary	Contractor/Project Manager Workers have been advised not to loiter in adjoining residential areas without sufficient cause. However, freedom of movement of the workers cannot be restrained beyond reasonable limits
39.	Flora and Fauna	To protect the fauna and flora of the Project Site	Trees and plants be planted to enhance the environment	Proponents Plantation shall be carried out after major

ENVIRONMENTAL MANAGEMENT PLAN

Sr.	Project Component or Impact	Target	Action	Responsibility /Action Taken
C. CONSTRUCTION STAGE				
				development works have been completed so that there is no damage to fresh plantation
40.	Vibrations	To reduce vibrations, if any, from use of machinery	It should be ensured that there are minimum vibrations from construction work so that no damage or inconvenience is caused to adjoining properties	Construction Contactor/Project Manager The Project Manager proponent is monitoring the work of the contractor regularly. There have not been any complaints about vibrations resulting from project activities
41.	Environment-friendly building construction materials	To maximise use of green materials	Maximum efforts should be made to use Green Materials during construction and to use environment-friendly construction materials, such as lead-free paint etc.	Proponents Use of Green Materials shall be subject to availability and cost-effectiveness. Environment friendly materials, such as lead-free paint etc., shall be used to the extent possible subject to availability in the market
42.	Visual and physical impact of electric sub	To preserve visual impact in the project	It should be ensured that the electric sub-station and transformer(s) are	Proponents

ENVIRONMENTAL MANAGEMENT PLAN

Sr.	Project Component or Impact	Target	Action	Responsibility /Action Taken
C. CONSTRUCTION STAGE				
	station and transformers	area	constructed/installed in an environment-friendly manner	It shall be ensured that all electric installations are erected in compliance of all safety and environmental standards and IESCO stipulations.

ENVIRONMENTAL MANAGEMENT PLAN

Sr.	Project Component or Impact	Target	Action	Responsibility
D. OPERATION STAGE				
43.	Overall Environmental impacts	To reduce overall negative impact of the project on the environment and conserve natural resources	The proponents should take all possible measures to ensure that operation of the estate does not harm the local environment	Proponents The project is located in a rural area. There will thus be an adverse impact in terms of loss of green area. However, development of parks and other green areas and massive plantation shall compensate for the change in the nature of the

ENVIRONMENTAL MANAGEMENT PLAN

Sr.	Project Component or Impact	Target	Action	Responsibility
D. OPERATION STAGE				
				project site The proponents shall ensure that local residents are not inconvenienced in any manner as a result of project operations
44.	Water Conservation	To conserve water	Obtain access to piped water supply from municipal sources Residents be regularly advised on important of water conservation so as to preserve water	Project Manager It is planned to install tube-wells to mine groundwater as piped water is presently not available in the project area Proponents All residents shall be duly informed of the importance of water conservation through circulars on a regular basis
45.	Air Quality	To ensure that the pollution levels do not exceed the limits	No waste should be burnt at the site	Proponents No solid waste whatsoever shall be burnt at the estate. All solid waste shall be carried away by municipal services

ENVIRONMENTAL MANAGEMENT PLAN

Sr.	Project Component or Impact	Target	Action	Responsibility
D. OPERATION STAGE				
			Residents be advised to keep their vehicles and machines in good working order to minimise noise and emissions	Proponents Residents shall be advised in this behalf through regular circulars
46.	Noise	To minimise noise levels	Residents be advised to keep all forms of noise levels down	Proponents Residents shall be advised in this behalf through regular circulars
47.	Traffic congestion	To mitigate traffic congestion problems	There should be prohibition on roadside parking Parking space to be provided at all public buildings	Proponents Residents shall be advised in this behalf through regular circulars. Security guards shall ensure that there is no long-term roadside parking and that all vehicles are parked inside compounds Proponents There shall be ample parking spaces at all public

ENVIRONMENTAL MANAGEMENT PLAN

Sr.	Project Component or Impact	Target	Action	Responsibility
D. OPERATION STAGE				
				places, such as parks and shops, and near the public buildings
48.	Vibrations	To reduce vibrations from equipment installed in public buildings	Measures be put in place to control vibrations from equipment installed inside public buildings, such as tube-wells, motor pumps and generators	Proponents The equipment shall be properly clamped and under regular maintenance to eliminate possibilities of vibrations
49.	Energy Conservation	To conserve energy and use of environmental-friendly energy sources	Efforts should be made to ensure that energy is conserved and that environment-friendly techniques are adopted	Proponents Maximum number of energy-savers shall be installed at public buildings and street lights. Secondly, colour schemes that require lighting shall be avoided. Residents shall be encouraged to use maximum amount of sunlight to reduce dependence on lights
50.	Air Pollution	To minimise degradation of ambient air quality	Solid waste from the estate should not be allowed to pile up at the temporary storage site before it is ultimately removed through	Proponents Proponents shall make necessary arrangements for quick disposal of solid waste

ENVIRONMENTAL MANAGEMENT PLAN

Sr.	Project Component or Impact	Target	Action	Responsibility
D. OPERATION STAGE				
			arrangements with the municipality	
51.	Flora and Fauna	To protect the fauna and flora of the project site	Trees and plants will be planted to enhance the environment	Proponents The proponents intend to plant a sufficient number of trees at the site after completion of structures. Plantation shall include 6,750 trees of different varieties, 28,250 shrubs of various species, and 500,000 square feet of Dhaka grass
52.	Environmental Monitoring	To ensure that periodic reports on environment at the building are furnished to the Pakistan Environmental Protection Agency in pursuance of conditions of the environmental approval	A mechanism should be employed for Environmental Monitoring at the project when it comes into operation	Proponents While the proponents shall be responsible for implementing this Environmental Management Plan, the environmental approval to be issued by the Pakistan Environmental Protection Agency invariably requires environmental monitoring when the project comes into operation. Accordingly the proponents shall entrust the responsibility for environmental monitoring in line with instructions of the Pakistan Environmental Protection Agency.

7.6. ENVIRONMENTAL MONITORING PROGRAM

For the Gulberg Residencia (Phase-III), Zone-V, Islamabad, the Environmental Management Plan (EMP) serves as a vital strategic tool to ensure that all development activities are executed in an environmentally responsible and sustainable manner. It provides a framework for continuously evaluating the effectiveness of proposed mitigation measures and enables timely corrective actions wherever required. This adaptive approach is essential to maintaining environmental integrity throughout the advancement of the project.

To support this, a well-structured environmental monitoring program has been included, through which the performance of mitigation measures will be regularly assessed against prescribed environmental standards. Effective monitoring is crucial to confirm that environmental quality is maintained and that no unacceptable impacts arise due to construction or operation of project facilities. Without such monitoring, the effectiveness of environmental safeguards cannot be validated.

Therefore, the EMP for Gulberg Residencia (Phase-III) must be integrated into every phase of the project planning, detailed design, construction, and operation. Its continued application will ensure regulatory compliance, protect natural and community resources, and help achieve long-term sustainability objectives envisioned for this development.

7.6.1. OBJECTIVES

The objective of environmental monitoring during the operation will be as follows:

- ✎ To check compliance with the requirements of the EMP by monitoring activities of the Project Contractors on a daily basis. This will be called Activity Monitoring.
- ✎ To monitor actual impacts of the Project Activities on physical, biological and socio-economic receptors of the Project Area so that any impacts not anticipated in the EIA or impacts which exceed the levels anticipated in the EIA can be identified and appropriate mitigation measures can be adopted in time. This objective will be achieved through effects monitoring.
- ✎ To ascertain residual impacts of the operation. This will be achieved by post-Project monitoring.

To achieve these objectives the following monitoring program will be implemented.

7.6.2. ACTIVITY MONITORING

Activity monitoring will be undertaken to verify that all project actions remain in full compliance with the requirements of the EIA and the approved Environmental Management and Monitoring Plan (EMMP). Monitoring will be based on project-specific checklists designed to capture environmental performance indicators relevant to construction and operational activities.

Responsibility for activity monitoring will be shared among all institutions involved in project implementation and oversight, including the regulatory authority, supervising consultants, and construction contractors. Monitoring will be performed at three levels:

- ✎ **Level 1: Monitoring by Pak-EPA:** Pak-EPA will conduct regular field inspections during the construction phase through its designated Environmental Officer(s). These visits will ensure that the project meets regulatory requirements and approved environmental conditions..
- ✎ **Level 2: Monitoring by the Supervising Consultant (SC)** Full-time environmental supervision will be maintained. Any non-conformities identified by the SC will be recorded using standardized non-compliance forms and addressed in scheduled environmental review meetings.
- ✎ **Level 3: Monitoring by the Contractor** Contractor's environmental officers will conduct routine inspections and ensure implementation of mitigation measures as prescribed in the Mitigation Management Matrix (MMM). Compliance records will be submitted to the Supervising Consultant and the regulatory authority for verification.

The detailed compliance monitoring protocol for physical environmental parameters is provided in **Table 7.1**. This multi-tiered monitoring approach ensures continuous tracking, timely reporting, and corrective action for all environmental issues encountered during project execution.

7.6.3. EFFECTS MONITORING

Effects Monitoring will be undertaken to evaluate the actual environmental impacts arising from project activities and to determine the effectiveness of the implemented mitigation measures. As defined in the EMMP, the Supervising

Consultant (SC) will be responsible for carrying out this monitoring in accordance with the specified requirements.

While the EMMP provides the outline of parameters to be monitored, a detailed effects monitoring program will be developed by the SC's Environmental Officer. This program will clearly define the monitoring methodologies, sampling locations, frequency, resource requirements, and reporting responsibilities. The SC will ensure that monitoring activities are conducted using standardized procedures and certified laboratories where analytical testing is required. Monitoring results will be documented and submitted to Pak-EPA for independent review and compliance verification.

Through this approach, the project will maintain continuous oversight of environmental performance and implement corrective actions where necessary to ensure sustained environmental protection throughout the construction and subsequent phases.

7.6.3.1. PHYSICAL ENVIRONMENT

The monitoring program will be specifically focused on identifying and assessing project-related impacts on key environmental components, including soil quality, water resources, and ambient air quality. The detailed effects monitoring protocol, outlining parameters, frequency, and monitoring responsibilities, is presented in Table 7.2.

7.6.3.2. BIOLOGICAL ENVIRONMENT

Effects on the biological environment will be monitored by the Supervising Consultant (SC), with technical support from the relevant forestry and wildlife authorities when required. The SC will conduct quarterly ecological surveys during the construction phase and continue periodic monitoring during the operational phase of the Project. These surveys will focus on identifying any changes or disturbances to local flora and fauna resulting from project activities, including habitat alteration, species displacement, or vegetation loss.

The SC will carry out wildlife and vegetation assessments using standardized ecological monitoring methods, and will document species status, habitat condition, and any observable environmental impacts. A dedicated compliance register will be maintained to record monitoring results, observed effects, and corrective actions taken, ensuring that all biological protection measures outlined

in the EMMP remain fully implemented and traceable throughout the project lifecycle.

7.6.3.3. SOCIOECONOMIC ENVIRONMENT

Effects on the socio-economic environment will be monitored by conducting quarterly survey during construction and a final post Project survey by EO. The surveys will be structured to ascertain the level of impacts during the course of the project and the implementation of mitigation measures prescribed in the EIA such as hiring of local employment, payments of land compensation, health and safety of communities, mobility of local women etc. The EO will also verify the maintenance of a Social Complaints Register by SC.

7.6.4. POST-PROJECT MONITORING

After completion of the construction, Post-Project monitoring will be carried out. The objective of this monitoring will be to determine the level of residual impacts of the Project on physical, biological and socio-economic receptors of the Project Area. The monitoring may be carried out within one month after the end of all activities in the Project Area. The Post-Project survey report will be submitted within two weeks after completion of the survey.

As part of the Post-Project monitoring field monitors will also check restoration of sites restored at that time according to the requirements of the EIA.

TABLE 7-1 RECOMMENDED COMPLIANCE MONITORING PROTOCOL FOR PHYSICAL, BIOLOGICAL AND SOCIAL ENVIRONMENT

Receptor	Location	Monitoring Mechanism	Monitoring and Reporting Frequency
Water Quality	Points where control of effluents can be easily implemented Surface drainage channels Concrete preparation plants Workers camp sewage treatment facility Disposal areas of earth fill or solid waste Fuel (Petrol. Oil and Grease) products storages Vehicle and machine repairing and servicing yards Discharge points from	Discrete grab sampling and laboratory testing of water samples.	Sampling and laboratory testing should be done on 3 month basis during the construction and monthly during operational time. Discharges from construction sites should be tested for temperature, pH, electrical conductivity, dissolved oxygen. Treated effluent discharges from workers camp to be tested for faecal coliforms, total coliforms, Ammonia, Biochemical Oxygen Demand (BOD5).

Receptor	Location	Monitoring Mechanism	Monitoring and Reporting Frequency
	commercial establishment, hotels and restaurants. Discharge points from residential areas.		Concrete production effluents to be tested for pH and temperature. Outlet and drains from mechanical repair units. include testing for pH, turbidity, lead, hydrocarbons, and oils.
Dust Emissions	Tracks along the earth roads. At communities close to the access roads.	Visual checks	Weekly during routine monitoring by activity monitors and reported on a monthly basis during the construction period
Noise Levels	Camp sites, Selected locations along the access tracks Construction sites of health, education and commercial buildings. Sensitive receptors like schools, hospitals and community centers along roads and commercial buildings during operation stage	Noise meter	Once prior to the start of construction and then on a monthly basis throughout the construction period. Quarterly Once during the operational stage.
Fumes and gases	Ambient air (w.r.t. proposed land use plan of Master Plan), Silencers of heavy machinery, trucks and other vehicles.	LANCOM-III emissions monitoring system. Monitoring of ambient air quality in ppb.	Monthly monitoring of air pollution parameters including the NOX, SOX, COX, Lead, Hydrocarbons during construction period and quarterly during operation stage.
Biological Environment			
Hunting of animals and birds	In all Project Area generally and at construction sites particularly.	Periodic visits of Project Area and in consultation with community to get feed back on hunting by Contractor as well as outsiders	Monthly during routine monitoring and reported monthly basis during the construction period and quarterly monitoring and reporting during operation period.
Socio-cultural Environment			
Relocation of private and public infrastructure	In all Project Area generally and roads at particularly before construction activities started	Consultations with PAPs	Monthly during relocation of infrastructure and reporting on monthly basis.
Inconvenience to community	All around the Project Area at near by communities	Consultations with community to get feed back for inconvenience due to construction activities to perform their daily routine matters	Monthly during construction period and monthly reporting only during construction period

TABLE 7-2 RECOMMENDED EFFECTS MONITORING PROTOCOL

Receptor	Location	Monitoring Mechanism	Monitoring and Reporting Frequency
Water Quality	Sampling from points located at a greater distance from the construction sites to ensure they show the influence on wider range of receiving body.	Sampling and laboratory testing of water samples from the receiving body.	Sampling and laboratory testing should be done on quarterly basis. Parameters to be monitored should be as per standards.
Air Quality	Hotels premises, residential colonies, schools, hospitals, etc. along roadsides	Ambient air quality monitoring in ppb.	Quarterly air quality monitoring for NOX, SOX, COX and Hydrocarbons.
Tree Cutting	Construction sites and near camp site at construction stage and plantation sites during operation stage	Visual checking and consultations with locals Generation rate of new plantation	Monthly during construction and quarterly during operation stage.
Compensation, resettlement and dispute resolution	Construction sites and restoration of borrow areas	Consultation with affected persons and owners of the land	Monthly during construction

7.7. ENHANCED EMMP PROVISIONS: THIRD-PARTY AUDIT, MILESTONE-BASED REPORTING, AND ENFORCEMENT MECHANISMS

The current Environmental Management and Monitoring Plan (EMMP) has been strengthened to address identified gaps related to independent verification, structured reporting, and enforceability of environmental compliance. In its existing form, the EMMP primarily relies on internal monitoring and periodic reporting, which may limit transparency and accountability, particularly for a project of the scale and sensitivity of Gulberg Residencia Phase-III. To enhance robustness, the revised EMMP introduces provisions for third-party environmental audits, whereby independent and qualified auditors will be engaged to periodically assess compliance with EIA approval conditions, NEQS, and EMMP requirements. These audits will be conducted on a bi-annual basis during construction and annually during operation, ensuring objective verification and identification of non-compliance issues.

To further strengthen accountability, a formal enforcement mechanism will be incorporated into contractual arrangements, including clearly defined penalties for non-compliance, corrective action timelines, and provisions for suspension of work in case of significant violations. A Non-Compliance Register (NCR) will be maintained to systematically track issues and their resolution. Collectively, these provisions will ensure that environmental safeguards are effectively implemented, monitored, and enforced throughout the project lifecycle, in line with national regulations and international best practices.

Table 3: Third-Party Audit, Milestone-Based Reporting, and Enforcement Mechanisms

Component	Description of Gap	Proposed Provision	Implementation Mechanism	Responsibility	Frequency / Timeline	Compliance / Enforcement Tool	Monitoring Indicators
Third-Party Environmental Audits	No independent verification of environmental compliance; reliance only on internal reporting	Introduce mandatory independent third-party environmental audits to verify compliance with EIA approval conditions, EMMP, and NEQS	Engage certified environmental audit firm; develop audit TOR aligned with PEPA and international standards (ADB/GCF)	Project Proponent; External Auditor	Bi-annual during construction; Annual during operation	Audit reports submitted to regulator (Pak-EPA/CDA); corrective action plans required for non-compliance	Number of audits conducted; non-compliance findings; % corrective actions implemented
Milestone-Based Environmental Reporting	Absence of structured reporting linked with project progress stages	Establish milestone-based reporting framework tied to key project phases (site clearance, infrastructure completion, commissioning, operation)	Integrate environmental reporting into project Gantt chart; link payments/approvals with environmental compliance milestones	Contractor (construction phase); Project Management Unit (PMU)	At defined milestones (e.g., 25%, 50%, 75% completion) and monthly progress reports	Approval of subsequent construction phases conditional on environmental compliance clearance	Timely submission of reports; compliance status at each milestone; delay due to environmental non-compliance
Monthly Environmental	Limited clarity on reporting structure	Strengthen MER format to include quantitative	Standardized MER templates including air, water, waste, OHS, and	Environmental Officer; Contractor	Monthly during construction; Quarterly during	Review and approval by PMU and regulatory	Air quality data; waste volumes; incidents recorded; mitigation

Reporting (MER)	and content	indicators, incident reporting, and compliance tracking	climate indicators		operation	authority; escalation for non-compliance	measures implemented
Enforcement Mechanisms	No defined consequences for non-compliance; weak accountability	Introduce enforcement framework including penalties, stop-work orders, and corrective action timelines	Include environmental clauses in contracts; define penalty structure (financial deductions, suspension of work)	Project Proponent; Contractor; Supervisory Consultant	Continuous throughout project lifecycle	Contractual penalties; withholding of payments; regulatory action by Pak-EPA/CDA	Number of violations; penalties imposed; compliance improvement trends
Corrective Action and Non-Compliance Management	No structured system for addressing violations	Develop Non-Compliance Register (NCR) and corrective action tracking system	Record all violations; assign corrective actions with timelines; follow-up verification	Environmental Officer; PMU	Continuous; reviewed monthly	Closure of NCR required before next milestone approval	Number of open vs closed NCRs; average closure time
Institutional Oversight and Coordination	Weak coordination with regulatory authorities	Establish formal coordination mechanism with regulators and local authorities	Periodic coordination meetings; submission of compliance reports to Pak-EPA and CDA	Project Proponent; Regulatory Authorities	Quarterly or as required	Regulatory inspections and compliance verification	Number of coordination meetings; regulatory feedback received
Public Disclosure	No provision for	Introduce public	Publish summary reports;	Project Proponent;	Quarterly	Public complaints	Number of grievances

and Transparency	stakeholder access to environmental performance	disclosure of key environmental reports and grievance redress mechanism	maintain grievance log; community engagement sessions	PMU	disclosure; continuous grievance handling	trigger investigation and corrective action	received/resolved; response time
Capacity Building and Training	Limited emphasis on environmental compliance capacity	Conduct regular training programs for contractors and staff on EMMP implementation and compliance	Training modules on NEQS, waste management, OHS, climate measures	Environmental Officer; External Experts	Quarterly during construction; Annual during operation	Training completion as prerequisite for site work authorization	Number of personnel trained; improvement in compliance performance

7.8. COMMUNICATION AND DOCUMENTATION PLAN

Effective communication, transparent reporting, and proper documentation are essential to ensure that environmental requirements of the Gulberg Residencia (Phase-III), Zone-V, Islamabad are fully complied with during construction and operation. This plan outlines how environmental information will be shared between the Supervising Consultant (SC), the Contractor, and Pak-EPA.

7.8.1. KICK-OFF MEETING

Prior to the commencement of construction activities, a formal kick-off meeting will be held at the Contractor's main site office. The objective of this meeting is to demonstrate that all pre-construction requirements defined in the EIA/EMP have been fulfilled and that all stakeholders including SC, the Contractor, and Pak-EPA's designated representative are fully prepared to start the project in accordance with approved environmental conditions.

7.8.2. MEETINGS AND REPORTS

Monthly environmental review meetings will be held at the construction site throughout the construction phase to provide a structured platform for reviewing project progress and environmental performance. These meetings will focus on assessing the status of construction activities, discussing environmental performance and any non-compliances identified by the Supervision Consultant (SC), and planning appropriate corrective or preventive measures where required. The SC will document the outcomes of these meetings through Monthly Environmental Reports (MERs), capturing key discussion points and environmental performance for the preceding month.

At a minimum, each MER will include a summary of construction progress, a record of the SC's and Contractor's environmental personnel deployed on site, an overview of monitoring activities conducted, and a list of identified non-compliances along with corresponding corrective actions. The meetings will be chaired by the SC's Environmental Officer and attended by representatives of the Contractor, ensuring coordinated environmental management and compliance throughout the construction period.

7.8.3. MONTHLY ENVIRONMENTAL REPORT

The Supervision Consultant (SC) will be responsible for compiling the Monthly Environmental Report (MER), consolidating the findings of both activity monitoring and effects monitoring. The MER will include a comprehensive summary of project work activities, details of monitoring schedules and deployed personnel, and results of field inspections and environmental monitoring. It will also document a statistical record of non-compliances, the implementation status of mitigation measures, records of social grievances and their resolution, change management logs, and data on water and fuel consumption.

The completed MERs will be submitted to the relevant concerned departments and will serve as inputs for the Quarterly Environmental Reports to be submitted to the Pakistan Environmental Protection Agency (Pak-EPA). In addition, hard copies of all MERs will be maintained at the Project Management Office for record-keeping and regulatory review.

7.8.4. SOCIAL COMPLAINTS REGISTER

To ensure timely and effective resolution of local community concerns, the Supervision Consultant (SC) will maintain a grievance register documenting the nature of each complaint, its location and date of receipt, and the actions taken to address and resolve the issue. The status of recorded grievances will be regularly reviewed during monthly coordination meetings and will be reported as part of the quarterly environmental submissions to the Pakistan Environmental Protection Agency (Pak-EPA).

7.8.5. CHANGE RECORD REGISTER

Any changes in project design or environmental commitments will be documented in a Change Management Register, in accordance with the EMP Change Management Plan. Approval from relevant authorities will be sought, where required.

7.8.6. NON-COMPLIANCE RECORD REGISTER

The Supervision Consultant (SC) will maintain a Non-Compliance Register to systematically record all instances where environmental requirements are not met. Each entry will document a clear description of the non-compliance, an analysis of

the underlying root causes, the corrective and preventive actions proposed or implemented, and the status of closure. An updated copy of the Non-Compliance Register will be appended to each Monthly Environmental Report (MER) to ensure transparency, follow-up, and regulatory accountability.

7.8.7. FINAL MONITORING REPORT

Upon completion of construction works, SC will prepare a Final Environmental Monitoring Report, covering:

- ✍ Overview of environmental monitoring program
- ✍ Natural resource usage (water, fuel, materials)
- ✍ Summary and analysis of non-compliances
- ✍ Documented environmental effects on communities, wildlife, and physical resources
- ✍ Lessons learned and recommendations for future development phases

This report will be submitted to Pak-EPA as a record of environmental performance.

7.8.8. PHOTOGRAPHIC RECORD

SC will maintain a comprehensive photographic record of all environmentally significant locations, including:

- ✍ Pre-construction conditions
- ✍ Relocation/compensation areas
- ✍ Camp sites and access roads
- ✍ Monitoring activities and mitigation installations
- ✍ Progressive rehabilitation works

These images will serve as visual evidence for compliance assessment and reporting.

7.9. CHANGE MANAGEMENT PLAN

The EIA for the Gulberg Residencia (Phase-III), Zone-V, Islamabad recognizes that certain modifications may become necessary during project implementation and operation. These changes may arise from new site-specific information, monitoring

results, regulatory requirements, or evolving environmental conditions. To ensure that any such adjustments are handled in a controlled and responsible manner, a formal Change Management Plan has been established. The plan addresses both:

- ✕ additions to the EMP, and
- ✕ modifications to project activities or operational practices that may trigger updates to the EMP.

7.9.1. ADDITIONS TO THE EMP

The EIA and EMP have been prepared using the most reliable information available at the time of assessment. However, environmental monitoring during construction and operation may reveal the need for additional mitigation measures to safeguard environmental quality. When such circumstances arise, the following procedure will be adopted:

- ✕ A formal coordination meeting will be convened between Pak-EPA's designated Environmental Officer, the Supervising Consultant (SC), and the Contractor to review the proposed addition and reach consensus on the need for modification.
- ✕ Following the meeting, a Change Report will be jointly prepared. The report will clearly specify the new environmental requirement(s), justification for the change, and the roles/responsibilities for implementation.
- ✕ The Change Report will be signed by all involved parties, thereby becoming a binding site-level environmental document. Copies will be circulated to the SC and Contractor head offices for record-keeping.
- ✕ Approval from Pak-EPA will be obtained before implementing any revised or additional EMP measures.
- ✕ All concerned project personnel will be briefed on the approved change(s), and implementation will be tracked through regular environmental monitoring.
- ✕ The SC will document all additions to the EMP in the Monthly Environmental Report (MER) for transparency and regulatory verification.
- ✕ This structured approach ensures that any enhancements to environmental safeguards are incorporated promptly and responsibly, without disrupting overall project progress.

7.9.2. CHANGES TO THE OPERATION

During construction or operation of the Gulberg Residencia (Phase-III), certain modifications to project activities may be required. The Change Management System

ensures that such modifications are screened, evaluated, documented, and approved at the appropriate level before implementation, so that environmental compliance is maintained at all times.

The Change Management Plan classifies modifications into three categories depending on their potential to alter environmental impacts:

7.9.2.1. FIRST ORDER

First Order Changes refer to any modification that causes a significant deviation from the project description or environmental impacts originally assessed in the EIA. These changes may result in new or increased environmental risks and therefore require formal reassessment and approval by Pak-EPA prior to implementation.

Under these circumstances, the SC, along with Pak-EPA's designated Environmental Officer, will reassess the potential environmental impacts of the proposed change and submit an updated impact assessment to Pak-EPA for review and approval.

7.9.2.2. SECOND ORDER

Second Order Changes are those that do not substantially alter the original project scope or create significant impacts beyond those assessed in the EIA. These changes may require additional mitigation or precautionary measures but do not necessitate a revised environmental approval.

In such cases, the SC's Environmental Officer will review the proposed modification, assess its potential environmental effects, recommend mitigation (if required), and provide a notification to the concerned department and Pak-EPA as part of routine documentation.

7.9.2.3. THIRD ORDER

Third Order Changes involve minor on-site adjustments made purely to reduce environmental impacts and remain fully within the EIA-assessed limits. These adjustments do not create any additional environmental effect, and no further approval is required. The only requirement is that such changes are properly logged in the Change Record Register for traceability.

7.10. TRAINING PROGRAM

Environmental training will form part of the environmental management system. The training will be directed towards all personnel for general environmental awareness.

7.10.1. OBJECTIVES

The key objective of training program is to ensure that the requirements of the EMP are clearly understood and followed throughout the Project. The trainings to the staff will help in communicating environmental related restrictions specified in the EIA and EMP.

7.10.2. ROLES AND RESPONSIBILITIES

EO will primarily be responsible for arranging environmental training to all Project personnel on potential environmental issues of the Project. Contractors will be responsible to arrange trainings and ensure the presence of targeted staff. EO will prepare a Project specific training manual for this purpose. Contractors on their part will be required to provide induction training/briefing to all their staff before the start of any activity in the Project Area. This will be followed by trainings arranged by EO to all the targeted staff.

7.10.3. TRAINING LOG

A training log will be maintained by EO. The training log will include;

- ✎ Topic
- ✎ Date, time and location
- ✎ Trainer/Resource person
- ✎ Participants

7.10.4. TRAINING NEEDS ASSESSMENT

In addition to the training specified in the training log special/ additional trainings will be provided during the Project activity. The criteria to assess the need of training will be based on the following:

- ✎ When a specified percentage of staff is newly inducted in the Project.

- ✕ When any non-compliance is repeatedly reported refresher training will be provided regarding that issue.
- ✕ When any incident/accident of minor or major nature occurs.
- ✕ Arrival of new contractor/sub-contractor
- ✕ Start of any new process/activity

7.10.5. **TRAINING MATERIAL**

EO will develop and prepare training material regarding environmental awareness, sensitivity of the area, EIA, EMP and restrictions to be followed during the Project. Separate training material will be prepared for each targeted staff.

TABLE 7-4 TRAINING PROGRAM

Staff	Contents	Timing
Selected management staff, SC staff and the construction Contractor staff	Environmental sensitivity of the Project area Wildlife, vegetation issues and related mitigation EMP communication, documentation and monitoring requirements Air and noise pollution control Waste disposal	Prior to the start of any major Project activity
Construction supervisors and survey crew	Environmental sensitivity of the Project Area Wildlife, vegetation & community issues and related mitigation EMP communication, documentation and monitoring requirements. Good construction practices Preservation of flora and fauna Community relations Air and noise pollution control	Before the start of construction activities, daily during tool box meeting
Drilling supervisors	Drilling waste disposal Landfill site operation Air and noise pollution control during the drilling operation	Prior to start of drilling operation
Drivers	Road safety Road restrictions Vehicle restrictions Waste disposal Defensive driving	Prior to start of drilling operation
Mechanics and Vehicle Repair Personnel	Environmental control of vehicles and equipment Waste disposal	Prior to start of the operation
Camp Staff	Camp operation Waste disposal Water consumption House keeping	Prior to start of the operation
Restoration and Clean-up team	Restoration requirements	Prior start of restoration activity

7.11. ENVIRONMENTAL MANAGEMENT AND MONITORING COST

7.11.1. ENVIRONMENTAL MANAGEMENT COST

Environmental management cost related with the mitigation measures of environmental parameters related to the location of camp site facilities, construction activities, borrow material, etc. will be the sole responsibility of the Contractor and he will take care of cost implications as it will be the part of his contract agreement.

The Project's environmental management cost related with the construction of environmental mitigation infrastructure like waste water treatment plant, solid waste management, storm water drainage, etc. are being carried out separately will be the part of Project estimate.

Operation and Maintenance cost of the environmental mitigation infrastructure will be borne by the CDA as well as concerned departments responsible for operation and maintenance of the concerned facilities.

7.11.2. ENVIRONMENTAL MONITORING COST

The environmental monitoring at pre-construction stage and other in-house monitoring to be carried out by the Contractor(s) will be a part of his contract agreement. Similarly, the environmental monitoring to be carried out during the construction stage by the SC will be the part of their contract agreement. The environmental monitoring cost for the complete project will be PKR 1.9 million.

7.11.3. TRAINING COST

The Project training will be imparted at different stages and different staff levels. A lump sum amount of Rs. 1,920,000 may be allocated for this purpose.

TABLE 7-5: ESTIMATED BUDGET COST FOR THE IMPLEMENTATION OF EMMP OF THE PROJECT

Investment and Recurrent Cost	Units/ No. of Samples	Unit Cost specification	Cost (Rs)
A – Institutional Setup Cost			
Environment Officer @ 30,000 pm	12months	Monthly investment and operation cost	360,000
Equipment for field inspection	Lump sum	1 Digital Camera, 1 laptop and accessories	200,000
Recurrent cost	Lump sum	O&M for vehicle, telephone and printing	150,000
Sub Total A			710,000

B - Environmental Monitoring Activities (Base Line Sampling)			
Ambient Air Quality Monitoring	-	Lump sum	100,000
Ambient Water Quality Monitoring	-	Lump sum	100,000
Noise Levels	-	Lump sum	10,000
Sub Total B			210,000
C. External Monitoring	2	@ 150,000	300,000
D. Environmental Training	2	@ 50,000	100,000
E. Tree Plantation Cost	3,000	@ 150 per Plant	450,000
Sub Total (B-E)			1,000,000
Grand Total (A-E) Rs.			1,920,000

8. Climate Risk Assessment, Greenhouse Gas Emissions and Carbon Management Plan

8.1. INTRODUCTION

This chapter has been developed to address the identified gaps in the Environmental Impact Assessment (EIA) concerning greenhouse gas (GHG) emissions, carbon footprint estimation, and climate resilience considerations. The Gulberg Residencia Phase-III development, located in Zone V of Islamabad, represents a large-scale peri-urban housing expansion within a climatically sensitive and rapidly transforming landscape. Given the increasing frequency of extreme weather events, rising temperatures, and growing stress on water resources in the Islamabad–Rawalpindi region, it is essential to systematically integrate climate considerations into the project design, implementation, and operational phases.

The analysis presented in this chapter is aligned with internationally recognized methodologies, including the GHG Protocol and Intergovernmental Panel on Climate Change (IPCC) guidelines, and is contextualized within Pakistan's national climate policy framework, particularly the Nationally Determined Contributions (NDCs). In addition, the approach reflects emerging requirements of development partners such as the Asian Development Bank (ADB) and the Green Climate Fund (GCF), which emphasize climate risk screening, emissions accounting, and resilience planning as integral components of environmental assessment processes. The chapter therefore provides a structured framework for quantifying emissions, assessing climate risks, and identifying mitigation and adaptation measures tailored to the specific conditions of Gulberg Residencia.

8.2. GREENHOUSE GAS (GHG) EMISSIONS ASSESSMENT

8.2.1. CONSTRUCTION PHASE EMISSIONS

The construction phase of Gulberg Residencia is expected to generate a measurable level of greenhouse gas emissions due to the scale of infrastructure development and associated activities. A screening-level quantification will be undertaken to estimate emissions arising from key sources, including diesel consumption by construction machinery and equipment, transportation of materials

and workforce, and the embodied carbon associated with major construction inputs such as cement, steel, and asphalt.

The estimation methodology will rely on standard emission factors derived from IPCC guidelines and regionally applicable datasets. Emissions will be calculated and presented in terms of tonnes of carbon dioxide equivalent (tCO₂e) on both an annual basis and over the total construction period. Given the nature of the project, it is anticipated that embodied emissions from construction materials, particularly cement and steel, will constitute a significant proportion of the overall carbon footprint during this phase. This assessment will provide an initial baseline for identifying opportunities to reduce emissions through material efficiency, improved logistics, and low-carbon construction practices.

8.2.2. OPERATIONAL PHASE EMISSIONS

The operational phase represents the long-term emissions profile of the housing scheme and is closely linked to patterns of energy use, mobility, and resource consumption within the development. The assessment will estimate annual emissions from electricity consumption using Pakistan's grid emission factors, as well as from natural gas usage where applicable. In addition, emissions associated with traffic generation, both within the housing scheme and in its immediate surroundings, will be considered, reflecting the anticipated increase in vehicular movement as the area becomes fully occupied.

Further contributions to operational emissions will arise from solid waste generation, particularly methane emissions from organic waste, and from wastewater treatment processes where sewage treatment plants (STPs) are operational. The analysis will provide a sector-wise breakdown of emissions, enabling identification of key emission drivers and informing targeted mitigation strategies. The results will be expressed in tCO₂e per year, forming the basis for long-term carbon management and monitoring.

8.2.3. CARBON INTENSITY ANALYSIS

To facilitate a more meaningful interpretation of emissions data, the revised EIA will include a carbon intensity analysis that normalizes total emissions against relevant metrics. This will include the calculation of per capita emissions, expressed as tCO₂e per person per year, and emissions per unit area, expressed as tCO₂e per

kanal or hectare. These indicators will allow for comparison with similar residential developments and provide insight into the relative carbon efficiency of the project.

Where data is available, benchmarking will be undertaken against typical urban residential schemes in Pakistan, recognizing that such comparative datasets may be limited. Nonetheless, this analysis will support the identification of performance gaps and highlight opportunities for improving carbon efficiency through design and operational interventions.

8.3. CLIMATE RISK AND RESILIENCE ASSESSMENT

The geographic location of Gulberg Residencia in Zone V, in proximity to natural drainage systems such as the Korang River and associated nullahs, exposes the project to a range of climate-related risks. These include rising temperatures, increased frequency of intense rainfall events, and growing water scarcity. A dedicated climate risk assessment will therefore be conducted using available national datasets from institutions such as the Pakistan Meteorological Department (PMD), National Disaster Management Authority (NDMA), and Pakistan Council of Research in Water Resources (PCRWR), supplemented by standard screening methodologies.

8.3.1. URBAN HEAT ISLAND (UHI) EFFECT

The development of large residential areas with significant built-up surfaces has the potential to intensify the urban heat island effect, resulting in elevated local temperatures and reduced thermal comfort. The assessment will examine the balance between built-up areas and green cover within the project layout and identify zones that are particularly vulnerable to heat accumulation, such as densely constructed residential clusters and extensive paved surfaces.

Mitigation measures will focus on enhancing urban greenery through plantation of native species, incorporating cool and reflective materials in roofing and paving, and optimizing building orientation and ventilation to improve airflow. In addition, minimum green space ratios will be integrated into planning standards to ensure sustained thermal regulation over the long term.

8.3.2. FLOOD RISK AND STORMWATER MANAGEMENT

Flood risk assessment will consider both pluvial flooding, resulting from intense rainfall, and fluvial flooding associated with nearby water bodies. The analysis will review site topography, natural drainage patterns, and historical rainfall data, alongside projected climate scenarios, to evaluate the potential for flooding and waterlogging within the development.

Mitigation measures will include the design of stormwater drainage systems capable of handling extreme rainfall events, the incorporation of detention and retention structures to manage runoff, and the establishment of buffer zones along natural waterways. Nature-based solutions, such as bioswales and permeable surfaces, will be integrated to enhance infiltration and reduce surface runoff, thereby improving overall drainage performance.

8.3.3. WATER STRESS AND RESOURCE SUSTAINABILITY

Water availability is a critical concern for the long-term sustainability of the project, particularly in light of increasing variability in rainfall and declining groundwater levels in the region. The assessment will evaluate current and projected water demand, groundwater dependency, and recharge potential, identifying potential gaps between supply and demand.

To address these challenges, a combination of demand-side and supply-side measures will be implemented. These include rainwater harvesting systems at both plot and community levels, the use of water-efficient fixtures, and the recycling of treated wastewater for non-potable applications such as landscaping. Groundwater recharge interventions will also be incorporated to enhance aquifer sustainability and reduce long-term water stress.

8.4. CARBON FOOTPRINT ASSESSMENT

A comprehensive carbon footprint assessment will be developed for the project, integrating emissions from both construction and operational phases. This assessment will quantify total lifecycle emissions in tCO₂e, as well as annual emissions and intensity indicators. By consolidating emissions data across all major sources, the analysis will provide a clear baseline against which future performance can be measured.

The carbon footprint will serve as a critical tool for identifying emission reduction opportunities and tracking progress over time. It will also support alignment with national and international climate commitments, including Pakistan's NDC targets,

and facilitate potential engagement with climate finance mechanisms where applicable.

8.5. CLIMATE RESILIENCE AND LOW-CARBON ACTION PLAN

An integrated Climate Resilience and Carbon Management Plan will be incorporated into the Environmental Management and Monitoring Plan (EMMP), combining mitigation and adaptation strategies to enhance the overall sustainability of the project.

Mitigation measures will focus on reducing emissions through the promotion of solar photovoltaic systems, energy-efficient infrastructure such as LED street lighting and efficient pumping systems, and improved transport planning to encourage non-motorized mobility. Solid waste management practices, including segregation and composting, will be implemented to reduce methane emissions.

Adaptation measures will address climate risks through the development of heat-resilient urban design features, flood-resilient infrastructure, and water conservation systems. These measures will be integrated into the overall planning and design framework, ensuring that resilience is embedded within the project from the outset.

8.6. MONITORING, REPORTING, AND INSTITUTIONAL ARRANGEMENTS

Effective implementation of the proposed measures will require a robust monitoring and reporting framework. Climate-related indicators, such as green cover percentage, water reuse rates, and energy consumption trends, will be incorporated into the EMMP. These indicators will enable ongoing tracking of environmental performance and support evidence-based decision-making.

Institutional responsibilities will be clearly defined, with the project proponent responsible for overall implementation and an Environmental Officer designated to oversee monitoring and reporting. During the construction phase, contractors will be required to comply with site-specific environmental management plans and reporting requirements.

Periodic environmental monitoring reports will be prepared, and a system of adaptive management will be established to allow for adjustments based on monitoring results and evolving climate conditions. This approach will ensure that the project remains responsive to emerging risks and continues to meet regulatory and sustainability objectives.

9. ENVIRONMENTAL PLANS

9.1. OVERVIEW OF SOLID WASTE GENERATION

Domestic and commercial solid waste comprises all non-gaseous and non-liquid wastes generated from residential, commercial, institutional, and community-based activities. Effective management of solid waste covering collection, segregation, treatment, reuse, recycling, and final disposal is essential from a public health, environmental protection, and urban aesthetics perspective. In the absence of proper waste management systems, indiscriminate dumping within populated areas can lead to serious health risks, environmental degradation, and visual blight.

The quantity and composition of solid waste generated by a community are strongly influenced by its socio-economic characteristics, consumption patterns, and lifestyle. In Pakistan, per capita solid waste generation has been steadily increasing due to rapid urbanization, economic growth, and technological change. Solid waste typically consists of plastic and rubber, metals, paper and cardboard, textiles, food and animal waste, yard waste, wood, bones, stones, excreta, and fine particulates in varying proportions.

9.2. NATIONAL SOLID WASTE MANAGEMENT CONTEXT

A study jointly conducted by the Pakistan Environmental Protection Agency (Pak-EPA) and the Japan International Cooperation Agency (JICA) in October 2004 estimated that approximately 55,000 tons of solid waste are generated daily in urban areas of Pakistan, of which only about 60 percent is collected by municipal authorities. Due to limited improvements in waste management infrastructure particularly in Islamabad these figures are considered broadly representative of current conditions. The city has limited engineered landfill capacity, and waste is often disposed of in open or informal dumping sites without segregation, compaction, or leachate control, exacerbating environmental and public health risks.

9.3. ENVIRONMENTAL IMPACTS OF POOR SOLID WASTE DISPOSAL

The environmental impacts associated with improper solid waste management can be broadly categorized into two groups: impacts resulting from poor disposal practices, and stress on natural resources due to excessive waste generation.

9.3.1. IMPACTS OF POOR DISPOSAL PRACTICES

Improper handling and disposal of solid waste can result in:

- ✗ Exposure of waste collectors and municipal staff to hazardous materials due to mixing of hazardous and municipal waste, often without adequate personal protective equipment;
- ✗ Pollution of surface and groundwater resources, soil contamination, and generation of toxic fumes from uncontrolled waste disposal;
- ✗ Nuisances such as foul odors, proliferation of flies, mosquitoes, rats, and rodents;
- ✗ Increased public health risks due to the creation of breeding grounds for disease vectors;
- ✗ Degradation of visual and aesthetic quality due to scattered and airborne waste; and
- ✗ Blockage of drainage channels and sewerage systems, leading to flooding and sanitation problems.

9.3.2. STRESS ON NATURAL RESOURCES

Excessive waste generation places significant pressure on natural resources, as production and consumption processes require land, water, energy, raw materials, and chemicals. These pressures can be reduced by minimizing unnecessary consumption, promoting reuse and recycling, and adopting environmentally sustainable alternatives. Although scientifically designed landfills can mitigate some impacts and allow eventual land reclamation, minimizing waste at source reduces the demand for landfills and associated environmental burdens.

9.4. CONSTRUCTION PHASE SOLID WASTE STREAMS

During the construction phase, the project is expected to generate a wide range of solid and hazardous waste streams, including vegetation cleared during site preparation; paper and cardboard from packaging and site offices; wood waste from formwork, scaffolding, and packaging; masonry and ceramic debris; surplus construction materials such as aggregates and bricks; and metal waste including scrap steel, containers, and reinforcement off-cuts. Additional waste streams may include plastics, styrofoam, glass, insulation materials, excess soil and sand, and organic waste from on-site kitchens.

Hazardous and special wastes may also be generated in limited quantities, such as waste oil and grease, chemicals and paints, batteries, oily rags, contaminated soil,

discarded electrical cables, and minor quantities of clinic or medical waste from site health facilities.

9.5. OPERATIONAL PHASE SOLID WASTE STREAMS

During the operational phase, solid waste generation will be predominantly municipal in nature. Expected waste types include organic kitchen waste and food leftovers, newspapers and other paper products, cotton and textile waste, floor sweepings, cardboard cartons, wooden packaging, disposable paper plates and cups, assorted packaging materials, and obsolete or discarded household appliances from residential units.

9.6. ESTIMATED SOLID WASTE GENERATION

Based on urban waste generation benchmarks, solid waste generation for the project has been estimated at approximately 0.8 kg per capita per day. Assuming an average daily presence of 164,976 persons, including residents, visitors, retail employees, and management staff, the total solid waste generation within the project area is estimated at approximately 159,980 kg per day. The largest contribution originates from residential areas, followed by commercial, institutional, and recreational activities.

9.7. SOLID WASTE MINIMIZATION AND MANAGEMENT MEASURES

To minimize environmental impacts and ensure safe handling and disposal of solid waste, the following measures shall be implemented during both construction and operation phases:

- ✎ Engagement of licensed waste management contractors during construction for collection and disposal of solid waste;
- ✎ Contractual obligations for waste contractors to ensure environmentally sound handling, transportation, and disposal;
- ✎ Extension of municipal solid waste collection services to the project area upon commencement of operations;
- ✎ Provision of designated waste collection points and rubbish depots throughout the estate;
- ✎ Promotion of waste minimization through reduced packaging and return of packaging materials to suppliers for reuse;
- ✎ Regular transportation of collected waste to approved municipal landfill sites;

- ✕ Segregation of waste at source to facilitate safe disposal and recycling;
- ✕ Awareness campaigns encouraging paper reuse, reduced waste generation, and responsible disposal practices;
- ✕ Posting of informational signage in public buildings promoting waste minimization; and
- ✕ Separate collection and disposal of recyclable materials through licensed recycling contractors and industries.

A dedicated solid waste sub-contractor will be engaged to manage solid and liquid waste in an environmentally responsible manner. Recyclable materials will be separated and sold to authorized recycling industries, supporting resource recovery and reduction of landfill burden.

9.8. TRAFFIC AND TRANSPORTATION MANAGEMENT PLAN

There shall be increase in vehicular traffic in the project area and around the project site as construction commences. These vehicles could possibly include excavators, bulldozers , tractors, graders, rollers, dumpers and loaders, wheel loaders, heavy duty vehicles, water tankers, and jeeps and cars for project supervisors and engineers. The exact number of such vehicles shall vary according to pace of construction. However, using the rule of thumb for projects of such size, there shall be a maximum of five to ten vehicles visiting the site per day at the peak of construction. Traffic Police will be approached to obtain counsel for movement of oversized vehicles carrying equipment to the project site. It will be ensured that such movement takes place during off-peak hours or on holidays and never at night. The proponent shall instruct the contractor that least possible disturbance is created from operation of construction vehicles. Measures to reduce disturbance shall include:

- ✕ Separate parking space shall be demarcated at the project site for parking of construction vehicles;
- ✕ Construction vehicles shall not park or queue up on any road close to the project site;
- ✕ All vehicles carrying construction materials and supplies shall reach the project site from the north via Murree Road, or from the south through Lehtrar Road, so that vehicles do not affect city traffic;
- ✕ The drivers shall be under strict instructions to bypass heavily populated areas;
- ✕ Such vehicles shall time their arrivals and departures during off-peak hours, and

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- ✎ Drivers of these vehicles shall be barred from blowing horn at the project site or on the roads.

The project site is in close proximity to two forty feet wide four-lane dual carriageways with broad hard shoulders, and which will ultimately be widened further when need arises. The area is thus well covered in terms of access and ability to absorb additional traffic load. Traffic count at the project site and nearby locations on a twenty-four hour basis is shown in table below. The counts included all mechanical vehicles, such as cars, buses, trucks, vans, and motor-cycles etc., and did not include bicycles or other forms of non-mechanical traffic.

The only component of the proposed project is residential, and thus vehicular activity at the estate shall be more or less constant throughout, with vehicular activity increasing during peak traffic hours of the day corresponding to school and office times. Gulberg Residencia impact on local traffic has thus to be reckoned mainly according to usual daylight hours, early morning, afternoon and early evening. It is not possible at this stage to assess how many vehicles shall frequent the estate during a day and how long they shall remain at the premises. An accurate traffic count can only be taken when the project is fully colonised. As such, only an estimate based on various assumptions can be attempted at this stage of the project. Secondly, there is no scientific yardstick to determine how many times vehicles of residents shall enter, leave and re-enter the premises. Thirdly, it cannot be assessed either as to how many people shall visit the project area. If there is a high standard school within the project area, the number of vehicles entering from outside during school hours can throw any estimate way off the target.

The starting point to calculate additional traffic load as a result of project operation is the number of maximum residential units. The layout plan caters for 12,477 residential units for single family homes. Based on plot price and profile of future residents, each dwelling is expected to have at least 2.25 vehicles per family after factoring in some houses that may have independent ground and first floor residents. Then the question arises as to how many visitors there shall be at the estate during a normal day. There is no way to predict the number of visitors and an accurate count can be made only on operation. Further, some visitors may come again and again. The best way to estimate the number of visitors at a housing estate and the number of times that residents leave and come back is to take a traffic count at fully colonised housing colonies of similar nature.

Based on data collected, vehicular activity during a normal working day at the proposed project, worked out by a management specialist, is shown in the following table. The calculations are not conservative and based on the following assumptions:

- ✎ 12,477 residential units are likely to have 2.25 vehicles per dwelling at an average;
- ✎ It is expected that the residents shall make at least 1.5 per day at an average from the premises;
- ✎ It is anticipated that 383 dwellings shall receive at least 1.5 visiting vehicles per day;
- ✎ It is expected that visitors shall make at least 1.25 per day at an average to and from the scheme;
- ✎ The total number of retail units is 25, each of which is likely to have at least 1.5 vehicles, leaving the scheme at the same rate per day;
- ✎ Each employee at the management office is likely to have a vehicle, adding twenty to the local pool, and entering the scheme at the rate of 1.5 times per day;
- ✎ At least two vehicles from the utilities service shall frequent the scheme daily, and
- ✎ Service deliveries shall add at an average five vehicles per day to the scheme traffic.

Based on the aforesaid assumptions, vehicular activities generated by the project at full colonisation would be as under:

TABLE 9-1: VEHICULAR ACTIVITY AT THE PROJECT

Description	Number of units	Rate	Number of vehicles	Frequency of visits	Traffic added
Dwellings	12,477	2.25	28,073	1.5	42,109
Visitors					
Retail Units	25	1.5	38	1.5	42
Management Office Staff	20	1	20	1.5	30
Management Office Vehicles	2	---	2	2	4
Utilities Services	2	---	2	4	8
Service Deliveries	5	---	5	2	10
TOTAL	---	---	28,140	---	42,203

The following measures shall be taken by the proponents to manage additional traffic added as a result of the operation of the proposed project:

- ✎ Security guards shall make sure that vehicles leaving the scheme join traffic on the access roads in an orderly manner and do not obstruct oncoming traffic;
- ✎ Employees arriving on public transport shall not insist on being dropped at the mouth of the access roads and shall alight at designated bus stops;
- ✎ Management Office shall advise residents and retail units to instruct their drivers not to blow horn indiscriminately;
- ✎ Visitors shall park their vehicles within the compounds of residential units so that there is minimal street parking;
- ✎ Taxis shall not be permitted to linger or loiter outside or close to the main entrance of the estate;
- ✎ Residents shall be encouraged, through circulars and notices from Management Office to keep their vehicles tuned so that these vehicles do not generate unwanted emissions;
- ✎ Residents shall also similarly be encouraged to pool vehicles to curtail the number of vehicles that frequent the estate on a permanent basis;
- ✎ Security guards shall regulate incoming traffic in such a way that vehicles intending to enter the estate do not generate long queues on the access roads, and

In order to facilitate the above, vehicles belonging to residents and retail establishments shall be provided with stickers so that stickered vehicles are flagged through without delay.

9.9. HEALTH AND OCCUPATIONAL SAFETY

Inconvenience and discomfort for workers and accidents resulting from careless construction practices can result in disruption of project implementation, as also socio-economic issues. Although it is the responsibility of the construction contractor to ensure occupational safety for workers, the proponents have given explicit instructions for observance of occupational safety and to abide by labour and safety standards.

These work-related hazards are universally-accepted and although subject to review and updating, these have been catalogued by the International Labour Organisation. There are no health hazards at the site that can impact unfavourably on the workers or immediate neighbours. Nonetheless, the following measures shall be taken by the contractors, under the supervision and inspection of the proponents, to enforce compliance of health and safety standards:

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- ✕ Workers will be briefed about health hazards and all precautions that must be taken during construction;
 - ✕ Wages shall be disbursed on time;
 - ✕ Wages shall not be below minimum wage;
 - ✕ There shall be no bonded labour;
 - ✕ There shall be no child labour;
 - ✕ Women workers, if any, shall be paid standard market wages, at least equal to minimum wage;
 - ✕ The contractor will maintain a register of wages, which shall be open for inspection by the proponents;
 - ✕ No deductions shall be made from wages unless prior arrangement in writing has been made with workers regarding provision of services and benefits;
 - ✕ All labour and occupational safety laws and regulations shall be fully observed;
 - ✕ Working hours shall be according to the law of the land;
 - ✕ In case labourers, masons and other employees are made to work beyond normal hours, they shall be paid overtime according to the law of the land;
 - ✕ Workers shall be insured against accidents under the relevant labour laws;
 - ✕ Hard hats shall be worn by all workers and foremen at all times at the project site;
 - ✕ The contractors will prepare an emergency plan so as to be fully prepared for an emergency situation;
 - ✕ All medicinal needs of the workers, if any, will be attended to on top priority;
 - ✕ Adequate first-aid arrangements shall be made at the project site as immediate relief in case of an accident;
 - ✕ A number of fire extinguishers and other fire-fighting equipment shall be present at the premises;
 - ✕ In such case, there shall be a strict code of conduct regarding interaction with female workers;
 - ✕ Masks will be available for workers to avoid dust inhalation;
 - ✕ The construction contractor is contractually bound to show labour wages (returns of labour) accounts to the proponents, and
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- ✕ There shall be no night, Sunday or holiday work without prior permission of the proponents and without payment of applicable wage rates.

9.10. EMERGENCY AND FIRE-FIGHTING PROTOCOLS

Gulberg Residencia would be susceptible to a fire hazard and other emergencies. A fire could be caused through negligence or accident within the project area or igniting nearby trees and shrubs because of heat or accident, negligence or criminal intent. Since the size of the housing scheme is not such that a separate fire brigade service must be established at the site, other fire-fighting measures would be sufficient to manage a fire threat. Other emergencies could be an earthquake, flood, health epidemic and terrorist activity, or any other unforeseen calamity. Therefore, appropriate protocols would be employed to reduce the risk and manage an emergency situation in order to ensure safety of residents.

7.3.1 Fire-fighting Regimes

Capital Development Authority's building and town planning regulations specify that every public facility must be provided with sufficient means to extinguish fire. Sufficient fire prevention and fire-fighting measures have been incorporated into the project design. The proposed project shall be equipped with adequate fire-fighting measures in the form of fire hydrants at appropriate places within the scheme, from where fire tenders can access water to counter a fire situation. The fire hydrants shall draw water from the overhead and underground water tanks. A central alarm shall signal fire alerts whenever there is a fire situation within the proposed housing scheme. The nearest fire brigade is located close to Zero Point in Islamabad, which can be called upon in the event of a fire emergency. Fire-proof clothing and fire-fighting equipment shall be placed at maintenance offices and guard rooms.

7.3.3 Other Emergencies

There could also be other emergencies, such as earthquakes, epidemic, pest attack or terrorist activity. The Management Office shall devise a list of all possible emergencies and prescribe reaction, response and evacuation procedures for all such contingencies. Security Guards shall also be trained to act in case of all possible emergency situations and shall follow protocols defined within the evacuation plan. The fire alarms can be activated to signal evacuation. At the same time, communication shall be made with hospitals, emergency services and police for urgent support.

9.11. CUMULATIVE TRAFFIC IMPACT ASSESSMENT

This chapter has been developed to address the identified gap in the EIA regarding the absence of a quantitative assessment of cumulative traffic impacts and associated air quality implications. Gulberg Residencia Phase-III is strategically located along the Islamabad Expressway corridor, one of the busiest arterial routes connecting Islamabad and Rawalpindi. The corridor already experiences significant traffic pressure due to rapid urbanization, commercial expansion, and residential developments in Zone V and adjoining areas.

Available traffic data and planning studies for Islamabad indicate that the Expressway currently carries traffic volumes exceeding 80,000–100,000 vehicles per day (vpd) on certain stretches, with peak hour volumes approaching or exceeding design capacity at key intersections. In this context, the addition of traffic generated from Gulberg Residencia and other nearby developments necessitates a comprehensive, quantitative Traffic Impact Assessment (TIA) coupled with an Air Quality Impact Assessment (AQIA) to evaluate cumulative impacts and ensure compliance with environmental standards.

9.12. TRAFFIC IMPACT ASSESSMENT (TIA)

9.12.1. BASELINE TRAFFIC CONDITIONS

A detailed baseline traffic assessment will be undertaken to establish the current performance of the road network surrounding Gulberg Residencia. Traffic surveys will be conducted along the Islamabad Expressway, at major access points to the housing scheme, and at critical intersections connecting to feeder roads.

The surveys will include classified traffic counts, capturing different vehicle categories such as cars, motorcycles, buses, and heavy vehicles. Peak hour traffic flows will be recorded for both morning and evening periods, typically ranging between 7:30–10:00 AM and 4:30–7:30 PM, when traffic demand is highest. In addition, travel speeds, delays, and queue lengths will be measured to determine the operational efficiency of the corridor.

Preliminary observations from similar corridors in Islamabad suggest that average travel speeds during peak hours can drop to 20–30 km/h, compared to free-flow speeds of 60–70 km/h. The Level of Service (LOS) at major intersections along the Expressway is often observed at LOS D to LOS E, indicating unstable flow

conditions and high congestion levels. This baseline will provide a reference against which future impacts can be assessed.

9.12.2. TRAFFIC GENERATION AND DISTRIBUTION

The traffic generation potential of Gulberg Residencia will be estimated based on projected population and housing units within Phase-III, as well as previously approved phases. Assuming an average household size of 5–6 persons and a vehicle ownership rate of approximately 0.6–0.8 vehicles per household in Islamabad, the development is expected to generate a substantial number of daily trips.

Using standard residential trip generation rates, the project may generate approximately 6–8 trips per household per day, resulting in thousands of additional trips being introduced to the road network once the development reaches full occupancy. These trips will include work commutes, school travel, commercial activities, and service-related movements.

Traffic distribution modeling will allocate these trips across the Islamabad Expressway, internal roads within Gulberg Residencia, and connecting feeder roads. Given the location of the project, a significant proportion of traffic is expected to merge onto the Expressway, thereby contributing to existing congestion levels.

9.12.3. CUMULATIVE TRAFFIC IMPACT ANALYSIS

The cumulative impact assessment will consider not only the traffic generated by Gulberg Residencia Phase-III but also contributions from earlier phases and other ongoing or planned developments in Zone V. Future traffic scenarios will be developed for:

- ✎ Without Project Scenario (baseline future growth)
- ✎ With Project Scenario (including cumulative development impacts)

Traffic growth rates in Islamabad are typically estimated at **5–7% per annum**, reflecting rapid motorization and urban expansion. Under these growth conditions, traffic volumes on the Islamabad Expressway could increase significantly over the next 10–15 years, potentially exceeding 120,000–150,000 vehicles per day on critical segments.

The analysis will evaluate changes in traffic volumes, travel speeds, and Level of Service at key intersections. It is anticipated that, without mitigation, several intersections may degrade to LOS E or LOS F, indicating severe congestion, long delays, and reduced network efficiency. Congestion hotspots are likely to emerge at entry/exit points of the housing scheme and at signalized intersections along the Expressway.

9.12.4. MITIGATION AND TRAFFIC MANAGEMENT MEASURES

Based on the assessment findings, a range of mitigation measures will be proposed to manage traffic impacts and maintain acceptable levels of service. These measures will include the upgradation of access points, provision of dedicated turning lanes, and signalization improvements at critical intersections.

In addition, the development will incorporate service roads and internal circulation planning to minimize direct conflict with through traffic on the Expressway. The promotion of public transport options and non-motorized transport (walking and cycling infrastructure) will also be considered to reduce reliance on private vehicles.

A phased development approach will be adopted, linking occupancy levels with the implementation of road infrastructure improvements. This will ensure that traffic demand does not exceed available capacity at any stage of project development.

9.13. AIR QUALITY IMPACT ASSESSMENT (AQIA)

9.13.1. BASELINE AIR QUALITY ASSESSMENT

Baseline air quality monitoring will be conducted at representative locations along the Islamabad Expressway and within the project vicinity. Key pollutants to be measured include PM_{2.5}, PM₁₀, nitrogen dioxide (NO₂), sulfur dioxide (SO₂), and carbon monoxide (CO).

Existing studies in Islamabad indicate that particulate matter concentrations, particularly PM_{2.5}, often exceed WHO guideline values of 5 µg/m³ (annual mean) and may range between 35–80 µg/m³ in urban areas, depending on season and traffic conditions. These levels are also frequently above Pakistan's National Environmental Quality Standards (NEQS), highlighting the need for careful management of additional emission sources.

The baseline assessment will establish current pollution levels and identify sensitive receptors such as residential areas, schools, and healthcare facilities.

9.13.2. EMISSION ESTIMATION (TRAFFIC AND CONSTRUCTION)

Emission estimation will be carried out for both construction and operational phases. During construction, emissions will primarily arise from diesel-powered equipment and dust generated from earthworks and material handling. These emissions are typically short-term but can be significant if not properly managed.

During the operational phase, vehicular emissions will constitute the primary source of air pollution. Emission factors specific to Pakistan's vehicle fleet, including fuel types and engine technologies, will be applied to estimate pollutant loads. These emissions will be quantified in grams per kilometer (g/km) and aggregated to estimate total emissions in tonnes per year (t/year).

Given the projected increase in traffic volumes, emissions of NO₂ and particulate matter are expected to increase proportionally, particularly during peak hours when congestion leads to higher fuel consumption and idling.

9.13.3. DISPERSION MODELING AND IMPACT PREDICTION

A screening-level dispersion model will be used to predict the spread and concentration of pollutants in the surrounding environment. The model will consider factors such as traffic volume, emission rates, meteorological conditions (wind speed, direction), and terrain characteristics.

Predicted concentrations will be evaluated at sensitive receptors, including residential areas within Gulberg Residencia and along the Expressway corridor. Incremental increases in pollutant levels due to project-related traffic will be assessed and compared against NEQS and WHO air quality guidelines.

Preliminary estimates suggest that localized increases in PM and NO₂ concentrations may occur near high-traffic zones; however, with appropriate mitigation measures, these increases can be maintained within acceptable limits.

9.13.4. MITIGATION MEASURES FOR AIR QUALITY

Mitigation measures will be implemented to minimize air quality impacts during both construction and operation. During construction, dust suppression techniques such as regular water sprinkling, covering of material stockpiles, and controlled vehicle movement will be adopted. Construction equipment will be regularly maintained to ensure efficient combustion and reduced emissions.

During the operational phase, measures will focus on improving traffic flow to reduce congestion and associated emissions. The promotion of cleaner fuels, adoption of fuel-efficient vehicles, and development of green buffers along roads and within the housing scheme will help to absorb pollutants and improve ambient air quality.

9.14. INTEGRATION WITH EMMP AND MONITORING

The findings of the Traffic Impact Assessment will be integrated into the Environmental Management and Monitoring Plan (EMMP). This will include provisions for periodic traffic surveys, monitoring of Level of Service at key intersections, and regular air quality monitoring at selected locations.

Institutional responsibilities will be defined for coordination with the Capital Development Authority (CDA) and traffic management authorities to ensure effective implementation of mitigation measures. Monitoring data will be used to inform adaptive management, allowing for timely interventions in response to changing conditions.

10. CONCLUSIONS AND RECOMMENDATIONS

10.1. CONCLUSIONS

This Environmental Impact Assessment (EIA) has been conducted for the Revised & Extended Layout Plan of Gulberg Residencia (Phase-III), Zone V, Islamabad, in accordance with the requirements of Section 12 of the Pakistan Environmental Protection Act, 1997, the IEE/EIA Regulations, 2000, and relevant guidelines issued by the Pakistan Environmental Protection Agency and the Capital Development Authority. The assessment has comprehensively examined the project's planning, construction, and operational phases, with due consideration given to the physical, biological, and socio-economic environment of the project area and its surroundings.

The baseline environmental assessment indicates that the project area largely comprises undeveloped land with scattered vegetation, limited ecological sensitivity, and no presence of protected habitats or species of conservation concern. Existing surface and groundwater resources, climatic conditions, soil characteristics, and ambient air and noise quality have been documented to establish pre-project conditions. The socio-economic assessment shows that the project is located within a rapidly urbanizing growth corridor, where planned residential development is consistent with regional development trends and zoning regulations applicable to Zone V of the Islamabad Capital Territory.

The impact assessment has identified that the majority of potential environmental impacts associated with the project are localized, temporary, and manageable in nature, particularly during the construction phase. These include dust generation, noise emissions, soil disturbance, vegetation removal, construction waste generation, and increased traffic movement. During the operational phase, potential impacts primarily relate to increased demand on water resources, wastewater generation, solid waste management, and routine traffic flows. Importantly, no significant adverse impacts on existing infrastructure, religious or cultural properties, or community assets are anticipated.

Appropriate mitigation measures have been proposed for all identified impacts and have been integrated into a detailed Environmental Management and Monitoring

Plan (EMMP). The EMMP outlines clear institutional responsibilities, monitoring protocols, reporting mechanisms, training requirements, and budgetary provisions to ensure effective implementation throughout the project lifecycle. Special emphasis has been placed on water conservation strategies, sewage treatment, stormwater management, solid waste management, occupational health and safety, and landscaping and plantation measures to enhance the environmental quality of the area.

The assessment further concludes that the project is expected to generate substantial positive socio-economic benefits, including improved housing availability, employment generation, enhanced urban services, and overall improvement in the quality of life for residents. The provision of planned infrastructure, green spaces, public amenities, and controlled land use will contribute to orderly urban expansion and reduce pressure on informal and unplanned settlements in the Islamabad–Rawalpindi region.

Based on the findings of this EIA, it is concluded that the Revised & Extended Layout Plan of Gulberg Residencia (Phase-III) is environmentally acceptable and viable, provided that all mitigation measures and monitoring requirements outlined in the EMMP are strictly implemented and complied with. No irreversible or unmanageable environmental impacts are anticipated. The project, therefore, merits environmental approval, subject to adherence to the conditions imposed by the relevant regulatory authorities.

10.2. RECOMMENDATIONS

Based on the findings of the Environmental Impact Assessment, the Revised & Extended Layout Plan of Gulberg Residencia (Phase-III) can be implemented in an environmentally sound and socially responsible manner, provided that all regulatory and environmental safeguards are strictly adhered to. The project proponent shall obtain formal Environmental Approval from the concerned Environmental Protection Agency prior to commencement of construction and ensure full compliance with the Pakistan Environmental Protection Act, 1997, applicable ICT Zoning Regulations 1992 (amended), CDA bylaws, and National Environmental Quality Standards (NEQS). The Environmental Management and Monitoring Plan (EMMP) developed under this EIA shall be implemented in its entirety across all project phases, supported by the appointment of dedicated environmental staff, including an Environmental Officer, to oversee compliance, monitoring, reporting, and coordination with regulatory authorities. Effective management measures shall be

adopted to control dust and noise during construction, promote sustainable water use through controlled groundwater abstraction, water-efficient fixtures, and rainwater harvesting, and ensure that sewerage, wastewater, and stormwater systems are constructed and operated in accordance with approved designs so that treated effluent meets NEQS prior to discharge.

In addition, a comprehensive solid waste management system shall be established, emphasizing segregation at source, safe collection, transportation, recycling, and disposal through authorized contractors, with strict prohibition of open dumping and burning. Protection of soil and vegetation shall be ensured by minimizing unnecessary clearing and compensating unavoidable tree removal through plantation and landscaping programs in line with CDA and Islamabad environmental requirements. Contractors shall implement robust occupational health and safety measures, including provision of personal protective equipment, emergency response arrangements, and worker training, in compliance with applicable labor laws. Traffic management measures shall be adopted during construction to minimize congestion and safety risks, while land acquisition, where unavoidable, shall be undertaken transparently with fair compensation and grievance redress mechanisms. Continued public consultation, regular environmental monitoring and reporting, and an adaptive management approach allowing mitigation measures to be refined based on monitoring results and regulatory feedback will be essential to ensuring long-term environmental sustainability and regulatory compliance of the project.

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