CAPITAL DEVELOPMENT AUTHORITY

October 2023

ENVIRONMENTAL IMPACT ASSESMSENT OF REHABILITATION/UP-GRADATION OF ROADS FROM SHAH ALLAH DITTA TO ALEXANDER WELL, ICT LIMITS, ISLAMABAD

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Executive Summary

Title of Project

This report presents the Environmental Impact Assessment of the project “Rehabilitation/Up-Gradation of Road from Shah Allah Ditta to Alexander Well, ICT Limits, Islamabad.

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

Location of Project

The rehabilitation/upgradation of existing project commences at the western section of the D-12 service road, specifically along the Shah Ahah Ditta road, and concludes at the location which is about 200 meters away from Alexander Well.

The project's starting point can be defined by its GPS coordinates as 33°42'18.684" N and 72°55'59.736" E, while its endpoint is marked by 33°43'48.324" N and 72°55'35.58" E.

Name of Proponent and Organization preparing Report

The Capital Development Authority, Islamabad is the proponent of the project. The CDA is responsible for the development and upkeep of Islamabad.

M/s Project Procurement International, an Environmental and Management Consultancy Firm, Islamabad has prepared Environmental Impact Assessment of Rehabilitation/Up-Gradation of Road from Shah Allah Ditta to Alexander Well, ICT Limits, Islamabad.

Outline of the Project

The Capital Development Authority intends to Rehabilitate/Up-Grade of Road from Shah Allah Ditta to Alexander Well, ICT Limits, Islamabad. Capital Development Authority intends to Rehabilitate/ Up-grade Road from Shah Allah Ditta to (Alexander Well), ICT limits, Islamabad. Total length of the road is 7.5 km including 3.5 km Rigid Paved Road from Shah Allah Ditta to Buddha Caves and 4 km Flexible Road from Buddha Caves to Alexander well. The cost of the project is **PKR 530 million**.

Rehabilitation / Up-Gradation of Road from Shah Allah Dita to (Alexander Well), ICT Limits, Islamabad” project only intends to rehabilitate existing revenue road.

Environmental Baseline Conditions

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

Physical Environment

Topography: Islamabad is located on the Northern edge of the track known as Potohar Plateau. The Potohar Plateau has an uneven table and land is gradually rising in elevation from 500 to 600 meters above sea level, and the highest point is 1,600 meters above mean sea level. The project site is undulating in nature.

Geology and Soil: The project site strata mainly consist of silty clay underlain by sand and boulders/rock beds.

Land Use: Shah Allah Dita Road is revenue road. Presently the road condition is deteriorated with many potholes and unmetalled sections causing large amount of dust pollution due to vehicular traffic.

Surface Water: The Budha Cave Chashma are the main streams draining the area and are the main surface water resource in the vicinity of the project site. Moreover, the Bahudra kas (stream) is also present about 383 m away from the Shah Allah Ditta road.

Ground Water: Ground Water of the project site is available at a depth of 180-200 ft. and used for drinking and other domestic purposes. Bore holes are dug to access ground water.

Groundwater analysis were carried out at the project site on 04th October 2023. The parameters that were analyzed include pH, Total Dissolved Solids, Chloride, Cadmium, Chromium, Copper, Lead, Manganese, Nickel, Zinc, Antimony, Aluminum, Arsenic, Boron, Barium, Mercury, Selenium, Total Coliforms, E.Coli, Color, Taste, Odour, Turbidity, Total Hardness as $CaCO_3$, Cyanide, Fluoride, Nitrate, Nitrite, Residual Chlorine and Phenolic Compounds (as Phenols) whose concentrations were 7.1, 418 mg/L, 6 mg/L, ND, ND, ND, ND, ND, ND, ND, ND, ND, ND, ND, 0.2 mg/L, ND, ND, ND, ND, ND, Acceptable, Acceptable, 0.2 NTU, 380 mg/L, ND, 0.4 mg/L, 16 mg/L, ND, ND, ND respectively.

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

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

From February to May the temperature rises at the rate of 5.0 ºC per month. The highest temperature reached in May when the mean maximum temperature remains 39.1 ºC.

Air Quality: The ambient air and noise level monitoring was conducted on 06th October to 07th October 2023 for 24 hours at location-1 and from 08th October to 09th October 2023 for 24 hours at location-2 of Shah Allah Ditta Road, Islamabad.

The average 24-hour CO, SO_2, O_3, NO, NO_2, $PM_{2.5}$, PM_{10}, and SPM were recorded as 1.5 mg/m^3, 11.5 ug/m^3, 21.0 ug/m^3, 13.7 ug/m^3, 26.5 ug/m^3, 34.6 ug/m^3, 133 ug/m^3, 458 ug/m^3 for Location-1 and 1.6 mg/m^3, 12.7 ug/m^3, 23.1 ug/m^3, 15.1 ug/m^3, 29.2 ug/m^3, 38.0 ug/m^3, 153 ug/m^3, 503 ug/m^3 for Location-2 respectively.

The ambient air quality concludes that PM10 and PM 2.5 were exceeding the NEQS limits. This increase in particulate matter concentration can be associated with deteriorating conditions of the road.

Noise and Vibration: Ambient noise levels were also continuously recorded at two locations of the project site for 24 hours. The sound pressure level (dB) was frequency weighted on A-curve (dB (A)) and time-weighted (dB (A) Leq) on an hourly basis.

The 24-hour monitoring period for noise level was carried out at 2 different locations of the project site. For location-1, at day time noise level was 67 dB and at night time it was 60 dB while for location-2, at day time noise level was 73 dB and at night time it was 64 dB. The noise levels were exceeding the NEQS limits on both locations and the commercial and transportation activities can be the possible reason of this incompliance.

Ecological Environment

Flora: The vegetation of Islamabad is a representative of Dry Subtropical Scrub Forest which is dominated by Acacia Modesta (Phulai), Ziziphus mauritiana (Ber); Ziziphus nummularia (Mullah), etc. Other associates existing in varying proportions include Prosopis cineraria (Jand), Melia Azadirachta (Dharek); Morus alba (Mulberry-Shahtoot); Dalbergia sissoo (Tahli-Shisham); Acacia nilotica (Kiker). In the undergrowth Cannabis sativa (Bhang), Calotropis

Procera (Desi Ak), Parthenium hysterophorous (Gandi Booti) and Ocimum bacilicum (Niazbo) are predominant.

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

Socio-Economic and Cultural Environment

The socio-cultural and socio-economic conditions of the project area, namely Shah Allah Ditta Village is described in the report. These are the localities, which may get direct positive or negative impacts from the upgradation/rehabilitation of Shah Allah Ditta Road.

Public Consultation

During this consultation, several residents of adjoining Shah Allah Ditta Road were consulted. Different aspects of the project were highlighted regarding their impacts on the physical, biological, and socio-economic environment of the project area. Concerns regarding various aspects, existing environment, and impacts of the project were noted, and mitigation measures are proposed in the EIA report.

Generally, the people of the project area are in favour of the project and stated that this project would create employment opportunities and increase real estate value in the project area.

Impacts and Mitigation Measures

Physical Environment

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

The solid waste may be generated due to different construction activities, and it will mainly include surplus excavated and construction material.

Construction machinery and project vehicles will release exhaust emissions, containing Carbon Monoxide (CO), Oxides of Sulfur (SO_x), Oxides of Nitrogen (NO_x), and Particulate Matter (PM). In addition, various burning activities involved in Road construction will also cause air pollution.

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

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

Shah Allah Ditta Road is being upgraded/rehabilitated in an area with a semi-urban setting. There is a need to maintain much of its natural landscape and vegetation as it is the most asset of the project site.

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

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

The recyclable waste from the project site (such as cardboard, drums, broken/used parts, etc.) will be sold to recycling contractors, or where appropriate to reuse/recycle it. The hazardous waste will be kept separate and handled according to the nature of the waste. While storing, hazardous waste will be marked.

Appropriate sewage treatment mechanisms such as septic tanks of adequate sizes will be incorporated into the design for treating of sanitation water where municipal sewage system is not available or does not exist.

Water quality analysis will be carried out at the project site and campsite quarterly during the construction phase.

Ecological Environment

Impacts: The project area has a cover of vegetation. The site preparation and construction activities may disturb the natural vegetation from the areas where Road of Shah Allah Ditta will be rehabilitated.

Mitigations: CDA will maintain plantation cover and aesthetic beauty of the area as it is what the people will be attracted to.

A plantation plan will be prepared to plant mature plants to strengthen the ecological environment of the project area.

Socio-Economic Environment

Impacts: As the project includes the rehabilitation/upgradation of the existing Shah Allah Ditta road hence, there is no issue of resettlement of the community due to the proposed project. The project is located in close vicinity of Shah Allah Ditta which may pose some safety hazards to the local population during the rehabilitation phase of the project.

Construction workers may be susceptible to the eye and respiratory diseases due to their routine exposure to dust and exhaust emissions on site. Injuries could happen primarily by occupational-related accidents, animal bites, etc. Activities such as land clearing, earthworks, and construction of facilities present various occupational hazards to the workers on the project site.

Budha Caves and Alexander well are reported sites of archaeological or historical significance along the Shah Allah Ditta Road and end point. However, due to the upgradation of Shah Allah Ditta road these Archeological and historical sies will not be disturbed. If in case any further artefact of such significance is found during the rehabilitation activities, the Archeology Department, Government of Pakistan will be informed.

Mitigations: Any physical injury will be mitigated through the provision of appropriate training and emergency response procedures. Protected fencing will be fixed around the construction site.

Provision of Personal Protective Equipment (PPE) to the workers will be ensured. Unauthorized access to the construction area will not be allowed. Vehicle speeds of 20 km/hour at the project site will be implemented. Appropriate light diffusers and reflectors will be used, if required, to minimize the public nuisance caused by light pollution.

Environmental Management Plan (EMP) and Proposed Monitoring

For effective implementation and management of mitigation measures, an Environmental Management Plan has been proposed. The EMP reflects the commitment of CDA to safeguard the environment as well as the surrounding population.

The EMP provides a delivery mechanism to address potential impacts of project activities, to enhance project benefits and to introduce standards of good practice in all project activities.

An Environmental Monitoring Plan has been proposed for the construction and operational phase of the project, which will be adopted by CDA.

The cost proposed for the proposed Environmental Monitoring Plan is Rs. **6,932,540/-**

Conclusion and Recommendations

On the basis of the overall impact assessment, more specifically, nature and magnitude of the residual environmental impacts identified during the present EIA, it is concluded that Rehabilitation/upgradation of Road from Shah Allah Ditta to Alexander Well, ICT Limits, Islamabad is likely to cause minor environmental impacts during its rehabilitation and operational phase provided, these impacts can be mitigated provided that the proposed project activities are carried out, as mentioned in the report, and the mitigation measures included in this report are completely and effectively implemented.

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

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List of Abbreviations

CDA	Capital Development Authority
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
GPD	Gallons per Day
HSE	Health, Safety and Environment
IEE	Initial Environmental Examination
NCS	National Conservation Strategy
NEQS	National Environmental Quality Standards
PEQS	Punjab Environment Quality Standards
NOC	No Objection Certificate
PEPA	Pakistan Environmental Protection Act 1997
PEPC	Pakistan Environmental Protection Council
PPI	Project Procurement International
Sr. No.	Serial Number

List of Units

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

1 Introduction

1.1 Project Background and Overview

In numerous rural areas of Islamabad, such as Shah Allah Ditta, there is a problem with household wastewater and rainwater flowing through unpaved streets, causing unhygienic conditions and pollution in the area. Additionally, the existing Road in Shah Allah Ditta are in poor condition and urgently need repair. To address these issues, the proposed project aims to improve and upgrade the Road from Shah Allah Ditta to Alexander Well within the Islamabad Capital Territory (ICT) limits. Once the project is completed, the responsibility for its operation and maintenance will be handed over to the relevant union council, ensuring that deprived areas receive essential facilities for which residents have been requesting through various government channels.

Furthermore, it's important to recognize that Roads play a vital role in a country's economic development and overall progress, bringing significant social advantages along with them. They are crucial for the growth and advancement of a nation. Additionally, having well-connected roads is essential for granting people access to employment opportunities, social services, healthcare, and education, which is pivotal in the fight against poverty.

Roads not only connect places but also open up new areas for development, contributing to economic and social growth. They also support tourism activities, such as visiting Shah Allah Ditta Budha Caves and Alexander Well, which can boost local economies.

In light of these considerations, the Capital Development Authority (CDA) aims to improve the existing roads from Shah Allah Ditta to Alexander Well. The primary goal of this proposed project is to enhance the socio-economic conditions of the rural population living in villages along this route. It seeks to make it easier for people to travel within the village and access various services. Additionally, by addressing issues like sewage and wastewater management, it aims to control diseases. Ultimately, the project aspires to elevate the social status and well-being of the rural community residing around the Shah Allah Ditta Road.

1.2 Brief description of the nature size and location of the project

Nature: This project is the Rehabilitation/Up-Gradation of Roads from Shah Allah Ditta to Alexander Well, ICT Limits, Islamabad.

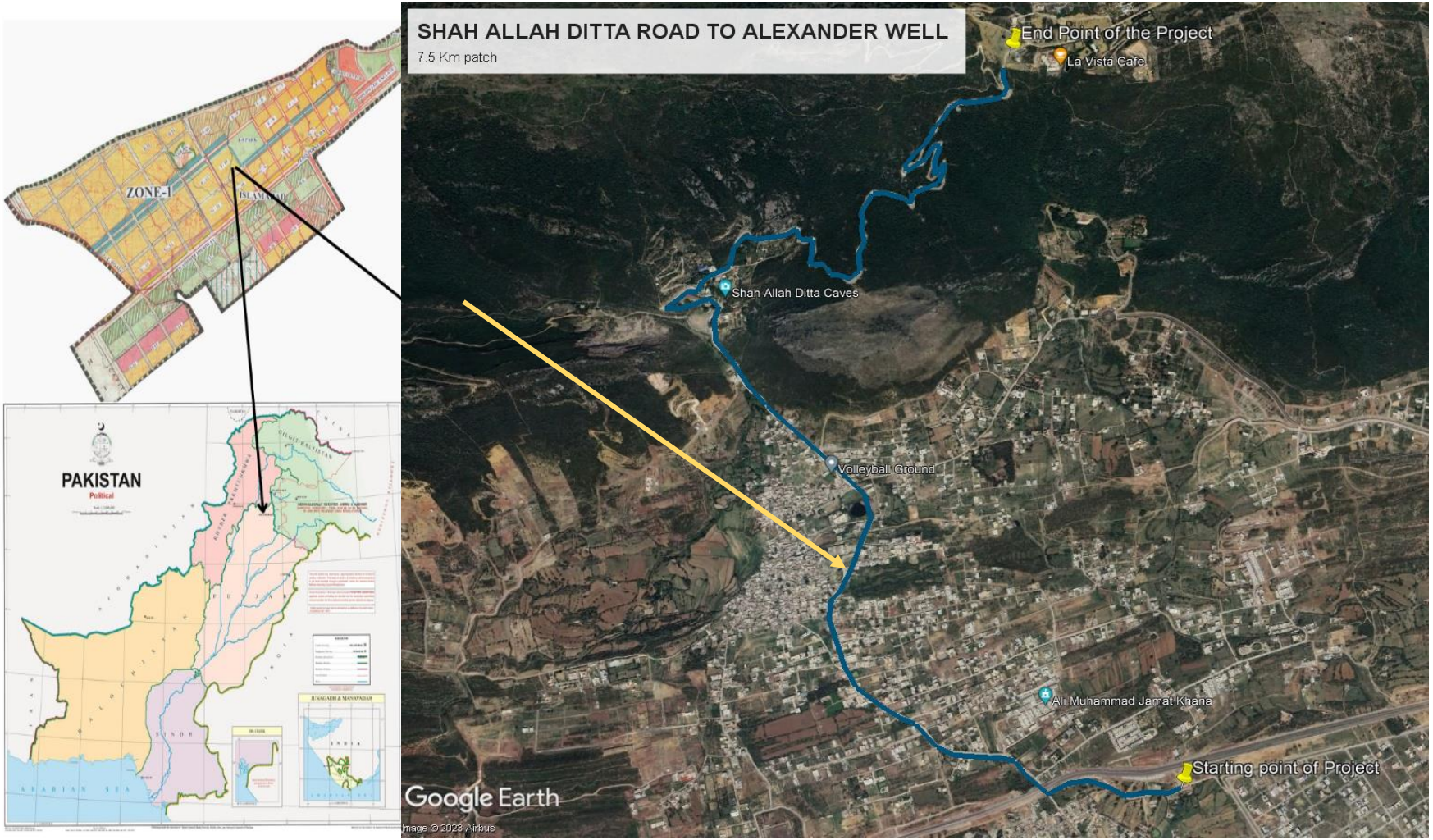
Size: The Capital Development Authority intends to Rehabilitate/Up-Grade the Road from Shah Allah Ditta to Alexander Well, ICT Limits, Islamabad. Total length of the road is 7.5 km including 3.5 km Rigid Paved Road from Shah Allah Ditta to Buddha Caves and 4 km Flexible Road from Buddha Caves to Alexander well.

Location: The construction project commences at the western section of the D-12 service road, specifically along the Shah Ahah Ditta road, and concludes at the location known as Alexander Well.

The project's starting point can be defined by its GPS coordinates as **33°42'18.684" N** and **72°55'59.736" E**, while its endpoint is marked by **33°43'48.324" N** and **72°55'35.58" E**.

The key map of the project location has been shown in **Figure 1.1.**

Figure 1.1: Key Map of Project Location



1.3 The Proponent

The Capital Development Authority, Islamabad is the proponent of the project.

CDA came into existence on June 14, 1960. The CDA board is composed of the Chairman and Members of Planning, Finance, Estate, Environment, Administration and Engineering. Each member is in charge of various directorates comprising highly qualified, experienced and capable professionals in various fields and disciplines. The CDA is responsible for the development and upkeep of Islamabad.

1.4 The Consultant

M/s Project Procurement International, an Environmental and Management Consultancy Firm, Islamabad has prepared Environmental Impact Assessment of Rehabilitation/Up-Gradation of Road from Shah Allah Ditta to Alexander Well, ICT Limits, Islamabad. The list of names, qualification and roles of team members carrying out the EIA has been attached in **Annexure-1.**

1.5 Contact Persons

Proponent	Environmental Consultant
Mr. Akram Jatt Sandhu, Deputy Director (Road Division-I) Capital Development Authority Old Naval Headquarter, Melody Market Islamabad. Tel: 0333 5709996	**Engr. Saadat Ali** Managing Director Project Procurement International 26, Second Floor, Silver City Plaza, G-11 Markaz, Islamabad, Tel: +92-51-2363624, Cell: +92-300-854 0195 Email: projectpi@gmail.com Web: www.projectpi.pk

1.6 Environmental Impact Assessment

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

"No proponent of a project shall commence construction or operation unless he has filed with the Federal Agency an Initial Environmental Examination or where the project is likely to cause an adverse environmental effect, an Environmental Impact Assessment, and has obtained from the Federal Agency approval in respect thereof".

The project falling in schedule II requires an EIA. Therefore, an EIA of Shah Allah Ditta to Alexander Well Road Project is required.

1.7 Aims and Objectives of EIA Report

The aim and objectives of the EIA of the project are as follow:

- Identification and assessment of all major and minor impacts during construction and operational stages of the project.
- Identification of all significant impacts that may require detailed assessment.
- Propose mitigation measures to minimize, eliminate or to compensate the potential adverse impacts identified.
- Preparation of Environmental Management Plan.
- Preparation of an Environmental Impact Assessment report for submission to the Federal Environmental Protection Agency, Islamabad.

1.8 Screening of the Project

The Rehabilitation/Up-Gradation of Road from Shah Allah Ditta to Alexander Well, ICT Limits, Islamabad will be a Land-use development having 7.5 km Road patch.

EIA is mandatory under **section 12 clause (I)** of the Pakistan Environmental Protection Act 1997 for all development interventions.

According to Pakistan EPA (Review of IEE and EIA Regulations, 2000), the proposed project falls under **Category J** (Any other project) of Schedule II and, therefore, requires the EIA study.

1.9 Scoping of the Project

A scoping exercise was undertaken with Pakistan Environmental Protection Agency on 12th October 2023 to identify the potential issues that are to be considered in the Environmental Impact Assessment. The scoping exercise included the following indispensable tasks:

Spatial and Temporal Boundaries of the Project: The construction project commences at the western section of the D-12 service road, specifically along the Shah Ahah Ditta road, and concludes at the location known as Alexander Well.

The spatial and temporal boundary of the Project during the operational phase will be localized and long-term.

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

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

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

- The EMP cost should be proportionate to the total cost of the project
- Seasonal ambient air data of project area
- Effectiveness of Construction Material and Transportation Management Plan
- Water arrangement and measures to recharge groundwater
- Solid Waste Management, Treatment and Disposal Plan
- Concerns of the residents to be affected by the project (Project Affected Persons, if any)

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

1.10 Screening of Potential Environmental Impacts

The environmental, and socioeconomic baseline data collected during the Project was used to assess the potential impacts of the proposed activities. The potential sources of environmental impacts identified and analyzed during the impact assessment study include:

- Air Emissions
- Wastewater
- Solid Waste
- Noise Levels

The impact assessment was carried out by visiting the Project area and creating an understanding of all the activities during Project siting, rehabilitation/upgradation and operation of the road from Shah Allah Ditta to Alexander Well.

Checklist of Screening of Potential Environmental Impacts			
Screening Questions	**Yes**	**No**	**Remarks**
Project Siting Impacts			
Densely populated?		✓	The proposed project site is located near Shah Allah Ditta Village. There are few residentials are present in the immediate vicinity of the project site
Heavy with development activities?		✓	There is no other major construction or development activity going on in the area.
Adjacent to or within any Environmentally sensitive areas?	✓		Margalla Hills are environmentally sensitive areas located close to the project site.
Archaeological / Cultural heritage site	✓		The Shah Allah Ditta caves are located at a distance of 46.17 meters from the Shah Allah Dita roadside, while the Alexander well is situated approximately 200 meters away from the endpoint of Shah Allah Dita Road.
Protected area	✓		Margalla Hills is an environmentally sensitive area located close to the project site.
Wetland	✓		Not applicable
Mangroves		✓	No mangroves are present in the microenvironment.
Estuarine		✓	Not Applicable
Bay		✓	Not Applicable
Potential environmental impacts will the Project cause			
Dislocation or involuntary resettlement of people?		✓	No dislocation or involuntary resettlement of people
Traffic congestion	✓		The Shah Allah Ditta Road rehabilitation may cause traffic congestion.
Surface and Groundwater Contamination		✓	The wastewater will be disposed of in sewerage network of Islamabad.
Checklist provides the screening for potential environmental impacts			
Screening Questions	Yes	No	Remarks
Deterioration of environmental conditions surrounding the Project site.		✓	During the construction phase, related environmental impacts may be envisaged; however, they will be curtailed by mitigation measures. During the operation phase, mitigation measures will be implemented to minimize the environmental footprint.
Degradation of land and ecosystems (e.g. loss of wetlands and wildlands, coastal zones, watersheds and forests)?		✓	Not envisaged.

Checklist of Screening of Potential Environmental Impacts			
Degradation of cultural property and loss of cultural heritage?		✓	The Shah Allah Ditta caves are located at a distance of 46.17 meters from the Shah Allah Dita roadside, while the Alexander well is situated approximately 200 meters away from the endpoint of Shah Allah Dita Road. Hence no such impacts are expected.
Disproportionate impacts on the poor, women and children, Indigenous peoples, or other vulnerable groups?		✓	No such impacts are expected.
Pollution of receiving drainage waters resulting in residential land, agricultural grounds and land resources?		✓	Loss of land comprising residential, agricultural and grazing land is not envisaged.
Water resources problems (e.g. depletion/ degradation of available water supply, deterioration of surface and groundwater quality and pollution of receiving waters?		✓	A number of water-conserving fixtures will be installed in the Project to reduce water consumption.
Social conflicts between construction workers from other areas and local workers?		✓	Not expected. Reputable and experienced contractors will be hired.
Road blocking due to soil excavation?		✓	All construction activities will happen inside the project site.
Noise and dust from construction activities?	✓		Likely but will be minimized through better management practices.
Traffic disturbances due to construction material transport?	✓		A proper traffic route will be finalized and shared with ITP for construction material haulage.
Temporary silt runoff due to construction?	✓		If such a situation emerges, it will be mitigated through better management practices and the installation of silt traps.
Contamination of surface and ground waters due to improper waste disposal	✓		Proper solid waste collection and disposal.
Are there any demographic or socio-economic aspects of the Project area that are already vulnerable (e.g., high incidence of marginalized populations, rural-urban migrants, illegal settlements, ethnic minorities, women or children)?	✓		The Project area is not vulnerable with respect to any demographic or socioeconomic aspects.

2 Approach and Methodology

2.1 Approach for EIA

The approach for conducting Environmental Impact Assessment of the Rehabilitation/Up-Gradation of Road from Shah Allah Ditta to Alexander Well, ICT Limits, Islamabad is to follow the requirement of Pakistan Environmental Protection Agency (Review of IEE/EIA) Regulations, 2000.

2.2 Kick-off Meeting with the Proponent

The consultant team held a kick-off meeting with the Deputy Director (Road III), Capital Development Authority (CDA) at the beginning of the EIA study. During the kick-off meeting, all technical data, and the layout plan of the project "Rehabilitation/Up-Gradation of Road from Shah Allah Ditta to Alexander Well, ICT Limits, Islamabad" was provided.

2.3 Collection of Secondary Data

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

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

2.4 Collection of Primary Data and Field Visit

The Project Procurement International (PPI) team visited the project site and adjoining areas in coordination with CDA officials, for obtaining detailed knowledge of the environmental conditions of the area. During the field visits, the existing environmental conditions were studied. In addition, consultation/meetings were held with the community.

The Rapid Social Appraisal method was applied to discover the facts, empirically verifiable observations or verifying the old facts, on the prevailing socio-economic and cultural conditions of the project area.

2.5 Analysis of Alternatives

The EIA report gives the details of alternatives considered during the environmental assessment of the project**.**

2.6 Stakeholder & Public Consultation

The information obtained from the community was used to identify concerns and issues that have been subsequently mentioned and addressed in the EIA report. The list of the people met during public consultation is provided in **Annexure-2**.

2.7 Review of Legislative Requirements

The information on environmental policies, national and international laws as well as guidelines relevant to the project were reviewed, and a synopsis of all relevant laws have been narrated in the report.

2.8 Identification of Impacts

The identification of impacts is a key activity in the environmental assessment process, which is based on the professional judgment of our experienced team supported by national and international guidelines. The potential impacts were identified with methodical consideration of likely or possible significant impacts on the environment for the project "Rehabilitation/Up-Gradation of Road from Shah Allah Ditta to Alexander Well, ICT Limits, Islamabad". The aim of this task was to assess the associated risks with these impacts.

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

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

2.9 Identification of Mitigation Measures

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

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

2.10 Development of Environmental Management Plan (EMP)

An EMP has been developed for effective implementation of the recommended mitigation measures. The EMP includes a control to minimize the identified impacts, and monitoring program to monitor residual impacts, if any, during the construction and operational phases of the project.

The EMP also lays down procedures to be followed during the operational phase of the project. The EMP also identifies the roles and responsibilities of all concerned personnel during the project's construction and operational phases.

2.11 Organization of the EIA Report

This report has been structured in the following manner:

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

Chapter 2 (Approach and Methodology) describes the approach and methodology used to conduct the Environmental Impact Assessment.

Chapter 3 (*Legal Framework)* describes the regulatory framework of Pakistan on the environment and its implications for the project.

Chapter 4 *(Project Description)* provides the description of the proposed project, its layout plan and associated activities, raw material details and utility requirement.

Chapter 5 (Project Alternatives) provides the insight towards different alternative options were considered during project assessment.

Chapter 6 *(Existing Environment*) provides a description of the micro-environment and macro-environment of the project site. This chapter describes the physical, ecological, and socio-economic resources of the project area and surroundings.

Chapter 7 *(Public Consultation)* this chapter describes details of discussions held with primary and secondary stakeholders.

Chapter 8 *(Impact Assessment and Mitigation Measures)* details the potential environmental and social impacts of the project on the different features of the micro and macro-environment using the matrix method.

Chapter 9 *(Environmental Management Plan)* explains the mitigation measures proposed for the project in order to minimize the impacts to acceptable limits. It also describes the implementation of mitigation measures on ground and monitoring of environmental parameters against likely environmental impacts.

Chapter 10 *(Conclusion)* summarizes the report and presents its conclusions.

The last chapter is followed by the references and **Annexures** that provide supporting information. **Annexure-3** is the glossary of the report where technical words have been briefly described. **Annexure-4** describes the Terms of Reference of the EIA Report.

3 Legislative and Institutional Framework

3.1 Introduction

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

The compliance status of the Rehabilitation/Up-Gradation of Road from Shah Allah Ditta to Alexander Well, ICT Limits, Islamabad Project has been reviewed with reference to the legislation and existing legal framework on the environment in Pakistan and International level as described henceforth.

3.2 National Conservation Strategy

The National Conservation Strategy (NCS) is the first policy document that pledged to balance Pakistan's economic development with the conservation of natural resources. It is the underlying goal of this document that all economic and statutory development in the country should be such that it does not conflict with the interests of nature conservation. The Pakistan Environmental Protection Act, 1997 is the basic legislative tool empowering the government to frame regulations for the protection of the environment. The World Bank environmental guidelines are used to bridge the gaps, wherever needed. The policy, laws, regulations, and standards relevant to Rehabilitation/Up-Gradation of Road from Shah Allah Ditta to Alexander Well, ICT Limits, Islamabad Project in the context of environmental protection is described in the following sections.

3.3 National Environmental Policy, 2005

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

3.4 Laws and Regulations

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

3.4.1 Pakistan Environmental Protection Act, 1997

The Pakistan Environmental Protection Act, 1997 (the Act) is the basic legislative tool empowering the government to frame regulations for the protection of the environment. The Act is applicable to a broad range of issues and extends to air, water, soil, marine and noise pollution, as well as the handling of hazardous waste. The discharge or emission of any effluent, waste, air pollutant or noise in an amount, concentration or level in excess of the National Environmental Quality Standards (NEQS) specified by the Pakistan Environmental Protection Agency (Pak EPA) has been prohibited under the Act, and penalties have been prescribed for those contravening the provisions of the Act. The powers of the federal and provincial Environmental Protection Agencies (EPAs), established under the Pakistan Environmental Protection Ordinance 1983, have also been considerably enhanced under this legislation and they have been given the power to conduct inquiries into possible breaches of environmental law either of their own accord or upon the registration of a complaint.

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

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

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

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

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

The rehabilitation/upgradation of Shah Alah Ditta Road Project falls in Schedule-II of the regulations. Hence, this type of project needs an EIA to be conducted.

3.5 Islamabad Nature Conservation and Wildlife Management Act, 2023

The Shah Allah Ditta Road is located at Margalla foothills. According to the concept of management of national parks and other similar protected areas, any national park is defined as a core zone and a periphery zone. In the core zone, no development such as construction of building etc. are allowed. The project of Rehabilitation/upgradation of road from Shah Allah Ditta Road to Alexander well lies in National Park area of Margalla Hills. According to Section 12 of National Park Clause (3) states:

"*Provision for access to roads, construction of rest houses, hotels and other buildings in the national park along with amenities for the public may be so made, the forest therein shall be so managed, and forest produce so obtained, subject to approval of the Board upon satisfaction that such activities will not adversely impact the conservation, protection and preservation of nature in the National Park."*

3.6 National Environmental Quality Standards (NEQS), 2000

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

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

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

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

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

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

3.6.1 NEQS for Liquid Effluent

The National Environmental Quality Standards (NEQS) for the discharge of effluent from industry are presented in **Table 3.1**.

Table 3.1: NEQS for Liquid Effluent Discharge

Parameters	Into Inland Waters	Into Sewage Treatment	Into Sea
Tempereture	=<3°C	=<3°C	=<3°C
pH Value	6-9	6-9	6-9
Biological Oxygen Demand $(BOD)_5$	80	250	80
Chemical Oxygen Demand (COC)	150	400	400
Total Suspended Solids (TSS)	200	400	200
Total Dissolved Solids (TDS)	3500	3500	3500
Grease & Oil	10	10	10
Phenolic Compounds (as phenol)	0.1	0.3	0.3
Chlorides (as Cl')	1000	1000	SC
Fluoride (as F')	10	10	10
Cyanide (CN') total	1.0	1.0	1.0
An-ionic Detergents (as MBAs)	2.0	20	20
Sulphate (SO'')	600	1000	SC
Sulphide (S')	1.0	1.0	1.0
Ammonia (NH^3)	40	40	40
Pesticides	0.15	0.15	0.15
Cadmium	0.1	0.1	0.1
Chromium (trivalent & hexavalent)	1.0	1.0	1.0
Copper	1.0	1.0	1.0
Lead	0.5	0.5	0.5
Mercury	0.01	0.01	0.01
Selenium	0.5	0.5	0.5
Nickel	1.0	1.0	1.0
Silver	1.0	1.0	1.0
Total Toxic Metals	2.0	2.0	2.0
Zinc	5.0	5.0	5.0
Arsenic	1.0	1.0	1.0
Barium	1.5	1.5	1.5
Iron	8.0	8.0	8.0
Manganese	1.5	1.5	1.5
Boron	6.0	6.0	6.0
Chlorine	1.0	1.0	1.0

Source: *NEQS, Pakistan Environmental Protection Agency*

3.6.2 NEQS for Gaseous Emission

The National Environmental Quality Standards (NEQS) for permissible limits of gaseous emission from industry are presented in **Table 3.2**.

Table 3.2: NEQS for Gaseous Emission

Parameter	Source of Emission	Standard
Smoke	Smoke opacity not to exceed	40% or 2 Ringlemann Scale or equivalent smoke number
Particulate Matter	Boilers & Furnaces: Oil Fired, Coal-Fired, Cement Kilns	300
	Grinding, crushing, clinker coolers and related processes, metallurgical processes, converters, blast furnaces and cupolas	500
		300
		500
Hydrogen Chloride	Any	400
Chlorine	Any	150
Hydrogen Fluoride	Any	150
Hydrogen Sulphide	Any	10
Sulphur Oxides	Sulfuric Acid/sulphonic Acid Plants	5000
	Other Plants except power plants operating on oil and coal	1700
Carbon Monoxide	Any	800
Lead	Any	50
Mercury	Any	10
Cadmium	Any	20
Arsenic	Any	20
Copper	Any	50
Antimony	Any	20
Zinc	Any	200
Oxides of Nitrogen	Nitric Acid Manufacturing Unit	3000
	Other plants except for power plants operating on oil or coal:	
	Gas-fired	400
	Oil fired	600
	Coal-fired	1200

Source: *NEQS Pakistan Environmental Protection Agency*

3.6.3 NEQS for Vehicular Emission

The National Environmental Quality Standards (NEQS) for permissible limits of exhaust emissions from vehicles are presented in **Table 3.3.**

Table 3.3: NEQS for Vehicular Emission

Parameters	Standards (Maximum permissible limits)	Measuring Method

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

Source: *NEQS Pakistan Environmental Protection Agency*

3.6.4 NEQS for Drinking Water, 2010

The National Environmental Quality Standards (NEQS) for drinking water quality, 2010 are presented in **Table 3.4**.

Table 3.4: NEQS for drinking water quality

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

Parameter	Standard values	WHO guidelines
Boron	0.3	0.3
Cadmium	0.01	0.003
Chloride	≤ 250	250
Chromium	≤ 0.05	0.05
Copper	2	2
Toxic Inorganic		mg/Litre
Cyanide	≤ 0.05	0.07
Flouride	≤ 1.5	1.5
Lead	≤ 0.05	0.01
Mangnese	≤ 0.5	0.5
Mercury	≤ 0.001	0.001
Nickel	≤ 0.02	0.02
Nitrate	≤ 50	50
Nitrite	≤ 3	3
Zinc	5	3
Pesticides mg/L		PSQCA No.4639-2004.page No 4 Table No. 3serial No. 20-58
Phenolic Compounds		<0.002
Polynuclear aromatic hydrocarbons		0.01
Radioactive		
Alpha emitters bq/L	0.1	0.1
Beta emitters	1	1

Source: *NEQS Pakistan Environmental Protection Agency*

3.6.5 NEQS for Ambient Air and Noise

The National Environmental Quality Standards (NEQS) for Ambient Air and Noise, 2010 are presented in **Table 3.5** and **3.6.**

Table 3.5: NEQS for Ambient Air

Pollutants	Time Weighted Average	Concentration in Ambient Air (ug/m^3)
Sulfur Dioxide (SO_2)	Annual Average* 24 hrs**	80 120
Oxides of Nitrogen gas (NO)	Annual Average* 24 hrs**	40 40
Oxides of Nitrogen gas (NO_2)	Annual Average* 24 hrs**	40 80
Ozone (O_3)	1 hour	130
Suspended Particulate Matter (SPM)	Annual Average* 24 hrs**	360 500

Pollutants	Time Weighted Average	Concentration in Ambient Air (ug/m^3)
Respirable Particulate Matter (PM_{10})	Annual Average*	120
	24 hrs**	150
Respirable Particulate Matter ($PM_{2.5}$)	Annual Average*	15
	24 hrs**	35
	1 hr	15
Lead (Pb)	Annual Average*	1
	24 hrs**	1.5
Carbon monoxide (CO)	8 hrs	5 mg/m^3
	1 hr	10 mg/m^3

** Annual Arithmetic mean of minimum 1040 measurements in a year taken twice a week 24 hourly at a uniform interval

* 24 hourly /8 hourly values should be met 98% of the year, 2% of the time, it may exceed.

Source: NEQS, National Environmental Protection Agency

Table 3.6: NEQS for Noise

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

Source: NEQS, National Environmental Protection Agency

3.7 Environmental Protection Agency's Environmental Guidelines

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

- Guidelines for the Preparation and Review of Environmental Reports,
- Guidelines for public consultation,
- Guidelines for Sensitive and Critical Areas, Sectorial Guidelines.

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

3.8 Implication of Legislations to the Project

The implication of the above-mentioned legislation to the pre-construction, construction and operational phase of the Rehabilitation/upgradation of road from Shah Allah Ditta to Alexander well Project would be as follows:

- Capital Development Authority being the proponent of the project will ensure that construction and operational phases of the project be carried out in accordance with the EIA report and Environmental Management Plan is effectively implemented.

- The project will be subjected to four basic provisions relating to pollution control under the Pakistan Environmental Protection Act, 1997, as contained in section 11, 13, 14 and 15 as follows:
  - Section 11 prohibits discharge or emission of any effluent or waste or air pollutant or noise in excess of the NEQS, or the established ambient standards for air, water or land.
  - Section 13 prohibits hazardous wastes.
  - Section 14 prohibits the handling of hazardous substance except under a license or in accordance with the provision of any local law or international agreement.
  - Section 15 prohibits the operation of motor vehicles for each air pollutant or noise is being emitted in excess of the NEQS of the established ambient standard.

4 Project Description

4.1 Introduction

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

4.2 Objective of the Project

The objectives of the project are as follows

- Improvement of Socio-economic conditions of rural population in villages especially Shah Allah Ditta Village, Islamabad
- Easy Access to different areas of the village
- Control diseases, caused by sewage and waste water
- To raise the social status of the rural community
- To improve the quality of Life
- To improve the environment of the rural community

4.3 Project Administrative Jurisdiction

The proposed project site lies in the limits of Islamabad Capital Territory.

4.4 Project Location and Accessibility

The project commences at the western section of the D-12 service road, specifically along the Shah Allah Ditta Road, and concludes at the location which is about 200m away from Alexander Well.

The project's starting point can be defined by its GPS coordinates as **33°42'18.684" N** and **72°55'59.736" E**, while its endpoint is marked by **33°43'48.324" N** and **72°55'35.58" E**. The surrounding areas near the project site are as follows:

North: Margalla Hill Top

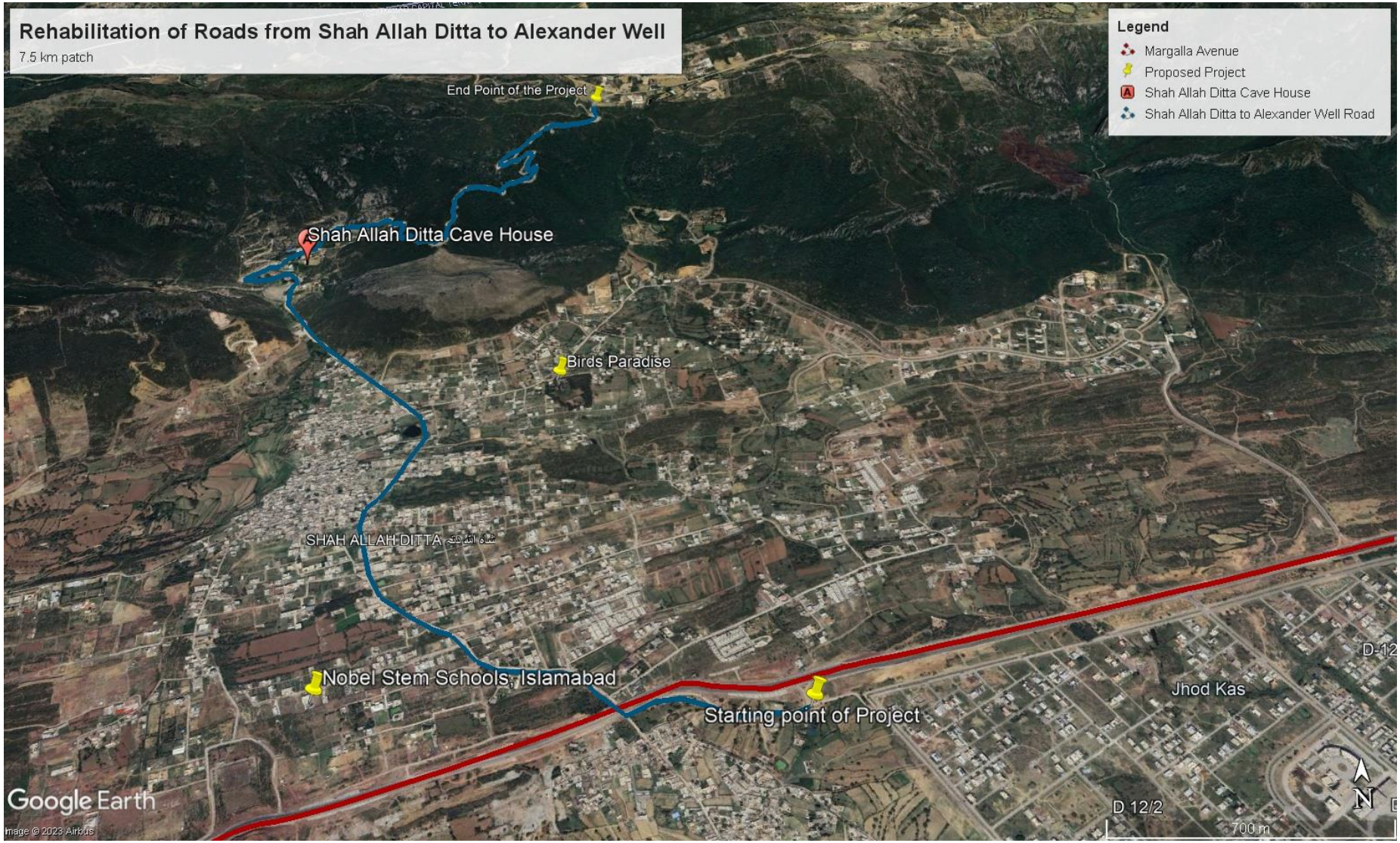
South: Margalla Avenue

East: Nobel Stem School, Islamabad

West: Birds Paradise

The location of the project is shown in **Figure 4.1.**

Figure 4.1: Project Location and Accessibility Map of Shah Allah Ditta Road



4.5 Description of the Project

Capital Development Authority intends to Rehabilitate/ Up-grade road from Shah Allah Ditta to Alexander Well, ICT limits, Islamabad. Total length of the road is 7.5 km including 3.5 km Rigid Paved Road from Shah Allah Ditta to Buddha Caves and 4 km Flexible Road from Buddha Caves to Alexander well. The width of the road is 24'-0'' and have following scope of the works:

- Asphaltic wearing and Binder Course (2'' + 2'') thick
- Convex Mirror Signs
- Metal Guard Rail
- Road Marking
- Protection Work
- Traffic Road Sign
- Shoulder Flexible Road 5'-0''
- Sude Dish Drain Flexible Road 5'-0''

4.6 Land acquisition

This project only involves the rehabilitation/ upgradation of existing road from Shah Allah Ditta to Alexander Well, ICT Limits, Islamabad. There is no issue land acquisition and resettlement.

4.7 Time Schedule

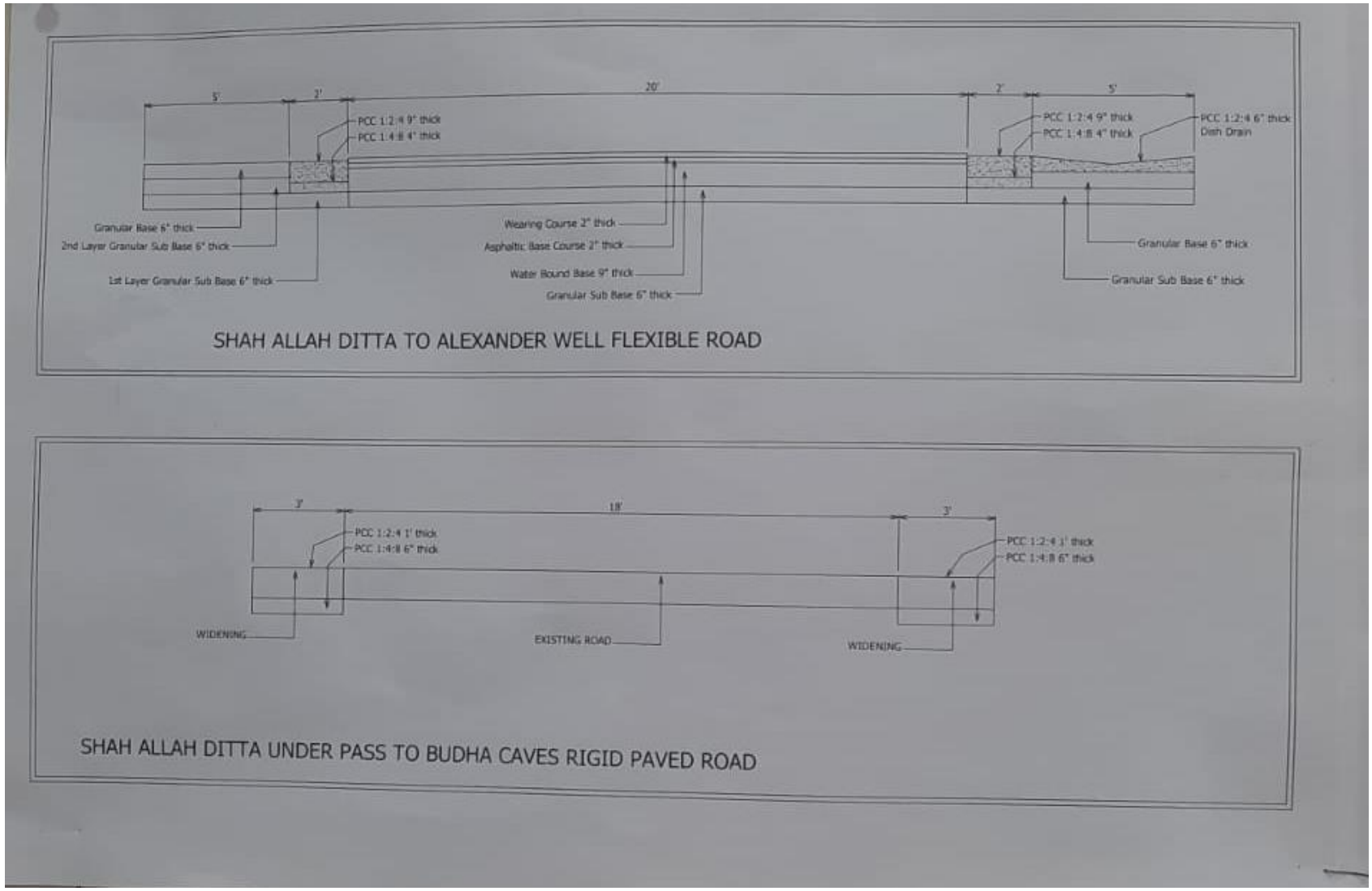
It is estimated that the project will be completed within a period of 3 months.

4.8 Project Construction Cost

The estimated cost for rehabilitation/ upgradation of Shah Allah Ditta to Alexander Well flexible road and Shah Allah Ditta under Pass to Budha caves rigid paved road is **Rs. 530 million.**

Figure 4.2 shows the Cross Section of Shah Allah Ditta to Alexander Well flexible road and Shah Allah Ditta under Pass to Budha Caves Rigid Paved Road.

Figure 4.2: Cross Section of Shah Allah Ditta to Alexander Well flexible road and Shah Allah Ditta Under Pass to Budha Caves Rigid Paved Road



4.9 Staff Requirements during construction

A staff of 73 workers would be required by the contractor for Rehabilitation/Up-Gradation of Road from Shah Allah Ditta to Alexander Well.

Table 4.1: Contractor's Staff for Construction Work

S No	Portfolio	Numbers
1.	Plant	12
2.	Concrete party	14
3.	Stone masonries	4
4.	Operations	14
5.	Supervision staff	16
6.	Watchman	10
7.	Mechanical Staff	3
	Total	73

Source: *CDA Estimates, 2023*

The CDA staff for construction supervision will include:

Table 4.2: CDA Staff for Construction Supervision

S No	Portfolio	Numbers
1.	Deputy Director	01
2.	Assistant Director	01
3.	Sub Engineer	01

***Source**: CDA Estimates, 2023*

4.10 Traffic Plan and Transportation

As Shah Allah Ditta Road is also used by the residents of Shah Allah Ditta Village and the residents of other nearby areas, therefore, a traffic plan is prepared for the community as follows:

- Proper deviation route should be provided when it is necessary to block any road patch because of road rehabilitation/upgradation process.
- Signboards will be displayed at different locations on the road to direct the traffic in their desired direction
- To control the speed of traffic on the road speed breakers will be constructed
- To avoid over speeding in the streets, speed breakers will be constructed.
- Traffic signs will be installed on all road as per the requirement of smooth and safe traffic within the vicinity of Shah Allah Ditta Road.

4.11 Schedule of Implementation

The project will be completed in 03-month time.

4.12 Project Phases

Capital Development Authority is responsible for design and execution phase of the Rehabilitation/Up-Gradation of Road from Shah Allah Ditta to Alexander Well, ICT Limits, Islamabad. The rehabilitation/upgradation of road from Shah Allah Ditta to Alexander Well

would be implemented in three phases, i.e. Pre-construction/ design, construction and operation.

4.12.1 Pre-construction/ Design Phase

Site Investigation**:** A soil investigation of the project site is carried out for determining the suitability of a site to support the structures, roads, and other development works.

Subsequently, engineering details will be worked out, and working drawings, specifications for equipment and material would be prepared.

4.12.2 Construction Phase

Contractor Mobilization**:** This component involves the transportation of construction machinery and equipment to the project site and the establishment of the contractor's camp and office.

Site Preparation: Usually, this activity involves the operation of heavy earth-moving machinery and substantial land clearing, levelling and grading, as well as cutting and filling activities. The construction works will be carried out as per design/profile prepared by the consultant.

The first task during this activity is to demarcate the road alignment and other benchmarks, with the help of drawings prepared during the pre-construction and design phase of the project. On the spot changes will be employed to avoid, to the extent possible, cutting of trees. Once markings are complete; the land will be cleared and prepared for subsequent construction activities.

Rehabilitation/ Up-Gradation Activities**:** The construction activities will be carried out using the conventional methodology and sequence of work. The activities will include excavation, roads, and other things proposed in the scope of the work.

Staffing: Construction crews will be the responsibility of the contractor. It is estimated that 73 personnel will be working at the project site at a given time during the peak construction period.

These will essentially include masons, heavy machinery operators, drivers, electricians, plumbers, and general labours. For unskilled employment, preference will be given to residents close to the project area.

Table 4.3: Staff Engaged during the Construction Phases of the Project

S No	Portfolio	Numbers
1.	Plant	12
2.	Concrete party	14
3.	Stone masonries	4
4.	Operations	14
5.	Supervision staff	16
6.	Watchman	10
7.	Mechanical Staff	3
	Total	73

Source: *CDA Estimates, 2023*

Following steps will be taken for effective management of construction crew:

- A complaint cell for workforce will be established, where they can register their reservations related to work.
- The contractor will develop an effective system of communication/consultation and will ensure that the staff concerns are addressed.

- Employees will be discouraged from working excessive hours and/or missing break periods (this may involve a detailed job evaluation).
- Child labour will be avoided.
- Incidents of bullying, sexual and racial harassment will be monitored and, where necessary disciplinary actions will be taken.
- Clear job descriptions will be developed for the workforce, and it will be ensured that the individual is matched to them.

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

- Dozer
- Loader/Excavators/Jack Hammer
- Concrete Mixers
- Tractor Trolley
- Water tanker
- Water pump
- Diesel generator
- Vehicle for personnel movement
- Road rollers

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

Construction Material**:** The construction material will include cement, sand, crush, bricks, steel bars, paint, the piping material, and electrical material. Most materials will be procured from Lahore, Rawalpindi or Islamabad depending upon the prices. The Bills of Quantities of the material will depend upon the construction activities.

Disposal of Excavated/ Construction Waste**:** Construction waste will be recycled by the contractor. Construction debris will be used in the cut/fill process.

Electricity**:** Currently there is no electricity connection at the project site. However, the contractor will get proper electricity connection from IESCO for the construction activities and camp.

Camp Supplies**:** Camp supplies can be procured from Islamabad city and transported to the project site from Margalla Avenue.

Camp Site Sanitation Facilities**:** The contractor will construct a septic tank with a soakage pit to treat sewerage generated at the campsite.

Traffic Load during Mobilization (and Demobilization) of the Contractor: All of the constructions equipment and vehicles will be transported to the site via Margalla Ave or Shah Allah Ditta Road.

Traffic Load for Construction Materials Supplies: It is estimated that on average, 2-5 truckloads per day during the peak construction period will be supplying different types of construction materials to the project site during the peak construction period.

Other Supplies Water: During the construction phase, a maximum of about 6,000 gallons per day of water will be required for construction activities and human consumption. The water supply will be arranged by the contractor.

Fuels: For the construction equipment and vehicle, diesel will be required. The vehicles will get diesel from the nearest petrol pump.

4.12.3 Operational Phase

The ICT/Concerned Union Council under the technical supervision of Local Government and Rural Development Department Islamabad will be responsible for operation and maintenance of the Road from Shah Allah Ditta to Alexander Well, ICT Limits, Islamabad during the operational phase.

Figure 4.3: Pictorial Presentation of Project Site

Exhibit 1: Starting Point of the project site

Exhibit 2: End Point of the project site

Exhibit 3: Camp Site of the Proposed Project

Exhibit 4: Shah Allah Ditta Underpass

Exhibit 5: Road coming from Pind Sangral Village

Exhibit 6: Shah Allah Ditta Cave (Budha Cave) Entrance

5 Project Alternatives

5.1 Background

An analysis of available alternative is necessary to establish that the most suitable management and technology options will opt for the project.

5.2 Management Option

The three significant alternative management option is the 'no project option', 'site alternative option' and 'build as proposed option'.

5.3 No Project Option

If the "No Project" option is triggered; then Project will lose all positive impacts; as the Roads make a crucial contribution to economic development, growth and bring important social benefits to Shah Allah Ditta Village and its nearby areas. In addition, providing access to employment, social, health and education services makes a road network crucial in fighting against poverty. Roads open up more areas and stimulate economic and social development by promoting tourist activities. For those reasons, upgradation of Shah Allah Ditta road is most suitable option. It will also create employment opportunities for the locals.

The "No Project Option" does not appear reasonable given the above fact. However, the expected negative impacts can be minimized by adopting appropriate mitigation measures.

5.4 Build-As-Proposed-Option

The proposed project that is of Rehabilitation/Up-Gradation of Road from Shah Allah Ditta to Alexander Well, ICT Limits, Islamabad will improve the overall area and living standard of the local people by providing them with employment as well as by developing the area. The project will help develop an urban sprawl in the area that will result in economic activity. It will also promote the tourist activities as Shah Allah Ditta Road gives access to the historical and cultural heritages like Shah Allah Ditta Budha Caves, Saima Abdullah Shrine and Alexander Well. The project is significant as it will facilitate integrated development, efficient use of public resources and effective service delivery.

However, the negative impacts due to the project's construction and operational phases can be minimized, controlled, or eliminated, if the mitigation measures, as suggested in the EIA report, are implemented.

5.5 Site Alternatives

The infrastructure development in the area is rapidly improving due to the upgradation/rehabilitation of existing Road from Shah Allah Ditta to Alexander Well, ICT Limits, Islamabad. Site Alternative is not a valid option because the project involves the upgradation of the existing road.

The land for the project site is also already in the possession of Capital Development Authority (CDA), so no alternative site was considered for the project.

5.6 Conclusion

No alternative site has been identified. If the project is not implemented, then all positive impacts related to the project will be lost. The project will contribute to the development of the area by providing employment opportunities to the local population. The project aims to improve the living conditions for the residents of Shah Allah Ditta Village by upgrading the Shah Allah Ditta Road, thereby enhancing the quality and efficiency of local services. So, the best option is to build as proposed by mitigating its potential impacts.

6 Description of the Environment

6.1 Introduction

This chapter describes the existing environment of the project area. In order to assess the impacts and related mitigation measures, existing environmental conditions of physical, biological and the socio-economic environment of the project area were studied.

6.2 Project Area Location

The project area is located in the premises of Islamabad. The Shah Allah Ditta Road passes through the Shah Allah Ditta Village.

6.3 Baseline Physical Environment

6.3.1 Topography

Islamabad is located at the edge of the Potohar Plateau and at the foot of the Margalla Hills in Islamabad Capital Territory.

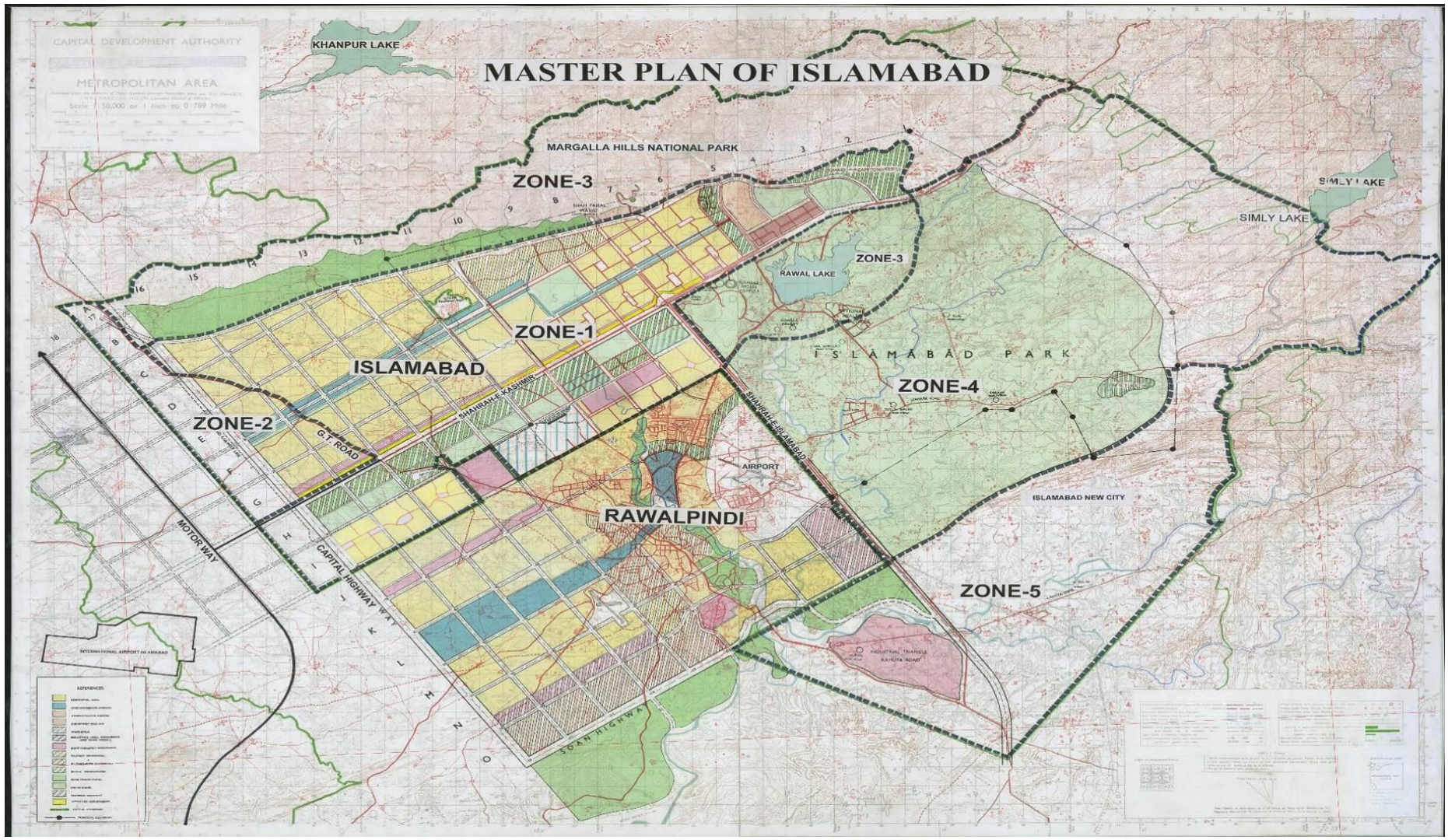
The Potohar Plateau has an uneven table and land is gradually rising in elevation from 500 to 600 meters above the sea level, and the highest point is 1,600 meters above mean sea level. The land gradually slopes towards the South. The land is composed either of alluvium (clay or silt) or of gravel caps. The plains are formed of alluvial deposits laid by the past and the present river systems of varying thickness. A large part of the area is undulating, and at various places, it is badly dissected by gullies and ravines.

The topography of Islamabad consists of plains and mountains. The northern part of the metropolitan area comprises mountains terrain of the Margalla Hills, and Rawal Lake lies in the northeast just below the hills. The southern portion of this city is an undulating plain drained by Korang River followed by its tributaries. Towards the east is a relatively flat area with bare soil and settlements. The map of Islamabad has been provided in **Figure 6.1**.

6.3.2 Geology and Soils

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

Figure 6.1: Map of Islamabad



6.3.3 Land Use

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

6.3.4 Seismic Risk

Islamabad region can be divided into three major structural zones. The mountainous north, including Margalla Hills, is complexly folded and thrust along the Hazara Fault Zone.

Southwards the mountains are a sloping piedmont bench that is truncated in sandstone and shale. The Soan River flows along the axis of Soan syncline.

Islamabad lies just at the edge of Hazara Fault Zone that consists of an arc of thrust and folded rocks about 25km wide and 150 km long that is convex to the south and extends west-southward away from the Himalayan syntaxis.

There are many thrust sheets in Islamabad area, some of these thrust faults are in front of Margalla Hills which extends north of Fateh Jang and form Kala Chita Range.

The Islamabad region lies in a tectonically active zone, where earthquakes have been frequent in the recent geological history due to faulting and folding of the structure. Geological past shows that there were many activities of earthquakes in the past in the region.

The Soan syncline is an asymmetric, faulted fold of regional extent, plunging west southward. Although earthquake shaking is not confined to areas near-surface faults, the risk of surface rupture is greater where the surface has been broken previously.

Earthquake in 2005 (7.6 magnitudes) resulted in large area destruction in Islamabad.

The Seismic Map of Islamabad is given in **Figure 6.2**.

6.3.5 Major Earthquakes

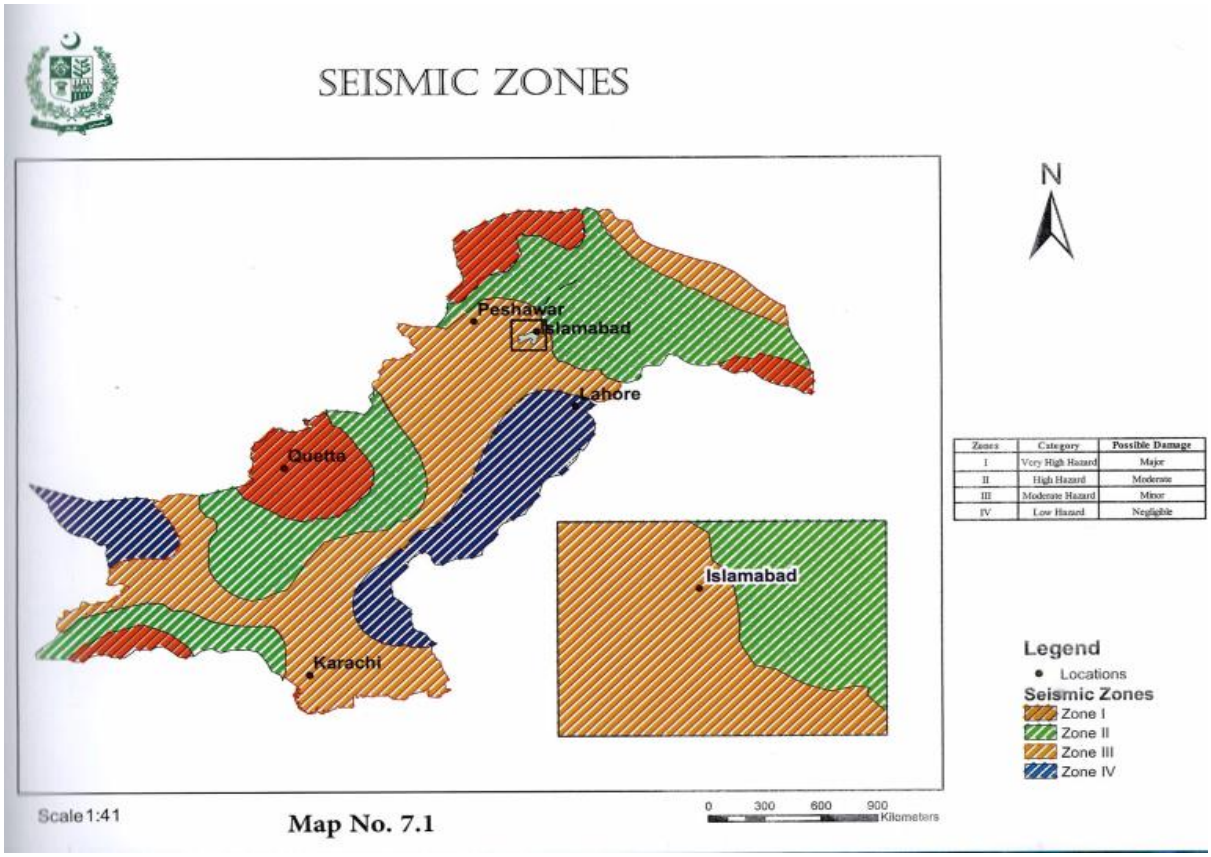
The Islamabad region lies in a tectonically active zone, where earthquakes have been frequent in the recent geological history due to faulting and folding of the structure. Geological past shows that there were many activities of earthquakes in the past in the region.

The Soan syncline is an asymmetric, faulted fold of regional extent, plunging west southward. Although earthquake shaking is not confined to areas near-surface faults, the risk of surface rupture is greater where the surface has been broken previously.

Earthquake in 2005 (7.6 magnitudes) resulted in large area destruction in Islamabad. Repeated earthquakes have been hitting the area almost every year. [1]

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

Figure 6.2: Seismic Map of Islamabad



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

6.3.6 Surface Water

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

The Budha Cave Chashma are the main streams draining the area and are the main surface water resource in the vicinity of the project site. Moreover, the Bahudra kas (stream) is also present about 383 m away from the Shah Allah Ditta road.

6.3.7 Ground Water

Ground Water of the project site is available at a depth of 180-200 ft. and used for drinking and other domestic purposes. Bore holes are dug to access ground water.

Groundwater analysis were carried out at the project site on 04th October 2023. The parameters that were analyzed include pH, Total Dissolved Solids, Chloride, Cadmium, Chromium, Copper, Lead, Manganese, Nickel, Zinc, Antimony, Aluminum, Arsenic, Boron, Barium, Mercury, Selenium, Total Coliforms, E.Coli, Color, Taste, Odour, Turbidity, Total Hardness as $CaCO_3$, Cyanide, Fluoride, Nitrate, Nitrite, Residual Chlorine and Phenolic Compounds (as Phenols) whose concentrations were 7.1, 418 mg/L, 6 mg/L, ND, ND, ND, ND, ND, ND, ND, ND, ND, ND, ND, ND, 0.2 mg/L, ND, ND, ND, ND, ND, Acceptable, Acceptable, 0.2 NTU, 380 mg/L, ND, 0.4 mg/L, 16 mg/L, ND, ND, ND respectively. The results are provided as **Annexure-5.**

Table 6.1: Ground water results

Sr. No.	Parameters	Reference values	Concentration	Method/ Equipment Used	Remarks
1	pH*	6.5-8.5	7.1	SMWW 4500H^+B	Within Limits
2	Total Dissolved Solids (TDS)*	<1000 mg/L	418 mg/L	SMWW 2540C	Within Limits
3	Chloride (as Cl^-) *	<250 mg/L	6 mg/L	SMWW 4500Cl^-B	Within Limits
4	Cadmium (Cd) *	0.01 mg/L	0.01 mg/L	U.S. EPA-200.7	Within Limits
5	Chromium (Cr) *	≤ 0.05 mg/L	ND	U.S. EPA-200.7	Within Limits
6	Copper (Cu) *	2.0 mg/L	ND	U.S. EPA-200.7	Within Limits
7	Lead (Pb) *	≤ 0.05 mg/L	ND	U.S. EPA-200.7	Within Limits
8	Manganese (Mn) *	≤ 0.5 mg/L	ND	U.S. EPA-200.7	Within Limits
9	Nickel (Ni) *	≤ 0.02 mg/L	ND	U.S. EPA-200.7	Within Limits
10	Zinc (Zn) *	5.0 mg/L	ND	U.S. EPA-200.7	Within Limits
11	Antinomy (Sb)	≤ 0.005 mg/L	ND	U.S. EPA-200.7	Within Limits
12	Aluminum (Al)	≤ 0.2 mg/L	ND	U.S. EPA-200.7	Within Limits
13	Arsenic (As)	≤ 0.05 mg/L	ND	U.S. EPA-200.7	Within Limits
14	Boron (B)	0.3 mg/L	ND	U.S. EPA-200.7	Within Limits
15	Barium (Ba)	0.7 mg/L	0.2 mg/L	U.S. EPA-200.7	Within Limits
16	Mercury (Hg)	≤ 0.001 mg/L	ND	U.S. EPA-200.7	Within Limits
17	Selenium (Se)	0.01 mg/L	ND	U.S. EPA-200.7	Within Limits
18	Total Coliforms	----	ND	SMWW 9221 B	----
19	E. Coli	Must not be detectable in any 100ml sample	ND	SMWW 9221 H	Within Limits
20	Fecal Coliform Bacteria	Must not be detectable in any 100ml sample	ND	SMWW 9221 H	Within Limits
21	Color	≤ 15 TCU	ND	SMWW 2120 C	Within Limits
22	Taste	Non Object. / Acceptable	Acceptable	Organoleptic	Within Limits
23	Odor	Non Object. / Acceptable	Acceptable	Organoleptic	Within Limits
24	Turbidity	<5NTU	0.2 NTU	SMWW 2130 B	Within Limits

25	Total Hardness as $CaCO_3$	<500 mg/L	380 mg/L	SMWW 2340 C	Within Limits
26	Cyanide(CN^-)	≤ 0.05 mg/L	ND	SMWW 4500 CN^- F	Within Limits
27	Flouride (Fl^-)	≤ 1.5 mg/L	0.4 mg/L	U.S. EPA-9214	Within Limits
28	Nitrate (NO_3^-)	≤ 50 mg/L	16 mg/L	SMWW 4500 NO_3^-B	Within Limits
29	Nitrite (NO_2^-)	≤ 3 mg/L	ND	SMWW 4500 NO_2^-B	Within Limits
30	Residual Chlorine	0.2-0.5 mg/L	ND	SMWW 4500-Cl B	Within Limits
31	Phenolic Compounds (as Phenols)	No Guideline Value Set	ND	SMWW 5530 C	Within Limits

Source: *ES PAK (PAK EPA & PUNJAB CERTIFIED)*

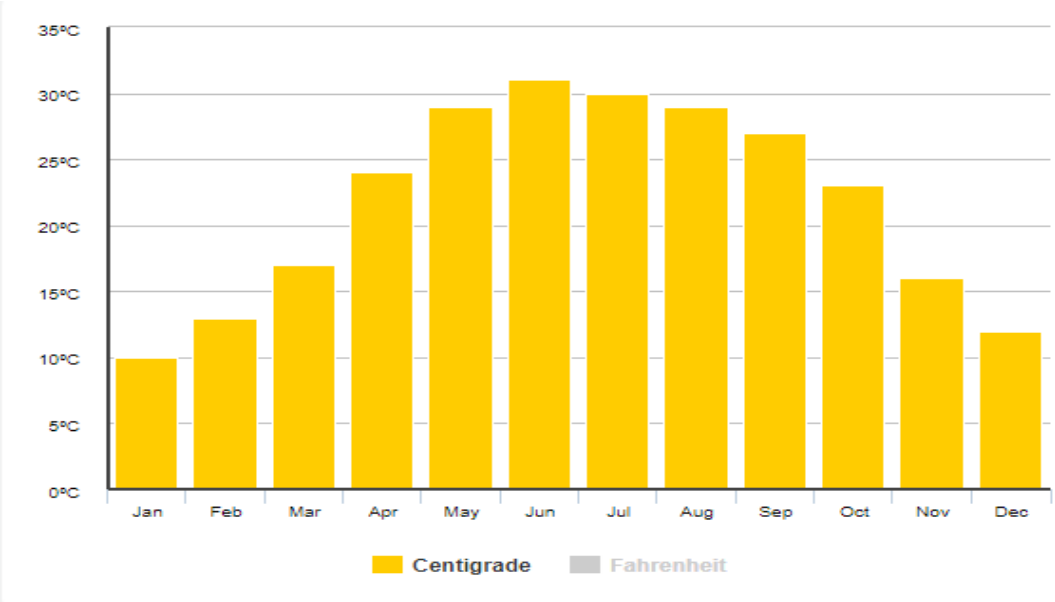
6.3.8 Climate

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

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

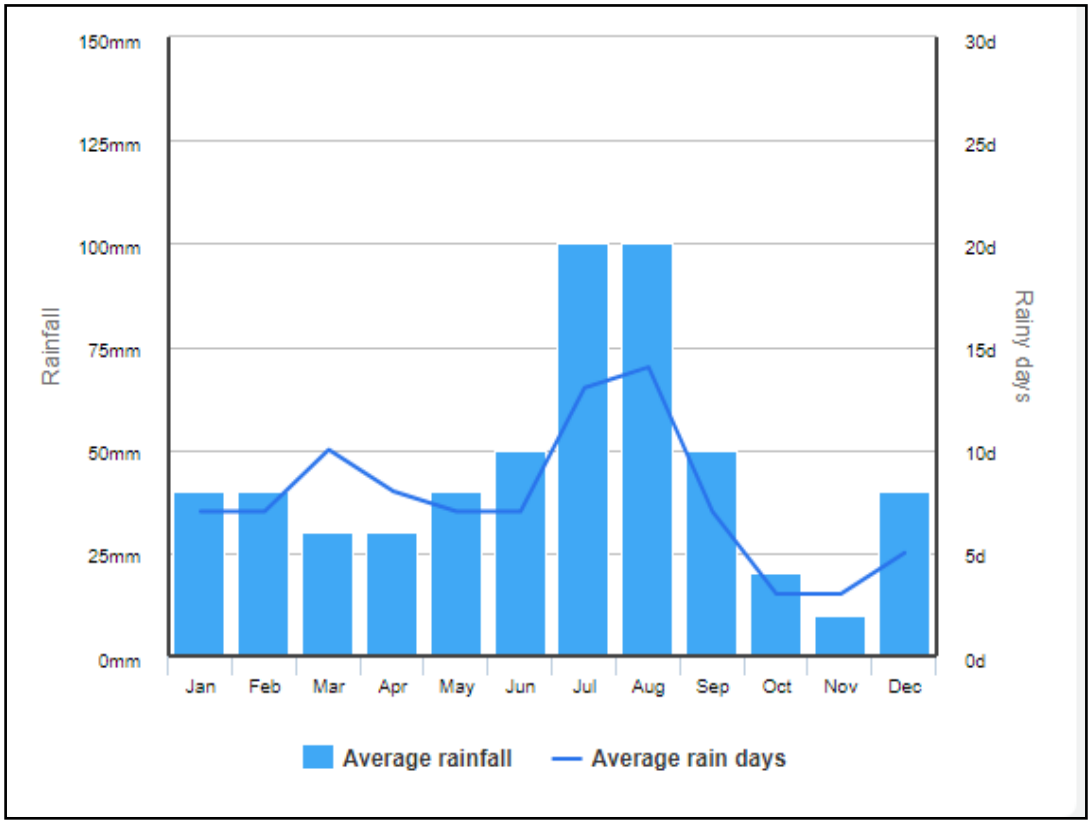
Metrological Data of Islamabad, including rainfall and mean minimum and the maximum temperature is shown in **Figure 6.3 & 6.4**.

Figure 6.3: Mean Monthly Meteorological Data of Islamabad[2]



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

Figure 6.4: Mean Monthly Precipitation Data of Islamabad[6]



6.3.9 Air Quality and Noise Level Monitoring

The ambient air quality and noise level monitoring was conducted on 2 locations along the road and compared against the National Environmental Quality Standards (NEQS) for Sulphur dioxide (SO_2), Oxide of Nitrogen (as NO), oxide of Nitrogen (as NO_2), Ozone (O_3), Suspended Particulate Matter (as SPM), Respirable Particulate Matter (as PM_{10}), Respirable Particulate Matter (as $PM_{2.5}$), and Carbon monoxide (CO) during 24 hours at the project site.

The ambient air and noise level monitoring was conducted on 06th October to 07th October 2023 for 24 hours at location-1 and from 08th October to 09th October 2023 for 24 hours at location-2 of Shah Allah Ditta Road, Islamabad.

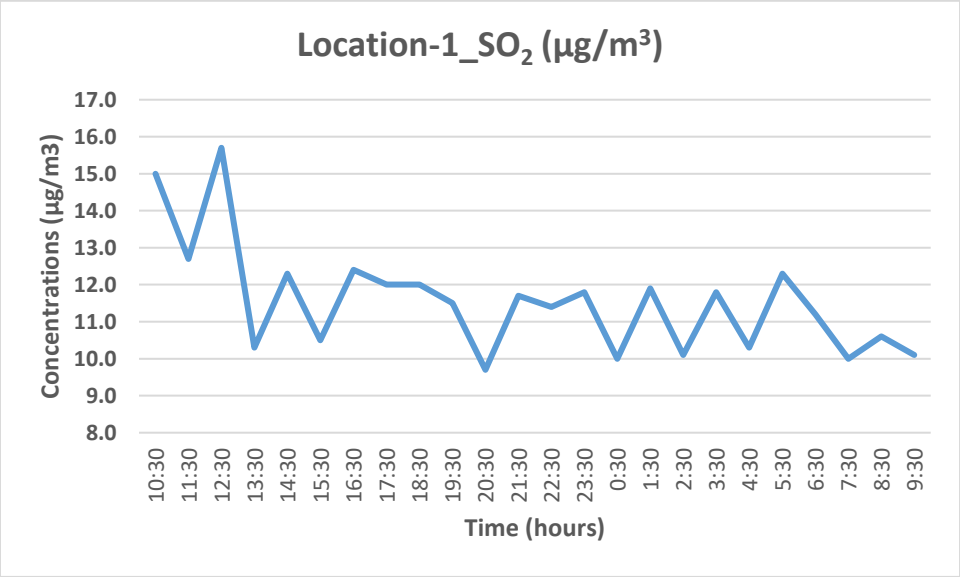
The ambient air quality and noise monitoring was carried out by Pak-EPA Certified laboratory, Environmental Services Pakistan (ESPAK).

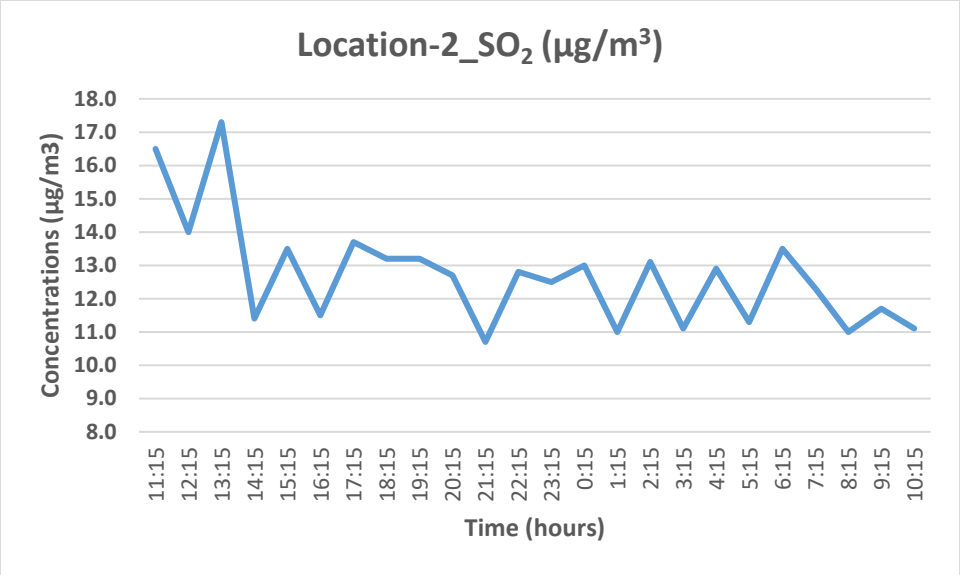
6.3.10 Ambient Air Quality Monitoring

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

The 24h average concentration of SO_2 at the monitoring site was 11.5 µg/m3 and 12.7 µg/m3 for Location-1 and Location-2 respectively, which is in compliance with the NEQS (120 µg/m3) of Pakistan.

Figure 6.5: Hourly variation of Sulphur dioxide (SO_2) at the project site



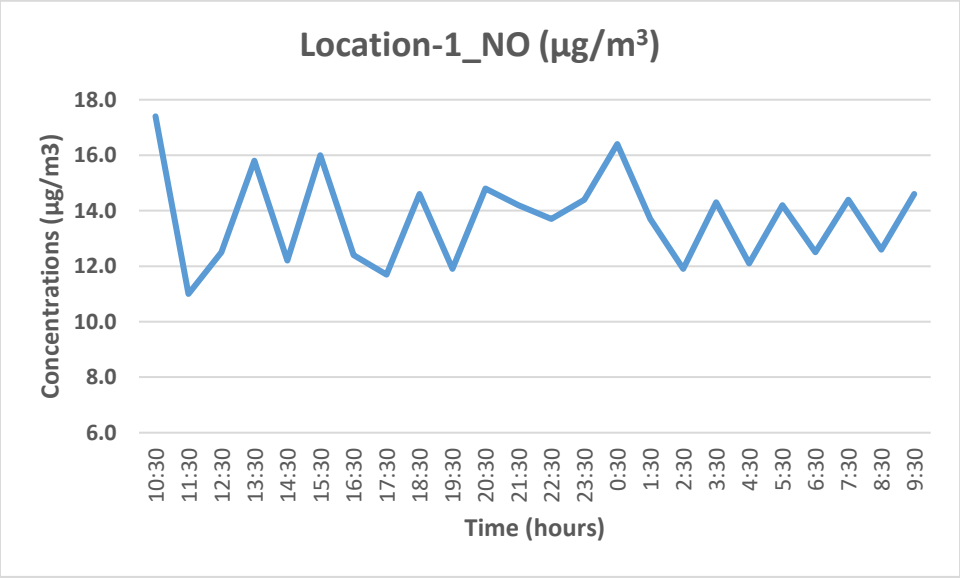


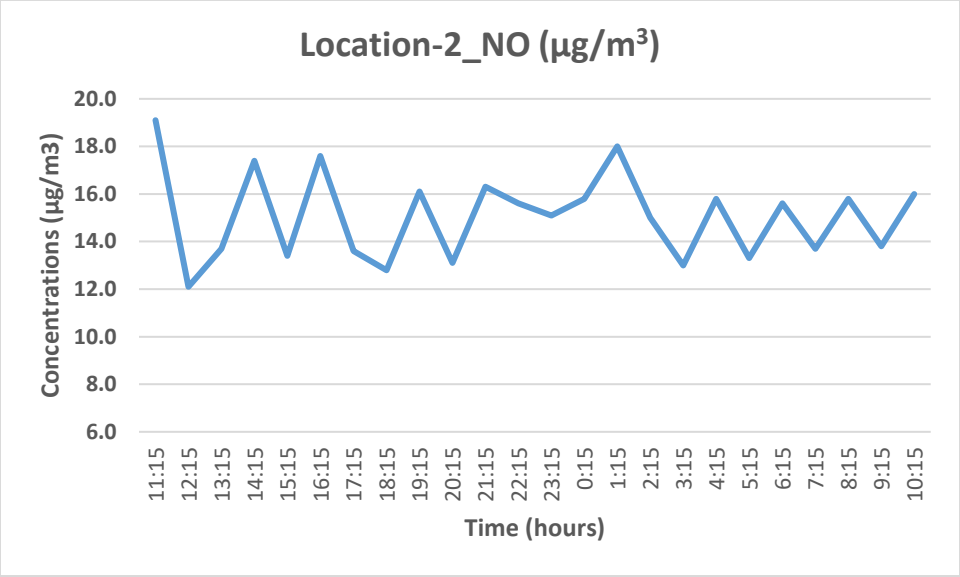
Nitrogen Monoxide (NO): Nitric oxide (nitrogen oxide, nitrogen monoxide) is a molecular, chemical compound with a chemical formula of NO. One of several oxides of nitrogen, it is a colourless gas under standard conditions. It is also produced naturally by the extremely high air temperatures produced along the path of lightning in thunderstorms.

Nitric oxide should not be confused with nitrous oxide (N_2O), an anesthetic, or with nitrogen dioxide (NO_2), a brown toxic gas and a major air pollutant, the latter being a product to which nitric oxide is rapidly oxidized in air.

The averaged (24h) concentration of NO was 13.7 µg/m3 and 15.1 µg/m3 for Location-1 and Location-2 respectively. Hence, remained within compliance with NEQS (40 µg/m^3) at the ambient air quality monitoring sites.

Figure 6.6: Hourly variation of Oxide of Nitrogen (as NO) at the project site



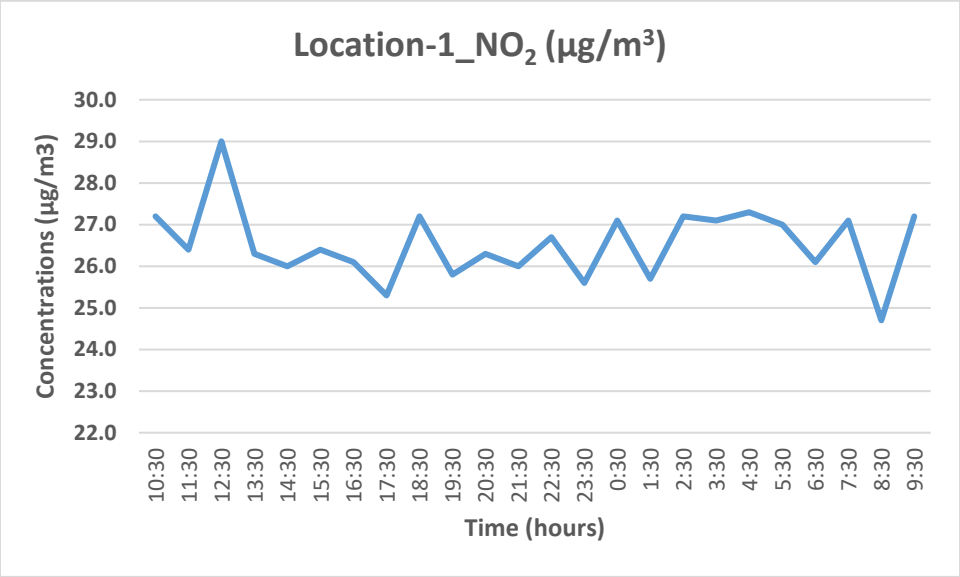


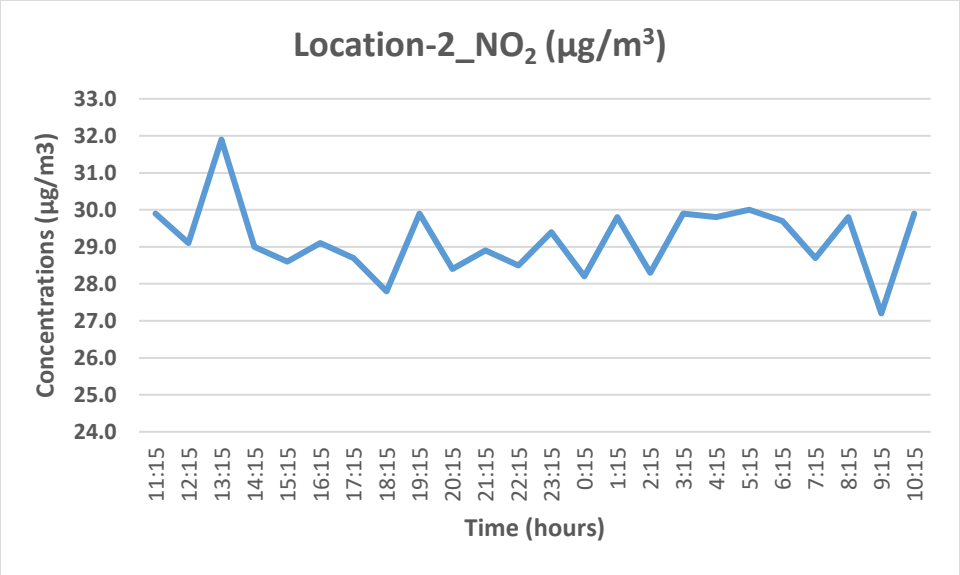
Nitrogen dioxide (NO_2): Nitrogen dioxide (NO_2) is a light brown gas that can become an important component of urban haze. It is likely that oxides of nitrogen are the second most abundant atmospheric contaminants in many cities, ranking next to Sulphur dioxide.

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

The primary sources of nitrogen oxides (NO_X) are motor vehicles and thermal power generation. The averaged (24h) concentration of NO_2 was 26.5 µg/m3 and 29.2 µg/m3 for Location-1 and Location-2 respectively, hence, remained within compliance with NEQS (80 µg/m^3) at the project site.

Figure 6.7: Hourly variation of oxide of Nitrogen (as NO_2) at the project site





Ozone (O_3)

Ozone or tri-oxygen is an inorganic molecule with the chemical formula O_3. It is a pale blue gas with a distinctively pungent smell. It is an allotrope of oxygen that is much less stable than the diatomic allotrope O_2, breaking down in the lower atmosphere to normal oxygen.

The 1 hr average concentration of Ozone was 21.0 µg/m3 and 23.1 µg/m3 for Location-1 and Location-2 respectively at the project site which remained within compliance limits of NEQS.

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

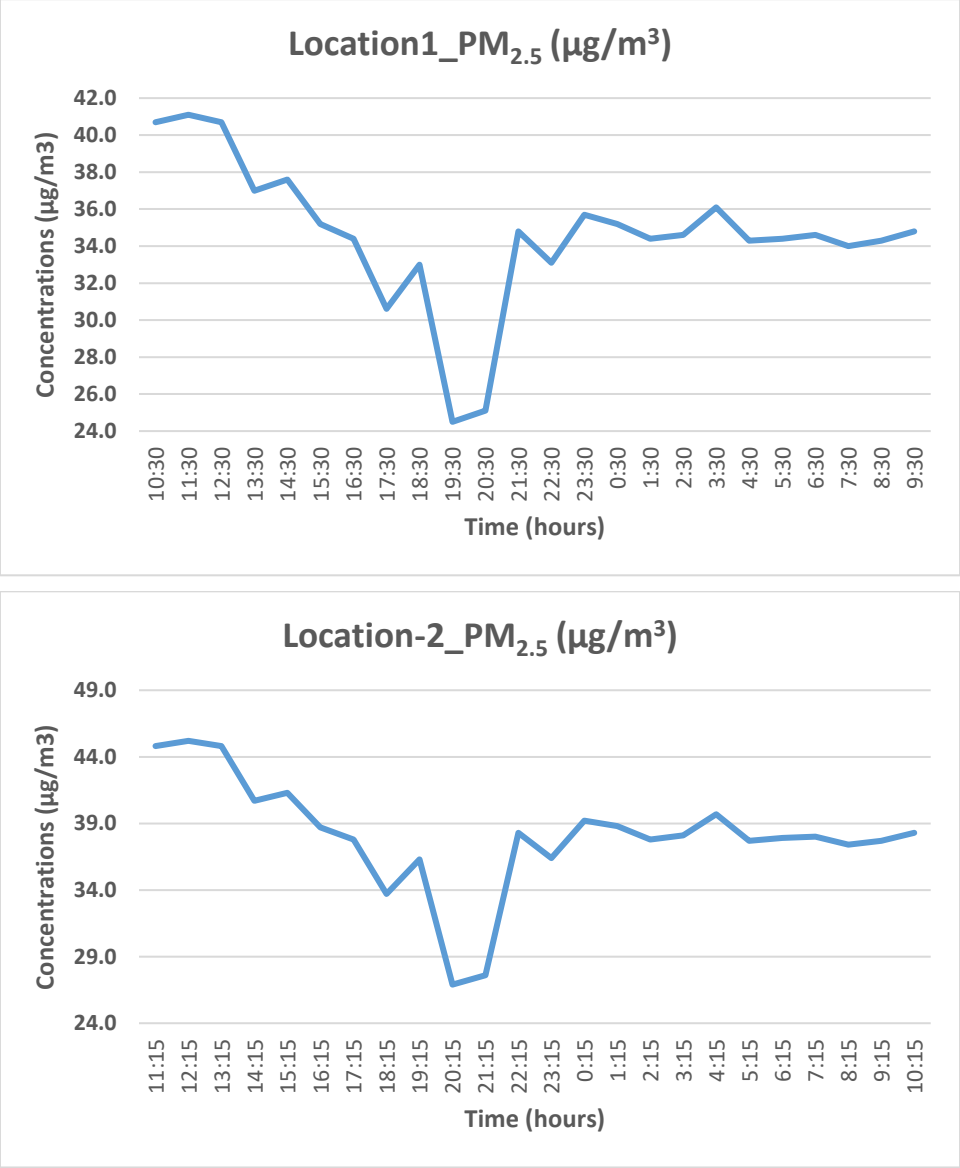
The fine PM can be sulfates, nitrates, organic matter (organic carbon compounds), elemental carbon (soot), and soil dust (crustal materials).

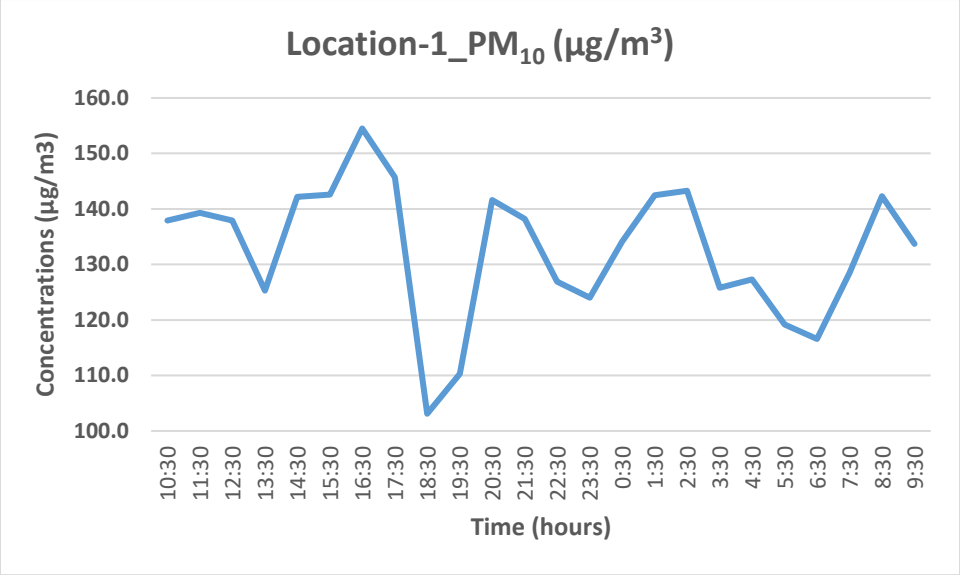
The time-averaged (24h) concentration of PM_{10} was 132.6 µg/m^3 and 152.6 µg/m^3 for Location-1 and Location-2 respectively which is exceeding the limits on Location-2 and for $PM_{2.5}$ concentration was 34.6 µg/m3 and 38.0 µg/m3 for Location-1 and Location-2 respectively which is exceeding the permissible limit of NEQs.

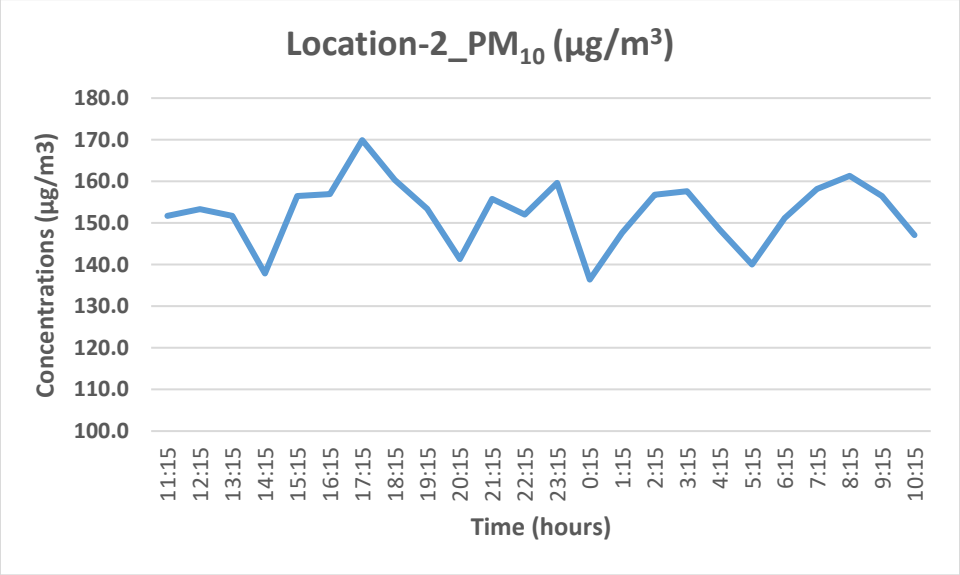
The concentration of $PM_{2.5}$ & PM_{10} were exceeding the limits during the 24h monitoring at the project site. One reason could be the existing condition of the road which could be the cause of increased dust particles in the air due to vehicular emissions. It can be improved by sprinkling water regularly and good maintenance of the road.

The PM_{10} and $PM_{2.5}$ hourly variation in concentrations are shown in **Figure 6.8**.

Figure 6.8: Hourly variation of Respirable Particulate Matter (PM_{10} and PM $_{2.5}$) at the Project Site





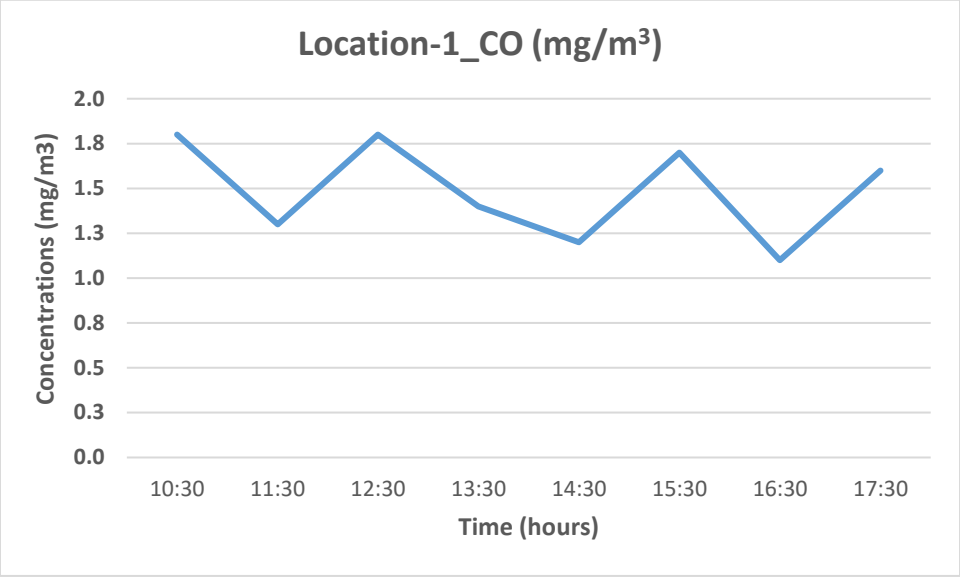


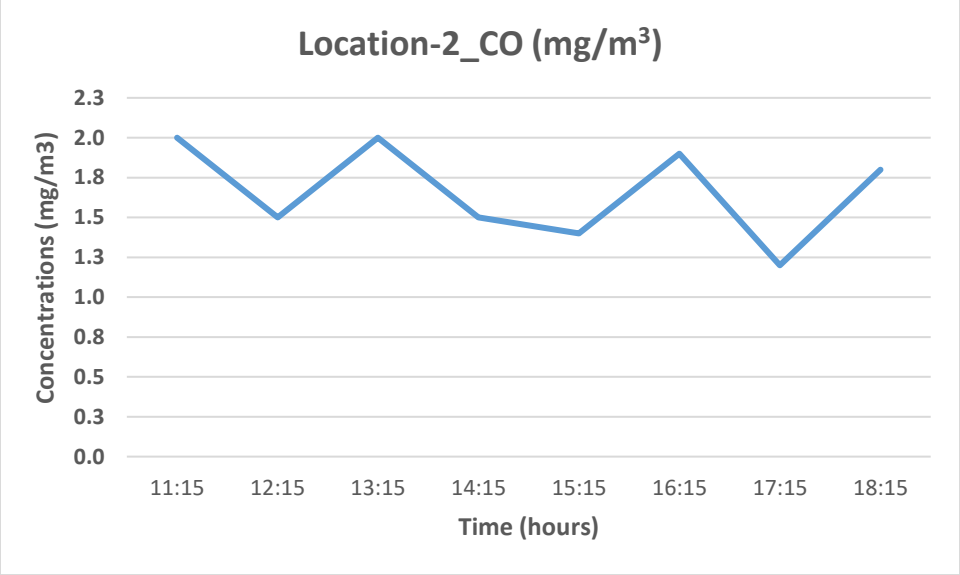
Carbon monoxide (CO): Carbon monoxide is an odourless, colourless and highly poisonous gas that has its major origin in the incomplete combustion of carbonaceous materials. Although industrial processes contribute to CO pollution levels, however, the principal source of CO is automobiles.

Vehicles operating at colder temperatures (in winter, during engine warm-up or in stop-and-go traffic) produce significant quantities of this deadly gas and is of particular concern in urban areas.

The Carbon monoxide (CO) concentration was monitored for 8h intervals at the selected site. The average 8h concentration of CO at the project site was found to be 1.5 mg/m^3 and 1.6 mg/m^3 for Location-1 and Location-2 respectively which is within the compliance limit of NEQS (i.e., 5 mg/m^3).

Figure 6.9: Hourly variation of Carbon Monoxide (CO) at the Project Site





6.3.11 Noise Level Monitoring

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

The 24-hour monitoring period for noise level was carried out at 2 different locations of the project site. The noise levels were exceeding the NEQS limits on both locations and the commercial and transportation activities can be the possible reason of this incompliance.

6.3.12 Conclusion of Ambient Air and Noise Level Monitoring

The ambient air and noise level monitoring was conducted on 06th October to 07th October 2023 for 24 hours at location-1 and from 08th October to 09th October 2023 for 24 hours at location-2 of Shah Allah Ditta Road, Islamabad.

Proper plantation on open spaces of the project site will be promoted to help enhance and maintain the air quality of the area in future.

The laboratory report detailing the ambient air and noise level monitoring report is attached in **Annexure 5.**

The SO_2, NO, NO_2, O_3, CO concentrations meets the NEQS limits. A summary of ambient air quality and noise levels results are given in **Table 6.2** below:

Table 6.2: Summary of Ambient Air Quality and Noise Results at the Project Site

Parameters	Limit Values (NEQS-24 hrs)	Location # 1 (Project Site)	Location # 2 (Project Site)	Method/ Equipment Used	Remarks
Carbon Monoxide	5 mg/m^3 (8 Hours)	1.5 mg/m^3	1.6 mg/m^3	Non-Dispersive Infrared Absorption (NDIR)	Within Prescribed Limits
Sulfur Dioxide (SO_2)	120 µg/m^3	11.5 µg/m^3	12.7 µg/m^3	UV Fluorescence (UVF)	Within Prescribed Limits
Ozone (O_3)	130 µg/m^3 (1 Hour)	21.0 µg/m^3	23.1 µg/m^3	Non-Dispersive UV Absorption	Within Prescribed Limits
Oxides of Nitrogen (NO)	40 µg/m^3	13.7 µg/m^3	15.1 µg/m^3	Chemiluminescence Detection	Within Prescribed Limits
Oxides of Nitrogen (NO_2)	80 µg/m^3	26.5 µg/m^3	29.2 µg/m^3	Chemiluminescence Detection	Within Prescribed Limits
Particulate Matter $PM_{2.5}$	35 µg/m^3	34.6 µg/m^3	38.0 µg/m^3	Particulate Sensor	Exceeding Prescribed Limits
Particulate Matter PM_{10}	150 µg/m^3	133 µg/m^3	153 µg/m^3	Particulate Sensor	Exceeding Prescribed Limits
Suspended Particulate matter (SPM)	500 µg/m^3	458 µg/m^3	503 µg/m^3	Particulate Sensor	Exceeding Prescribed Limits
Noise Level Day Time	65 dB(A)	67 dB(A)	73 dB(A)	Bentech Noise Meter	Exceeding Prescribed Limits
Noise Level Night Time	55 dB(A)	60 dB(A)	64 dB(A)	Bentech Noise Meter	Exceeding Prescribed Limits

6.4 Biological Environment

6.4.1 Flora

According to the natural vegetation of Pakistan, ecologically Islamabad lies under the thorny zone of vegetation. The vegetation is a representative of Dry Subtropical Scrub Forest which is dominated by *Acacia Modesta* (Phulai), *Ziziphus mauritiana* (Ber), etc.

The most common trees in Islamabad are of Amal Tas (*Casia fistulla*), Chinar (*Platanus orientalis*), Phulai (*Acacia modesta*), Dharek (*Melia zardorachita*), Jangali ber (*Zizyphus maurantiana*), Kiker (*Acacia nilotica*), Mulberry-Shahtoot (*Morus alba*), Safaida (*Eucalyptus camaldulensis*), Shisham (*Dalbergia sissoo*), Coconut (*Cocos nucifera*), Papeta (*Manilkara zapota*), Jaman (*Syzygium cumini*),Peli Kaner (*Thevetia peruviana*), Shireen (*Albizia lebbek*), Bamboo (*Bambusa*), Semal (*Bombax ceiba*), Palm (*Arecaceae*), Mango (*Mangifera indica*), etc. In the undergrowth *Cannabis sativa* (Bhang), *Calotropis procera* (Desi Ak), *Parthenium hysterophorous* (Gandi Booti) and *Ocimum bacilicum* (Niazbo) are predominant.

6.4.2 Fauna

The major wildlife of the area is porcupine, hare, wild boar, and grey partridges. The ecology of project area is very low because of already ongoing development activities.

The fauna of the tract is provided in **Annexure – 9**.

The species found in the Islamabad are:

Mammals

- *Canis aureus* (Asian Jackal)
- *Rattus rattus* (Rat)
- *Herpestes javanicus* (Grey Mangoos)
- *Felis chaus* (Jungle Cat)
- *Lepus negricollis* (Indian Hare)
- *Hystrix indica* (Porcupine)
- *Sus scrofa* (Wild Boar)

Reptiles

- *Calotes Versicolor* (Garden Lizard)
- *Eschis carinatus* (Saw scaled viper)
- *Passer domesticus* (House Sparrow)
- *Spalerosophis diadema* (Diadem Snake),
- *Uromastix hardwicki* (Spiny Tailed Lizard),

Birds

- *Coturnix coturnix* (Quail)
- *Centropus sinensis* (Common Crow)
- *Alcedo atthis* (Kingfisher)
- *Passer domesticus* (House Sparrow)
- *Corvus splendons* (House Crow)

6.5 Socio-Economic and Cultural Environment

This section describes the socio-economic and cultural environment of the project area.

A random sampling survey was carried out within the project area and its surroundings to collect firsthand, reliable, and authentic information that could lead to a sound socio-economic analysis of the people living in the area.

6.5.1 Shah Allah Ditta

Shah Allah Ditta (Urdu: شاہ اللہ دتہ) is a centuries-old village and a union council located at the foothills of the Margalla Hills in the Islamabad Capital Territory, Pakistan. It is located adjacent to Sector D-12 of Islamabad

Relics of the Buddhist era dating back to the 8th century can be found here along with burnt diyas and trees with amulets tied to them. Shah Allah Ditta caves are located on the route leading towards Khanpur. These caves are next to the shrine and tomb of Shah Allah Ditta. 2,400-year-old Buddhist era murals of Buddha appear on the walls of caves at Shah Allah Ditta. Moving up the mountain from the caves, there is a stepwell called Losar Baoli and a mosque built by Shahāb-ud-Din Ghori.

6.5.2 Pind Sangral

Pind Sangral in the region of Punjab is a town in Pakistan 7 miles or (11 km) in west of Islamabad , the country's capital city. Its geographical coordinates are 33° 42' 6" North, 72° 55' 53" East and its original name (with diacritics) is Pind Sangrāl. Pind Sangral is situated nearby to the localities Shah Allahditta and Lamiadhanan.

7 Stakeholder and Public Consultation

7.1 Introduction

During the EIA processing, the stakeholders were involved in the public consultation to know their opinions, concerns, issues, and suggestions regarding the project.

This chapter provides details of public consultations carried out with the community and stakeholders at different levels.

7.2 Approach to Public Consultation

The public consultation process has been approached to involve the community and stakeholders from the earliest stages. Public consultation has taken place during the planning and design phase of the project. The focus of attention has been the community living adjacent to the Shah Allah Ditta Road, Islamabad, as well as staff and visitors who may be affected by the project.

The viewpoint of the stakeholders has been considered, and their concerns and suggestions for possible improvements have been included in the EIA where appropriate.

Much of the public consultation process has revolved around concerns for the mitigation of construction and operational phase impacts.

Meetings were held with the Proponent, Emergency & Disaster Management Directorate of Capital Development Authority, IESCO, and community living around the project site. Their point of concern and suggestions regarding the project was solicited.

7.3 Objectives of Consultation

The overall objective of the consultation with the stakeholders is to verify the environmental and social issues that have been presumed to arise and to identify those which are not known or are unique to the project.

The objectives of the public consultation process are:

- Provide key project information to the stakeholders, and solicit their views on the project's potential or perceived impacts,
- Identification of potential problems and needs,
- To devise the way for collaborative problem solving,
- Develop and maintain communication links between the project proponents and stakeholders, providing opportunities to the public to influence the project design in a positive manner, and
- Ensure that views and concerns of the stakeholders are incorporated into the project design and implementation with the objectives of reducing or offsetting negative impacts and enhancing the benefits of the proposed project.

7.4 Categories of Stakeholders Contacted

Potential stakeholders for consultation and participation were identified, and discussions were held with the community living in the project area of impact. Moreover, government and private employees and local public representatives were also contacted.

7.5 Major Stakeholders Involved

The stakeholders contacted during the survey belonged to different categories of people, as shown in **Table 7.1**.

Table 7.1: Categories of Stakeholders Interviewed in the Project Area

No.	Stakeholder Category
1	Project Proponent (Capital Development Authority)
2	Environmental Practitioners
3	Government Organizations (IESCO, EDM)
5	Community living adjacent to Shah Allah Ditta to Alexander well Project, Islamabad

7.6 Scoping Session

During the public consultation process, both primary and secondary stakeholders were consulted. Consultation with the primary stakeholders was in the form of informal meetings and interviews.

The consultation with the secondary stakeholders was formal since most of them are government functionaries or professionals.

During these interviews, a simple, non-technical description of the project was given, along with an overview of the project's likely impacts on people and the environment. Following the project description, a discussion was held so that people could voice their concerns.

Generally, the community was aware of the project and encourage this initiative of CDA. The negative and positive impacts were communicated to them.

Major concern of the Stakeholders were the relocation of communities and protection of historical sites. Both concerns were addressed and it was explained that the project only involves the upgradation of existing road, hence there would be minimum impact on communities and practically no impact on historical sites.

On the other hand, there were also persons who gave positive gestures towards the project because the proposed project will provide employment opportunities and enhance the overall economic status of the community and will reduce any accidents taking place because of existing road conditions. Those who were aware of the project indicated their support as it will provide easy access to villages and enhance the overall social status of the community by improving their quality of life.

7.7 Issues Discussed

Following issues were discussed during the stakeholder consultation:

- Overall activities of the project and their possible impacts;
- Possible impacts on water bodies and natural vegetation, flora and fauna and historical sites;
- Possible mitigation measures and
- Beneficial factors and involvement opportunities of the local people in the set of activities of the Project.

7.8 Major Stakeholders and their Apprehensions

Meetings with major stakeholders were organized to discuss project-specific issues and their potential impacts on the local and regional environment.

Stakeholders consulted, and their valuable suggestions and comments are described here under:

Name and Designation	Location	Opinions/Concerns/Issues/Suggestions
Mr. Akram Jutt Sandhu, DD Roads	CDA, Islamabad	▪ The project is the rehabilitation of the existing revenue road. ▪ The project is very small scale and will be completed in 3 months. Since the project is the rehabilitation of existing road, there will negligible damage to the surrounding area. ▪ Presently, the existing situation is more harmful to the environment and human health as the deteriorating road condition is creating more dust emissions. ▪ The ready-mix concrete and asphalt will be hauled in so as to minimize air and noise pollution in the project area. ▪ The contractor will liaison with Islamabad Traffic Police to prepare a comprehensive Traffic Management Plan.
Mr. Sher Afzal	Assistant Director, Islamabad Electric Supply Company	▪ Rehabilitation of Shah Allah Ditta Road will spur the local economy and create many jobs in the project area. Such projects are much needed particularly after the slump in the economy. ▪ One of the key positive impacts of the project is the promotion of tourism. People will be able to reach the historic Buddha Caves easily. ▪ Occupational health and safety measures may be adopted by the contractor during construction works for the safety of workers.
Mr. Anwar Kamal Mr. Zulqarnain	Emergency & Disaster Management Directorate	▪ CDA is aware that the proposed project might pose negative Environmental Health and Safety Impacts ▪ Emergency and Disaster Risk Management should be an integral part of the operational phase of the Project however; it should also be considered during the construction phase of the Project.
Mr. Sami Naeem Khan	Eco Resource Solutions Limited, Islamabad.	▪ CDA must ensure that the project is limited to only rehabilitation. There should be no widening or construction of new track under this project. ▪ Since the project is located in a sensitive area, the construction period should be minimum as possible. Similarly, the water sprinkling and other mitigation measures should be strictly implemented and monitored. ▪ Pak EPA should take a very proactive role in the monitoring of the environmental management plan.
Dr Irshad Ahmed, Environmental Specialist	Rawalpindi	▪ The proposed project is the need of the area, so it should be established as soon as possible. ▪ Environmental impacts due to the proposed project will be easily mitigated. ▪ Septic tanks should be incorporated in the camp residencies. ▪ All the environmental parameters must be considered during the planning phase of the project.

7.9 Consultation with the Communities (Affected and Wider Communities)

The general consultation included community members around Shah Allah Ditta to Alexander Well project site to find out their opinion about the project. During the discussion, the community adjacent to the project site was informed about the salient features of the project, its location, and its activities.

The list of people consulted during public consultation is attached in **Annexure 2.**

The viewpoints of respondents are as follows:

- Overall, the residents of adjoining opportunities had no issue with the rehabilitation/upgradation of road and supported the project.
- There must be a proper alternate route to ensure the smooth flow of traffic on Shah Allah Ditta Road.
- The community should not be disturbed in any way by the operation and construction activities.
- The workers at the construction site should be equipped with PPEs, and they should be properly trained.

Figure 7.1: **Pictorial Presentation of Public and Stakeholders Consultation for Project**

Exhibit 7.1: Consultation with nurseries present at the project site

Exhibit 7.2: Road Side Consultation

Exhibit 7.3: Roadside Consultation

Exhibit 7.4: Consultation with shopkeepers present at roadside

Exhibit 7.5: Consultation with residents of the adjacent community

Exhibit 7.6: Consultation with residents of the adjacent community

Exhibit 7.7: Consultation with shopkeepers present at roadside

Exhibit 7.8: Road Side Publication

8 Impact Assessment and Mitigation Measures

8.1 Introduction

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

8.2 Environmental Screening of the Project

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

8.2.1 Impact Identification with Matrices

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

Impact Identification with Matrices:

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

Risk Assessment

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

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

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

Risk = Likelihood X Consequence

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

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

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

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

Based on the classification and values, a risk analysis matrix has been developed and presented in **Table 8.1.**

Table 8.1: Risk Analysis matrix

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

Based on the related values in **Table 8.1** following risk impact categories are identified.

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

Positive impacts

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

Based on the classification and values, a positive impact analysis matrix has been developed and presented in **Table 8.2.**

Table 8.2: Positive Impact Analysis Matrix

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

Possible (3)	15	12	9	6	3
Unlikely (2)	10	8	6	4	2
Rare (1)	5	4	3	2	1

Based on the related values in **Table 8.2** following positive impact categories are identified.

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

Table 8.3: Impact Identification with Matrix

Project activity	Environmental and Social issues	Risk Assessment			Mitigation Measures for risks/Enhancement measures for positive impacts	Risk Assessment after taking mitigation Measures		
		Likelihood	Consequence	Significance		likelihood	Consequence	Significance
Pre-construction Phase Impacts								
Site Selection	Encroachment on historic/cultural values	3	4	15	The Shah Allah Ditta Road pass near the Budha caves and ends about 200m far from Alexander well. The employment of small compaction machines should be employed near the archaeological site. CDA should inform the Department of Archaeology & Museums (DoAM).	1	1	6
	Disruption of Flora and Fauna	3	6	9	The project contractor will have to ensure that during construction work damage to natural vegetation is kept minimal and that no tree is chopped for fuel wood. ▪ Tree cutting and vegetation removal to minimum level. ▪ The equipment and machinery to be utilized by construction contractor shall be in strict conformity to noise standards as specified in the NEQS.	1	3	3
	Resettlement	2	5	10	No resettlement will be caused by the project.	1	3	3

Project activity	Environmental and Social issues	Risk Assessment			Mitigation Measures for risks/Enhancement measures for positive impacts	Risk Assessment after taking mitigation Measures		
		Likelihood	Consequence	Significance		likelihood	Consequence	Significance
Site Preparation	Noise	5	3	15	Noise barriers around the construction site along with mufflers (silencers) for vehicles and construction equipment to minimize noise.	4	2	8
	Dust generation	5	3	15	Additional water to be applied for dust suppression during dry weather.	3	2	6
Construction Phase Impacts								
Construction Works	Soil Erosion and degradation	5	3	15	Minimal land clearing, levelling and grading to reduce soil erosion. Construction of temporary reinforced walls to contain debris. Waste to be categorized and recycled. Slope stabilization measures to be taken during the project.	3	2	6
	Air Quality Deterioration	5	3	15	Construction equipment to be well maintained to reduce exhaust emissions. Workers to be provided with Personal Protective Gears (e.g., masks). Water to be used for dust suppression.	3	2	8
	Loss of vegetation	5	3	15	Spilling of chemicals and other effluents on the soil will be avoided. Tree plantation will also be carried out.	3	2	6
	Damage to Wildlife	3	6	9	Short term construction period will likely result in minimal disturbance to wildlife. Noise and illumination at the project site will be kept at the minimum.	3	2	6
	Noise and Vibration	4	3	12	Barriers to be constructed in sensitive areas. Night-time activities will not be held unless unavoidable.	3	2	6
	Quarrying Hazards	3	4	12	Exposed soils to be stabilized with mulch and grass to prevent hazards.	3	2	6

Project activity	Environmental and Social issues	Risk Assessment			Mitigation Measures for risks/Enhancement measures for positive impacts	Risk Assessment after taking mitigation Measures		
		Likelihood	Consequence	Significance		likelihood	Consequence	Significance
Waste Disposal	Surface (and Groundwater) quality	4	3	12	Wastewater will be properly drained into the nearest sewerage line or nullah on the site.	3	2	6
	Solid Waste Disposal	4	4	16	Any solid waste generated during construction will be recycled or disposed of in the nearest waste disposal site after consultation with CDA.	2	3	6
	Waste Effluent Disposal	4	4	16	Waste effluent generated from the septic tank will be properly drained into the nearest sewerage line on the site.	3	3	9
Positive impact	Job opportunities	4	4	16	Road construction activities will provide opportunity to local labours.	5	4	20
Operational Phase Impacts								
Operation of facility	Safety Hazard, Public Health & Nuisance	4	4	16	Safety signs and boards will be installed.	3	3	9
	Road Maintenance Works	4	3	12	Use of high-quality equipment and material by the contractor. Inspect culverts, roadside ditches and drainage system, water bars and outlets after each major runoff event and restore flow capacity as needed.	3	3	9
	Stormwater drainage system	4	3	12	Stormwater will be properly drained alongside	3	2	6
	Solid waste	4	4	16	Solid waste will be disposed properly at a designated disposal site.	3	3	9
Positive impact	Promotion of Tourism (Shah Allah Dita Caves and alternate route to Khanpur Dam)	4	4	16	Easy and safe access to the local residents and tourist coming to Shah Allah Caves.	5	4	20

Project activity	Environmental and Social issues	Risk Assessment			Mitigation Measures for risks/Enhancement measures for positive impacts	Risk Assessment after taking mitigation Measures		
		Likelihood	Consequence	Significance		likelihood	Consequence	Significance
	Reduction of dust emissions	4	4	16	All the potholes and unmetalled patches will be closed resulting in smoother road travel and dust generation (SPM)	5	4	20
	Business opportunities	4	3	12	The project will give rise to small scale businesses in the vicinity.	4	4	16

8.3 Environmental Impact Characterization

During the environmental impact assessment process of Rehabilitation/Up-Gradation of Road from Shah Allah Ditta to Alexander Well, ICT Limits, Islamabad, the predicted impacts were characterized. Various aspects of the impact characterization include:

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

The above aspects of environmental characterization are defined in **Table 8.4**.

Table 8.4: Impact Characterization of Rehabilitation/Up-Gradation of Road from Shah Allah Ditta to Alexander Well, ICT Limits, Islamabad

Categories	Characteristics
Nature	Direct: The environmental parameter is directly changed by the project. Indirect: The environmental parameter changes because of a change in another parameter.
Duration of impact	Short-term: Lasting only for the duration of the project, such as noise from the construction activities. Medium-term: Lasting for a period of a few months to a year before naturally reverting to the original condition such as loss of vegetation due to the clearing of the campsite, contamination of soil or water by fuels or oil.

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

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

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

8.4 Pre-Construction/Design Phase Impacts

8.4.1 Project Sitting Impacts

The impacts associated with the project sitting are those which relate to its location at the designated site in Islamabad. These impacts are different from those which are associated with the project's construction and operation phases, in the sense that the construction and

operation impacts are associated with the activities such as land clearing, waste disposal, whereas the sitting impacts relate to the mere presence of a facility at the given location.

For the proposed project, the

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

These are characterized in **Table 8.4**, and discussed below:

Project Site, Land Use, and Design

The Shah Allah Ditta Road is located at Margalla foothills. The impacts associated with the project sitting are those which relate to the location of road length, being at the foot hill of Margalla. The impacts include degradation of habitat, pressure on flora, fauna and other natural resources of the project area.

The unmitigated impact associated with not following the implementing the mitigation measures are characterized as follows:

- Nature : Indirect
- Duration : Short-term
- Geo extent : Local
- Reversibility: Reversible
- Likelihood : Possibly
- Consequence : Minor
- Impact significance: High

Mitigation Measures

Project Site: Total length of the road is 7.5 km including 3.5 km Rigid Paved Road from Shah Allah Ditta to Buddha Caves and 4 km Flexible Road from Buddha Caves to Alexander well. The width of the road is 24'-0''. Already operational road will be rehabilitated / upgraded.

Land Use: Shah Allah Dita Road is a revenue road and there is no change in land use.

Design: The proposed project is to rehabilitate/upgrade the existing road of Shah Allah Ditta to Alexander Well. The following mitigation measures are proposed:

- Implement a phased construction schedule to minimize disruptions to the community and limit the exposure of historical sites to potential damage
- Design the road with appropriate speed limits, signage, and traffic calming measures to ensure the safety of both road users and pedestrians in historical areas
- Enforce strict construction standards to prevent soil erosion, water pollution, and air pollution, which can harm the environment and community health
- Commit to restoring the area to its pre-construction state, including rehabilitation of historical sites and environmental rehabilitation where necessary

Visual Impacts

The proposed project can potentially damage the natural landscape, and visual impact may be observed. The unmitigated impact associated with the aesthetic value of the area is characterized as follows:

- Nature : Direct

- Duration : Long-term
- Geo extent : Local
- Reversibility : Irreversible
- Likelihood : Possibly
- Consequence : Severe
- Impact significance : High

Mitigation Measures

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

- First of all, the design of the road should be adopted in a manner that minimizes the changes in the topography, landscape and damage to the natural vegetation.
- Plant trees, shrubs, and other vegetation to screen the road from view. Strategic landscaping can help soften the visual impact and blend the road into the natural surroundings.
- Regularly maintain and clean road infrastructure, including signage and public spaces, to prevent visual degradation due to litter or neglect.
- Certain areas must be marked and left untouched to preserve natural vegetation.

Residual Impacts

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

8.5 Construction Phase Impacts

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

Physical Environment

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

Biological Environment

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

Social Environment

- Compensation for land acquisition
- Noise and vibration
- Safety hazards
- Public health and nuisance issue

- Sites of Archaeological or Historical Significance

These impacts are characterized in **Table 8.4** and can be readily pre-empted and mitigated.

The mitigation measures recommended in this section will need to be incorporated into the rehabilitation/upgradation of the road project.

These impacts and their respective mitigation measures are discussed below:

8.5.1 Soil Degradation and Contamination

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

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

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

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

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

Mitigation Measures

The followings mitigation measures will minimize soil erosion and contamination:

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

- The hazardous waste should be kept separate and handled according to the nature of the waste. While storing, hazardous waste will be marked.
- Domestic solid waste will be disposed of in a manner that does not cause soil contamination/water contamination.

Residual Impacts

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

8.5.2 Air Quality Deterioration

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

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

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

- Nature: Direct
- Duration: Short-term
- Geo extent: Local
- Reversibility: Reversible
- Likelihood: Likely
- Consequence: Minor
- Impact significance: Medium.

Mitigation Measures

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

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

Residual Impacts

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

8.5.3 Noise and Vibration

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

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

- Nature: Direct
- Duration: Short-term

- Geo extent: Local
- Reversibility: Reversible
- Likelihood: Certain
- Consequence: Moderate
- Impact significance: High

Mitigation Measures

- Construction equipment and vehicles will have exhaust mufflers (silencers) to minimize noise generation.
- Noise monitoring will be done at the project site, and if found more than 55 dBA, appropriate sound reduction mechanism (such as a noise barrier) will be put in place.

Residual Impact

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

8.5.4 Surface Water and Groundwater Contamination

The Budha Cave Chashma and the Bahudra kas (stream) are located in close vicinity of the project site. The project activities that can contaminate soil may also contaminate the surface water and groundwater. These include:

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

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

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

Mitigation Measures

The mitigation measures recommended to forestall soil contamination will also prevent surface and groundwater contamination. The project management should also ensure that there are no leaks in the sewerage or garbage disposal systems to avoid the contamination of surface water.

Residual Impacts

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

8.5.5 Loss of Vegetation

As the project includes the upgradation/rehabilitation of the existing road from Shah Allah Ditta to Alexander well so no tree cutting is involved during constructional and operational phases of the project. The construction crew might indulge in tree/shrub cutting to obtain fuelwood for the camp.

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

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

Mitigation Measures

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

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

Residual Impact

The trees planted under the plantation plan will take some time to grow and mature. In the longer run, however, the planted trees and vegetation will be more than compensate for any vegetation loss.

8.5.6 Damage to Wildlife

The project site is located in a rural area of Islamabad which provides habitat for wildlife. The construction activities will not have adverse impact considering the short term construction period and mitigation measures are implemented during project execution. The loss of natural vegetation discussed above and other project activities will potentially have adverse impacts

on the faunal resources and habitats of the area as well. Smoke, chemicals, dust particles, and noise generated by heavy machinery are a scaring factor for wildlife.

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

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

Mitigation Measures

- The measures to prevent soil and water contamination will forestall any adverse impact on the faunal resources of the area.
- Special measures will be adopted to minimize impacts on birds, such as avoiding noise-generating activities.
- Solid waste from the contractor's site office and construction waste will not be left in the open and be disposed of properly.
- The measures to restore natural vegetation loss in the area will benefit the area's fauna as well.
- The project staff will not be allowed to indulge in any hunting or trapping activities.
- Illumination levels at the site will be minimized, as far as possible.
- Appropriate diffusers should be used to restrict the illumination within the project site.
- Blasting should not be undertaken at the site for excavation purposes.
- Destruction of habitat and consequent check on the population of pest rodents may prove to be boon to maintain ecological balance.
- Developmental activities and establishment of the project site would be a positive step to keep down the number of this undesirable species at the desirable level from the human point of view.

Residual Impact

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

8.5.7 Disposal of Construction Waste/Excavated Material

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

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

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

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

Mitigation Measures

- Management of construction activities will be done in a way to ensure minimal degradation to the soil around the project site.
- Dumping of excavated waste and waste generated from the construction camp will be done at a designated site approved by local authorities.
- The contractors will be bound by contractual obligations to take care of the waste generated from the construction activities.

8.5.8 Traffic Management

During the construction phase, the movement of heavy machinery and transportation of construction material and equipment may cause traffic problems on the rehabilitation/upgradation of Shah Allah Ditta Road. As a result, the daily activities of the people living and working in nearby areas, as well as the normal traffic may be disturbed, which will require proper mitigation measures. This impact is temporary and minor negative in nature.

Mitigation Measures

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

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

8.5.9 Safety Hazards, Public Health and Nuisance

The rehabilitation/ upgradation of the 3.5 km Rigid Paved Road from Shah Allah Ditta to Buddha Caves is located close to a residential area and may pose some safety hazards to the public.

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

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

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

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

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

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

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

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

Mitigation Measures

- The local community will be educated regarding the safety hazards at the site.
- The mitigation measures discussed under air quality deterioration, soil and water contamination will address the public health concerns as well.
- Defensive driving practices will be inculcated in the project drivers through training, posters and other similar measures.
- Vehicle speeds of 15 km/hr at the project site will be implemented.
- Appropriate light diffusers and reflectors will be used, if required, to minimize the public nuisance caused by light pollution.
- A traffic management plan will be prepared and implemented during the construction phase to control the accidents.
- The contractor will ensure better working conditions for its employees.
- Regular routine health screening of the staff should be carried out.
- Firefighting equipment will be made available at the camp.
- The camp staff will be provided with firefighting training.
- The construction camps and site offices will have first-aid kits.

- The construction crew will be provided with an awareness of the transmissible diseases (such as HIV/AIDS, hepatitis B, and C).
- All safety precautions will be taken to transport, handle and store hazardous substances such as fuel.
- Road signage will be fixed at appropriate locations to reduce safety hazard associated with project-related vehicular traffic.

Residual Impacts

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

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

8.5.10 Sites of Archaeological or Historical Significance

The Archaeological or Historical Significance are the Shah Allah Ditta Budha Caves, Saima Abdullah Shrine and Alexander Well. As the project activities are related to the upgradation/ rehabilitation of the existing Shah Allah Ditta road so these historical places will not get affected.

8.6 Operational Phase Impacts

Once the rehabilitation of the Shah Allah Ditta road is completed, it will interact with different components of the environment. This interaction may result in the following adverse impacts:

- Noise Pollution
- Contamination of Surface and Groundwater
- Safety hazards, public health and nuisance

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

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

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

The potential environmental impacts of the project during operational phase are discussed below:

8.6.1 Noise pollution

The operation of Shah Allah Ditta road to Alexander Well will increase traffic. Hence, noise will be generated from traffic on the road.

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

- Nature: Direct
- Duration: Short-term
- Geo extent: Local
- Reversibility: Reversible

- Likelihood: Likely
- Consequence: Major
- Impact significance: High

Mitigation Measures

In-order to reduce noise during operation, CDA shall do linear plantation along the road and create awareness among the drivers to avoid un-necessary horns.

Residual Impact

After the effective implementation of the above measures, the residual noise related impacts of the operation of Shah Allah Ditta Road to Alexander Well will be negligible.

8.6.2 Air Quality

Potential key air quality impacts during the operational stage may arise as a result of exhaust emissions from significant increased number of vehicles which will use Shah Allah Ditta Road. The air quality impact is therefore expected to be high during operation phase.

These unmitigated impacts are characterized below:

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

Mitigation Measures

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

- Roadside tree plantation as applicable and feasible under harsh climatic condition; plants should be selected according to their abilities to absorb emissions.
- Regular road maintenance to ensure good surface condition
- Regular vehicle checks to control and ensure compliance with NEQS

Residual Impact

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

8.7 Positive Impacts of the Project

The positive impacts of Rehabilitation/Up-Gradation of Road from Shah Allah Ditta to Alexander Well, ICT Limits, Islamabad are as follows:

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

- Provide sustainable development.
- Provide better Transport facilities
- Promote tourism activities

- Enhance economic activities.

8.7.1 Employment

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

8.7.2 Improved Accessibility

Villagers gain better access to essential services such as healthcare, education, markets, and emergency services. This improved accessibility can lead to an overall increase in the quality of life for residents.

8.7.3 Economic Development

A road can stimulate economic growth by making it easier for people to transport goods and services to and from villages. This can lead to increased trade and business opportunities, potentially reducing poverty and unemployment in the area.

8.7.4 Enhanced Connectivity

Better connectivity can encourage tourism and promote cultural exchange between villages and urban areas. This can help preserve local traditions and cultural heritage while also boosting the local economy.

8.7.5 Faster Emergency Response

The road can facilitate quicker access for emergency services like ambulances, fire departments, and law enforcement, which is critical for saving lives and preventing disasters.

8.7.6 Environmental Benefits

Properly planned and designed roads can minimize environmental impacts by reducing the need for off-road traffic and illegal logging, helping to protect local ecosystems.

8.8 Summary of Impacts and their Mitigation Measures

Mitigation measures of above mentioned impacts have been developed to minimize the likelihood, extent or duration of their occurrence and any associated adverse effects. **Table 8.5** summarizes potential impacts and proposed avoidance and mitigation measures associated with these.

Table 8.5: Summary of Impacts and Mitigation Measures

Project Activities	Type(s) of Impact	Potential Impacts on Environment	Where the impact is likely to happen	When the impact is likely to occur	Magnitude of impacts	Mitigation Measures	Institutional Responsibility	
							Implementation	Supervision
Preconstruction/Design Stage								
Drainage	Environmental and road Infrastructure	Aesthetic, water pond, breeding ground for mosquitoes	All along Shah Allah Ditta Road	During and after rains	Major	Properly designed drains along the road so as to avoid formation of water ponds. Proper design and Maintenance	CDA	CDA
Cultural properties	Impact on Budha Caves	Social and religious Impacts	Shah Allah Ditta Budha Caves	At planning stage	Major if not addressed properly	Construction activities avoid any interference with religious site of Budha Caves.	CDA	CDA
Drainage Structures	Structures be designed to address flash flow risk	Flash flow may damage structure or cause drainage problems in Shah Allah Ditta Road	Throughout Shah Allah Ditta Road	Construction and operation during rainy seasons	Serious if Structures not properly designed.	Adequately designed drainage structures. Protective measures against scouring at bridges and culverts (e.g., planting with soil stabilizing shrubs and grasses) sufficiently size drains	CDA	CDA
Fog	Fog causing obstruction and risk of driving	Visibility problem, possibly causing accidents	During winter season anywhere all along Shah Allah Ditta Road	Winter season	Can be occasionally serious	Reflectors (Cat Eye) should be installed along Shah Allah Ditta Road.	CDA	CDA

Project Activities	**Type(s) of Impact**	**Potential Impacts on Environment**	**Where the impact is likely to happen**	**When the impact is likely to occur**	**Magnitude of impacts**	**Mitigation Measures**	**Institutional Responsibility**	
							Implementation	**Supervision**
Location in area with seismic background	Seismic activities may damage structures, environment, health, lives.	Damage to structures during earthquake	Throughout Shah Allah Ditta Road	After earthquake with intensity higher than designs are intended to Withstand.	Can be serious at times.	Seismic loads for Bridge and culverts to be computed in accordance with revised seismic code for Islamabad	CDA	CDA
Construction Phase								
Camp site and construction works								
Site selection for construction camp, materials storage, human activities on site, travel to and from construction camp	Socio cultural, environmental,	Sanitary waste disposal, solid (kitchen) waste disposal, fuel leakage, noise and additional traffic, water usage and pollution	Contractor's Camp Site for construction	Throughout construction period	Minor if recommendations are followed	Prior consultation with the contractor for establishing construction camp and workshops at the designated site on Shah Allah Ditta Road Proper storage and fencing, locking of storage rooms containing hazardous material	CDA	CDA
Construction Site restoration	Loss of roadside vegetation,	Loss of plants, and loss of functional	At construction sites	Long lasting	Moderate	Manage design to minimize removal of roadside Plantation.	CDA	CDA

Project Activities	Type(s) of Impact	Potential Impacts on Environment	Where the impact is likely to happen	When the impact is likely to occur	Magnitude of impacts	Mitigation Measures	Institutional Responsibility	
							Implementation	Supervision
after contract completion	and plantations; dissatisfaction with rehabilitation measures after Completion.	benefits from roadside plants				Plan compensatory planting: for each tree felled, 10 plants of similar Or local flora specie. Contractor will provide plan for removal and rehabilitation of site upon Completion. Conduct photographical and botanical inventory of vegetation before cleaning the site. Disallow introduction of exotic species or species with known environmental setbacks (e.g., Eucalyptus, Chk).		
Sanitation and waste disposal facilities at construction camp site	Sanitation and waste disposal facilities at camp site		At all solid and liquid waste collection areas, latrine sites of camps	During Construction	Moderate	Contactor to provide proper waste management plan for camp site waste. Sewerage system at such the camp to be properly designed (pit latrines or required septic tanks) to receive all sanitary waste waters. Provide adequate sanitation, washing, cooking, and dormitory facilities to workers.	Contractor/CDA	CDA
Movement of vehicles in construction site and	Environmental impact, impacts from	Soil compaction and alteration of	Throughout Shah Allah Ditta Road	During construction period	Low	Construction vehicles, machinery, and equipment shall move, or be stationed in the designed right-of-way to	Contractor via bid documents	CDA

Project Activities	Type(s) of Impact	Potential Impacts on Environment	Where the impact is likely to happen	When the impact is likely to occur	Magnitude of impacts	Mitigation Measures	Institutional Responsibility	
							Implementation	Supervision
along haulage routes	temporary haul and access roads	percolation and vegetation pattern, damage to properties and utilities				avoid unnecessary soil compaction. Air, water, and soil quality to be monitored regularly as in EMP Existing Shah Allah Ditta Road will be used to the extent possible for hauling materials.	Approved labs	
Movement, maintenance, and fuelling of construction vehicles	Environmental pollution and contamination	Contamination of soil and groundwater from fuel and lubricants	Budha Cave streams crossings Shah Allah Ditta Road	During construction period	Low	Construction vehicles and equipment to be properly maintained and fuelled so that oil and diesel spillage do not contaminate soil. Fuel storage and refuelling sites to be kept away from streams and nullahs. Oil and grease traps to be provided at fuelling locations to prevent contamination of water	Contractor via bid documents	CDA
Improper handling of solid waste generated at the camp site	Solid waste generated,	Contamination of soil due to improper handling of solid waste	Around Camp site	Throughout construction period	Moderate	Burning of wood or solid waste is not allowed in Islamabad. This should be strictly enforced. All the solid waste generated in the camp site should be collected and disposed off at the CDA disposal site.	Contractor via bid documents	CDA

Project Activities	**Type(s) of Impact**	**Potential Impacts on Environment**	**Where the impact is likely to happen**	**When the impact is likely to occur**	**Magnitude of impacts**	**Mitigation Measures**	**Institutional Responsibility**	
							Implementation	**Supervision**
Health and safety at work place	Health risk if Work conditions provide unsafe and/or unfavourable work conditions.	Relevant for Entire construction area. Throughout operation of site camp	Upon establishing camp site and throughout operation of construction camp	Throughout construction period	High	Obligatory insurance against work accidents for labourers Provide basic medical service and supplies to workers. Layout plan for camp site indicating safety measures taken by the contractor (e.g., firefighting equipment, safe storage of hazardous materials, first aid, security, fencing, and contingency measures in case of accidents). Work safety measures and good workmanship practices to ensure no health risk for labourers Proper maintenance of facilities for workers Regular pest control measures in the site camp	Contractor via bid documents	CDA
Soil and Borrow Material, Cut and Fill								
Disposal of surplus material, storing material for reuse	Physical environment	Water pollution from runoff of discarded asphalt, loss of	Along the full length of the Shah Allah Ditta Road	At start of Construction of Shah Allah Ditta Road	Low	Asphalt to be collected for Reuse Waste disposed at CDA disposal site. Continuous spraying of water to reduce dust	Contractor via bid documents	CDA

Project Activities	**Type(s) of Impact**	**Potential Impacts on Environment**	**Where the impact is likely to happen**	**When the impact is likely to occur**	**Magnitude of impacts**	**Mitigation Measures**	**Institutional Responsibility**	
							Implementation	**Supervision**
		productive land due to dust						
Digging borrow pit areas	Physical environment	Borrow pits collect water; malarial mosquitoes	A limited portion of the Shah Allah Ditta Road might require fill to raise its level	At start of Construction of Shah Allah Ditta Road	Low	Use approved borrow area in consultation with the Environment Directorate, CDA	Contractor via bid documents	CDA
Excavation of earth from borrow areas, embankment works, cutting operations, embanking, clearing of vegetation	Changes of topographic characteristic, loss of topsoil, impact on site, soil erosion, loss of vegetation habitat	Aesthetic, water storage, seepage, soil erosion,	Designated Borrow areas, and at all sites were high embankment are required (e.g., near bridges)	Long lasting	Medium	National Park areas to be avoided for borrowing of materials. Remove top soil and reintroduce for returning to nature. In areas with strong flash flow, high embankments are provided to minimize soil erosion. Stone pitching and/or retaining walls at high embankments in critical areas As applicable and needed stone pitching be done for slope protection.	in bid documents for contractor	CDA

Project Activities	**Type(s) of Impact**	**Potential Impacts on Environment**	**Where the impact is likely to happen**	**When the impact is likely to occur**	**Magnitude of impacts**	**Mitigation Measures**	**Institutional Responsibility**	
							Implementation	**Supervision**
Procurement of construction material	Physical Environment	landscape degradation by use of quarries and borrow areas	quarries and borrow areas	Long term effects	Medium	Procurement of earth, gravels, stones etc required for the project should be arranged from the sites duly approved by the CDA Planning Directorate (Regional) and no querying should be done in the Margalla Hills.	CDA, in bid documents for contractor	CDA
Storage, handling, and transport of hazardous construction materials	Health and safety	Work safely and human health risk	At all construction site	Throughout construction period	Low	Provision of protective items for labourers handling hazardous materials (e.g., helmets, adequate footwear for bituminous pavement works, protective goggles, gloves, etc.).	CDA, in bid documents for contractor	CDA,
Creation of construction waste material and spoil management	Contamination of soil and water from waste and quarry materials, and impact on landscape Value	Air, water, and solid waste generation	All construction sites and entire length of Shah Allah Ditta Road	During construction	High	All spoils to be disposed of in environmentally friendly manner and sites to be restored to original conditions. Non-bituminous and bituminous waste should first be recycled if not possible then be disposed of at CDA disposal site.	CDA, in bid documents for Contractor	CDA,
Transporting material to site	Physical environment	Creation of noise, fumes, and dust	All along Shah Allah Ditta Road	During construction	Medium	All vehicles carrying loose friable material to be covered.	CDA, in bid documents for Contractor	CDA,

Project Activities	**Type(s) of Impact**	**Potential Impacts on Environment**	**Where the impact is likely to happen**	**When the impact is likely to occur**	**Magnitude of impacts**	**Mitigation Measures**	**Institutional Responsibility**	
							Implementation	**Supervision**
Crushing rock for pavement	Physical environment	Dust emissions from crusher and screening plant	Crusher will be established at strategic location on Shah Allah Ditta Road	During crushing operations	Medium	Crushers to be fitted with dust Suppression equipment.	CDA, in bid documents for Contractor	CDA,
Constructing pavement, laying base course, cleaning surplus	Physical environment runoff of hydrocarbons during "curing" period	Noise, and dust	All along Shah Allah Ditta Road	During construction	Low, if Adequate precautions taken.	Supervision of construction to ensure proper techniques Lay asphalt only during dry period Water Spraying	CDA, in bid documents for Contractor	CDA,
Laying of asphalt	Physical environment	Emission of dust and fumes from asphalt plant Runoff of hydrocarbons during "curing" period	In asphalt batching plant area On length of Shah Allah Ditta Road where surface laying is taking place	In latter stages of Construction Within 48 hours of laying asphalt	Low, if lying of asphalt does not occur in rain.	Ensure workers use appropriate clothing and lay asphalt properly Lay asphalt during dry periods	CDA, in bid documents for Contractor	CDA

Project Activities	**Type(s) of Impact**	**Potential Impacts on Environment**	**Where the impact is likely to happen**	**When the impact is likely to occur**	**Magnitude of impacts**	**Mitigation Measures**	**Institutional Responsibility**	
							Implementation	**Supervision**
Planting trees	Ecological	Introduction of appropriate species	All Shah Allah Ditta Road	After construction	Medium	Environment Directorate, CDA to prefer indigenous plants.	CDA	CDA,
-do-	Socio-cultural	Trees create safety hazards	Where trees as planted	Once trees have matured	Medium	Planting scheme to include shrubs close to road side	CDA	CDA
Closure Plan								
Clearing site	Damage not restored on Closure			After completion of construction activities	Low	Planting scheme to include shrubs close to road side.	CDA, in bid documents for Contractor	CDA
Utilities Disruption								
Disruption in public utilities	Social and physical environment	Affected utilities create disruption of public services and economics	To be checked all along the Shah Allah Ditta Road	Construction period	None, if organized in a timely manner and implemented; otherwise Intermediate.	Timely notifications and consultations with respective Agencies specially with ISECO All public utilities (e.g. water pipes, power and telephone lines) likely to impacted by the Shah Allah Ditta Road construction need to be relocated well ahead of works commencement	CDA to notify all concerned line agencies	CDA
Water Issues								

Project Activities	**Type(s) of Impact**	**Potential Impacts on Environment**	**Where the impact is likely to happen**	**When the impact is likely to occur**	**Magnitude of impacts**	**Mitigation Measures**	**Institutional Responsibility**	
							Implementation	**Supervision**
Use of water for construction and consumption for human use	Social environment	Conflict with local water demand under very limited supply	Throughout project areas	During construction		Contractor will arrange for water required for construction in such a way that water availability and supply to nearby communities remain unaffected.	CDA, in bid documents for Contractor	CDA
Spillage of liquid waste	Water contamination	Risk of polluting surface and groundwater from spillage, drainage, and runoff from construction sites	Shah Allah Ditta Road especially near Budha Cave Chashma	During construction	Low	Regular water quantity monitoring according to determined sampling schedule to ensure that no contamination is taking place during construction. Contractor shall ensure that construction debris does not find its way into the drainage or bahudra kas streams	CDA Contractor	CDA,
Air Pollution Control								
Vehicular movement and operation of machinery	Emission from construction vehicles and machinery, causing public health risk,	Dust and other emissions	Workshops of contractor camp site	Throughout construction period	Low	All temporary service and access roads to be regularly water sprayed to minimize the dust generation. All vehicles, equipment and machinery used for construction to be regularly maintained to ensure that pollution emission levels	Contractor, Approved labs	CDA,

Project Activities	Type(s) of Impact	Potential Impacts on Environment	Where the impact is likely to happen	When the impact is likely to occur	Magnitude of impacts	Mitigation Measures	Institutional Responsibility	
							Implementation	Supervision
	nuisance, and other impacts on biophysical environment					conform to National Environmental Quality Standards (NEQS) of Pakistan Air quality parameters to be monitored, as suggested in EMP.		
Operation of asphalt, mix plants, crushers, etc	Dust generation from construction machines causing health risk to operating workers and impact on biophysical environment	Dust emissions from crusher and screening plant, emissions of dust and fumes from asphalt plant	At sites of plants	Throughout construction period	High	Ensure precautions to reduce dust emissions from mixers, plants, crushers, and batching plants (e.g., providing with dust extraction units). Crushers to be fitted with dust suspension equipment. Water will be sprayed in lime, cement, and earth mixing sites. Work safety measures, such as dust masks and appropriate clothing, to be used to ensure no health risk for operators	Contractor/CDA	CDA,

Project Activities	**Type(s) of Impact**	**Potential Impacts on Environment**	**Where the impact is likely to happen**	**When the impact is likely to occur**	**Magnitude of impacts**	**Mitigation Measures**	**Institutional Responsibility**	
							Implementation	**Supervision**
Transportation of materials, and other construction activities that create dust and emissions	Impact on health and biophysical environment	Dust and emissions from machines causing health risk to operators; Impacts on biophysical environment	Throughout Shah Allah Ditta Road	During construction	Low	Vehicles delivering loose and fine materials, like sand and fine aggregates, shall be covered to reduce spills on existing road. Ambient air quality monitoring be carried out in accordance with the EMP. If monitored parameters are above prescribed NEQS limits, suitable control measures must be taken.	Contractor/CDA	CDA,
Noise Pollution								
Operation of construction machinery,	Nuisance	Noise from vehicles, asphalt plants, and equipment causing nuisance and disturbance to humans and flora fauna of the area.	At asphalt plant, and construction sites	During construction	Medium	Plants, vehicles, and equipment to strictly conform to NEQS specified noise standards Vehicles and equipment used will be fitted, as applicable, with silencers and properly maintained. In accordance with EMP, noise measurements to be carried out at locations and schedules specified to ensure effectiveness of mitigation measures.	Contractor/CDA	CDA
Fauna and Flora: Wildlife and adjacent Ecological Sensitive Areas								

Project Activities	Type(s) of Impact	Potential Impacts on Environment	Where the impact is likely to happen	When the impact is likely to occur	Magnitude of impacts	Mitigation Measures	Institutional Responsibility	
							Implementation	Supervision
Access to sensitive areas and fragile ecosystem	Poaching of wildlife, collecting wild plants	Disturbance to ecologically sensitive areas adjacent or near to Shah Allah Ditta Road	Near Budha Cave Chashma	Throughout the construction period	Low	Use of firewood for cooking and execution of work to be prohibited. No open fires allowed. Restoration of damaged vegetated areas. Strict instructions to contractors' staffs (particularly the cooks) with respect to poaching wildlife Signage for wildlife crossing to raise attention Assist in public awareness program.	Contractor	CDA,
Road Safety and Community Life								
Risk associated with construction activities	Health safety issues	Accident and health risks to workers	At all Shah Allah Ditta Road	Throughout the construction period	Low	Ensure safely code for work staff is observed, including provision and wearing of safety equipment required for specific works (e.g. helmets, dust masks, ear muffs, safety goggles, etc.). At the construction site, a readily available and fully equipped first aid unit to be provided. Elaboration of contingency planning in case of major accidents	Contractor/CDA	CDA

Project Activities	Type(s) of Impact	Potential Impacts on Environment	Where the impact is likely to happen	When the impact is likely to occur	Magnitude of impacts	Mitigation Measures	Institutional Responsibility	
							Implementation	Supervision
						Adequate signage, lighting devices, barriers, persons with flags during construction to manage traffic at construction site		
Archaeological Sites								
Encountering archaeological sites during earthworks and construction	Impacts of historically important sites and damage to fossils, artifacts, tombs, structure, and others, as defined in 1975 Antiques Act	If sites of special interest not identified and flagged, contractors may inadvertently cause damage.	Throughout Shah Allah Ditta Road	Throughout construction period	Low	In case of finding any archaeological artifact structure, tomb, etc, the contractor must immediately halt all works and contact the Archaeological Department. In the event of such finding, the contractor has the duty to secure the site against any intrusion until an archaeological expert will decide on further action.	Contractor/CDA	CDA,
Operation Phase								
Water and Soil								

Drainage of runoff from roads into water bodies	Physical congestion of drainage structures	Localized flooding	At natural Drainage points in built-up areas of Shah Allah Ditta Road	When road operates and in rainy season, as required	Medium	Adopt performance specified maintenance contracts Ensure proper cleaning scheme for keeping drainage structure clear of debris and blockage.	CDA	CDA
Vehicular movement	Contamination from spills due to traffic and accidents		Throughout Shah Allah Ditta Road area	As incidents occur	Medium	Accidental spillage to be cleared and disposed of immediately and properly	CDA	CDA,
Ambient Air Quality								
Induced vehicular traffic movement	Emissions from vehicular traffic causing public health risk, nuisance, and other impacts on the biophysical environment	Adverse effects on people in Shah Allah Ditta from noise and dust	Where applicable, along full length of Shah Allah Ditta Road areas and sensitive spots	Tourism activity due to Alexander Well and Budha Caves	High traffic generation will be for short duration	Roadside tree plantation as applicable and feasible under harsh climatic condition; plants should be selected according to their abilities to absorb emissions. Regular road maintenance to ensure good surface condition Regular vehicle checks to control and ensure compliance with NEQS	CDA,	CDA,
Noise Level and Vibrations								
Induced vehicular traffic movement	Traffic-related noise pollution	Nuisance to Humans	All along Shah Allah Ditta Road	Tourism activity due to Alexander Well and Budha Caves	High traffic generation	Noise measurements to be carried to ensure the effectiveness of mitigation measures, (e.g., speed limits and noise control plantations	CDA	CDA,

	and vibrations from engines, tires, and use of (pressure) horns				will be for short duration	all along Shah Allah Ditta Road		
Flora and Fauna								
Roadside right-of-way plantation	Maintenance of flora	Soil erosion if site not re-vegetated. Acts as sound barrier against noise and dust.	Throughout project road	Operation stage	Low	Plantation/Vegetative barriers to lessen visual and other impacts. Monitoring of survival of trees at the specified rate and suitable measures should be taken to protect trees.	CDA	CDA
Road Safety								
Vehicular movement	Accidental harm to wildlife and trees close to Shahllah Ditta Road	Trees closed to road create safety hazards	At some locations of Shah Allah Ditta Road	Both at night and during the day	Low	Provision of proper safety signage Setting up speed limits of 80 km/hour at the Margalla Display of signboards alerting drivers' attention to wildlife and environmental issues related to safe driving and wildlife encounters	CDA	CDA

Fast access to sensitive areas	Threat to biological environment	Poaching on wildlife; disturbance of fragile ecosystem	Throughout Shah Allah Ditta Road	Operation stage	Low	Display of signboards explaining wildlife and other ecological value	CDA,	CDA
Vehicular movement	General road safety issues	Accidents and health risks	Throughout Shah Allah Ditta Road	Operation stage	Low	Traffic management plan to be developed in coordination with Islamabad Traffic Police. Traffic control measures, including speed limit, to be enforced.	CDA, Local Authorities and, Islamabad Traffic Police.	CDA

9 Environmental Management Plan

9.1 Introduction

This section outlines the implementation mechanism for the Environmental Management Plan (EMP) and defines the institutional arrangements required for the implementation of the plan.

9.2 Purpose and Objectives of EMP

The Environmental Management Plan (EMP) will provide a delivery mechanism to address the adverse environmental impacts of the project, to enhance project benefits and to introduce standards of best practices to be adopted for all phases of the project.

The primary objectives of the EMP are to:

- Facilitate the implementation of the earlier identified mitigation measures.
- Develop a proper monitoring mechanism and identify requisite monitoring parameters to confirm the effectiveness of the proposed mitigation measures.
- Define the responsibilities of the project proponent and provide a means of effectively communicating environmental issues with different stakeholders.

9.3 Institutional Capacity

9.3.1 Pre-Construction and Construction Phase

The organizational roles and responsibilities are summarized below:

a) Project Proponent

The overall responsibility for the compliance of with the Environmental Management Plan rests with the project proponent i.e., Capital Development Authority, Islamabad.

b) Project Manager

The contractors will carry out field activities as part of their contract agreement. The contractors will be responsible to implement various mitigation actions prescribed in the EIA report. The contractors will also be subject to certain liabilities under the environmental laws of the country, and under their contracts with CDA.

The Deputy Director CDA, Islamabad will monitor the contractors and ensure implementation of the EMP and EIA.

c) Engineers, Contractor / Sub Contractors

The contractor will carry out field activities as part of their contract agreement. The contractor will be responsible for implementing various mitigation actions prescribed in the EIA report relevant to the contract. The contractor will also be subject to certain liabilities under the environmental laws of Pakistan, and under their contracts.

d) Pakistan Environmental Protection Agency

The Environmental Protection Agency, Government of Pakistan, will periodically visit the project site to monitor the compliance of environmental protection measures detailed in the EIA report.

9.3.2 Operational Phase

As the magnitude of construction work will affect the local flora and fauna to some extent but limited environmental impact is envisaged during the operation phase. Therefore, no monitoring of environmental components is suggested.

However, the CDA (Environment Wing) shall look after the plantation work until the trees are self-sustained. The magnitude of environmental impacts during the operational phase will be less as compared with the construction phase; therefore, rehabilitation/upgradation of Shah Allah Ditta to Alexaner well road will have to implement various mitigation actions as described in the operational phase.

9.4 Organizational Structure and Responsibilities

9.4.1 Primary Responsibilities

The Deputy Director CDA or his representative will be over all responsible to ensure that EMP properly implemented throughout the project.

The Deputy Director CDA will be responsible to supervise/ monitor and ensure the implementation of the EMP and the EIA.

The engineering contractor(s) will be responsible for the implementation of the EMP and EIA on the ground.

9.4.2 Field Management and Quality Control

Carrying out construction activities in an environmentally sound manner during the construction phase will be the responsibility of the Deputy Director CDA. He will be responsible for implementing the EIA and EMP recommendations.

9.4.3 Contractual Provisions

Adherence to the requirements of the EIA and EMP in terms of environmental mitigation will be required from all project contractors and thus EMP will form part of their contracts with CDA. The contractor shall be responsible for implementing the mitigation measures and monitoring of various environmental parameters. CDA shall monitor the contractor's performance with respect to EMP implementation.

9.4.4 Approvals

CDA will obtain all the relevant clearances and necessary environmental approvals required by the Pakistan Environmental Protection Agency and other regulatory agencies.

9.5 Project Monitoring

The CDA will make necessary arrangements to monitor the key environmental data during the construction and operation phase. These will include quantity of water used, record of waste produced, record of waste disposal, and project-related vehicular traffic. Deputy Director CDA shall monitor project activities while working in the project area. He shall keep a record of all non-conformance observed and report these along with actions to CDA management for further action. He will also have to report any impacts anticipated along with his recommendations for further action.

9.6 Schedule of Implementation Environmental Monitoring Plan

Environmental Monitoring will be conducted during the operational phase of the project to ensure the effectiveness of the proposed mitigation measures.

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

The various purposes of the environmental monitoring plan are:

- To evaluate the effectiveness of mitigation measures.
- To respond to the unanticipated environmental impacts when the project is under implementation.

- To make regulations and improve management and environmental controls based on the monitoring data. Pakistan Environmental Protection Agency is entrusted with the overall responsibilities of monitoring the environment in Islamabad.

An Environmental Monitoring Plan for Rehabilitation/Upgradation of road from Shah Allah Ditta to Alexander Well has been provided in **Table 9.1**. The plan will be used as a management and monitoring tool for the implementation of the mitigation measures required by the EIA. The plan entails the required mitigation measures recommended in the EIA.

Table 9.1: Environmental Monitoring Plan for Rehabilitation/upgradation of Shah Allah Ditta Road to Alexander Well

Environmental Component	Project Phase	Parameters	Locations	Frequency	Standards	Implementing	Supervision
Construction Phase							
Air Quality	Construction	SO_2, NO, NO_2, O_3, PM_{10}, $PM_{2.5}$, Pb and CO	At Shah Allah Ditta Village At Shah Allah Ditta Buddha cave At the endpoint of Shah Allah Ditta Road	PM_{10}, for continuous 24 hours, on a quarterly basis	NEQS, WHO/USEPA guidelines,	Contractor/CDA	CDA
Roadside Plantation	Construction	Visual inspection of plant species survival rate and status of maintenance	At sites where the plantation was carried out	(1) One month after plantation (2) One year after plantation 1 month, 3 months, 6 months, and 12 months after planting	75 % survival rate	Contractor/CDA	CDA
Noise Levels	Construction	dB (A)	At construction sites	Twice in 24 hours at a selected site on a quarterly basis	EPA Ambient Noise standards	Contractor/CDA	CDA,
Surface Water Quality	Construction	pH, TDS, TSS, DO, coliforms, hardness, nitrate, chloride, sulfate	Budha Cave Chashma and Bahudra kas (stream)	Quarterly	WHO and NEQS	Contractor/CDA	CDA
Operational Phase							
Septic Tanks	Operation	NEQS parameters for liquid effluents	At campsites	Once in a month by the in-house laboratory	NEQS	CDA	CDA
Plantation	Operation	Visual inspection of plant species survival rate and status of maintenance	At sites where the plantation was carried out	2.5 years after plantation	75% survival rate	CDA	CDA Enviroment Wing
Safety and Traffic Rules Compliance	Operation	(1) Faulty, overloaded and speeding vehicles (2) Inspection of signage	All along with the estate, with spot check at accident-prone black spots	once in 3 months	To be determined	CDA	CDA

Key:

CDA= *Capital Development Authority*

dBA = *decibels (measured in the audible range)*

EPA = *Environmental Protection Authority,*

PEQS = *Punjab Environmental Quality Standards*

PM10 = *Particulate Matter smaller than about 10 micrometers, ROW = Right-of-Way*

SPM = *Suspended Particulate Matter*

TSS = *Total Suspended Solids*

USEPA = *United States Environmental Protection Agency*

WHO = *World Health Organization*

Table 9.2: Estimated cost for the implementation of the Environmental Monitoring Plan

Environmental Monitoring Activities	Units/ No. of Samples	Unit Cost specification	Cost (Rs)
Construction phase			
Ambient air quality monitoring Quarterly basis for 3 months	4	@ 40,000 per sample for 24 hr monitoring	160,000
Ambient water quality monitoring Quarterly basis in one location for 3 months	4	@ 25,000 per sample	100,000
Noise levels, the quarterly basis for 3 months	4	@ 10,000 per sample	40,000
Environment, Health Safety Engineer	3 months	@ 75,000	225,000
		Total	**525,000**

Source: *PPI Estimates, 2023*

9.7 Training Schedules

The key objective of the training program is to ensure that the requirement of EMP is clearly understood and followed throughout the project. The training shall cover the following areas:

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

CDA will be primarily responsible for providing training to all project personnel. A lump sum fee of Rs. 100,000 has been set aside for Environmental & Social Training Program.

The details about the program are shown in **Table 9.3**

Table 9.3: Framework for Environmental & Social Training Program

Type of Training	Training Description	Period	Duration	Training By	Trainee
Occupational Health and Safety	Training should be provided to aware staff to conform to safety codes	Before Commencement of Project Activities	Full day	External Sources	Site Supervisor, Site Engineer.
Environment & Social Laws, Regulations, procedure, and guidelines of the government	The training should detail the laws and regulation concerning the environment, Labor laws and compliance with government regulation.	Before Commencement of Project Activities	Full day	External Sources	Company manager, Site Supervisors, Site Engineers.
Occupational Health & Safety	Health, safety, and hygiene. Proper usage of Personal Protective Equipment (PPE's), Precautions to be taken for working in confined areas.	Before Construction Activities	Full Day	Site Supervisor, Site Engineer	Workers
Solid Waste Management	Waste segregation, identification of Hazardous Waste, Use of PPEs, and waste Handling	Before Commencement of Project Activities	Full Day	External Sources	Relevant workers and staff
Health Safety and Environmental Auditing	Health Safety and Environmental Audits, Reporting Requirements	Before Commencement of Project Activities	Full Day	External Sources	Relevant Department
Implementation of environmental management and monitoring plan	Explanation of Environment Management and Monitoring Program	Quarterly. As soon as the project activities start	Full Day	External Sources	Site Supervisor, Site Engineer

9.8 Schedule for Implementation and Environmental Budget

- Health Safety and Environment (HSE) induction/orientation will be provided to all workforce at the project site by a well-trained Site Supervisor.
- Assembly point will be established for the gathering of workforce regarding daily HSE Toolbox Talk at the project site.
- Special education sessions will be conducted at the site.
- The daily walkthrough will be conducted at the project site by the site supervisor and site engineer.
- All the Mandatory PPE's (Safety Helmet, Safety Jacket, Safety Shoes, Coverall, Safety Goggles, Earplug, Dust mask, Safety Gloves, etc.).
- All the heavy machinery will be inspected properly at the site.
- Inspection & Tagging system will be maintained at the project site.
- Safety signage will be provided at the project site.
- Fire posts will be established at the project site at easy approach location.
- Waste will be maintained properly.
- HSE Signboard will be installed at the project site for an emergency response.
- Rest area & smoking zones will be established at the site.
- First aid box with full supplies will be available at the project site.
- In-house training will be conducted on the project site.

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

- First Aid Boxes: First aid boxes will be provided at all active construction sites to cope up the emergency situations. Usually, a typical first aid box mainly contains antibiotics, basic medicines, cotton, bandages, healing balms, pyodine, spirit, pain killer, etc.
- PPEs: Site Engineer will be responsible for providing PPEs to all workers.
- Safety Signs: Relevant safety signboards will be displayed on the worksites and labour camps to make aware / train workers about safety rules. Mainly safety signs include signs of speed limits, electric spark, etc.
- TBTs: Toolbox Talks (TBTs) will be delivered on a regular basis to promote safety culture by the site engineer.
- Water Sprinkling: Dust pollution will be controlled with water sprinkling and minimizes the risk of adverse impacts of dust on workers and surrounding areas. Water sprinkling will be carried out regularly to minimize dust pollution and avoiding creating slush.
- Barricading: The contractor will put up barricade tape at all the active work sites.
- Training: Safety training will be delivered by the site supervisor and site engineer to achieve its objectives. Training will be conducted for capacity building of employees / workers /labour/ sub-contractors to make them well effective to respond in any kind of emergency situation.

The breakup cost for safety of workers is described in **Table 9.4.**

Table 9.4: Estimated cost for the implementation of Health & Safety Plan

Sr No	Item	Quantity	Unit Cost (Rs.)	Total Cost (Rs.)
Personal Protective Equipment (A)				
1	Dust Masks	876	10	8,760
2	Safety Shoes	37	3000	109,500
3	Gloves	219	400	87,600
4	First Aid Box	1	3000	4,380
5	Ear Plugs	219	200	43,800
6	Safety Helmets	18	1000	18,250
7	Safety Jackets (Hi-Vis)	37	500	18,250
Others (B)				
8	Provision of Dust Bins	5	1000	5,000
9	Warning Tape	3	500	1,500
10	Safety Cones	5	1000	5,000
11	Safety Sign Boards	5	1500	7,500
12	Rain Coat	73	1000	73,000
Total (A + B)				**382,540**

- Time Required for Construction Period = 3-month
- Number of Labor Required for Construction = 73
- Personal Protective Equipment PPEs
- Dust Musk: 3 Dust Mask for each labourer
- Safety Shoes: 1 Safety shoe for each labourer
- Gloves: 2 pair of gloves for each labourer
- First Aid Box: 2 first aid box for 100 labourer
- Ear Plug: 2 set of ears plug for each labourer
- Safety Helmet: 1 safety helmet for each labourer
- Safety Jackets: 1 safety Jackets (Hi-Vis) for each labourer
- Dust Bin: Rough estimate
- Water Sprinkling the whole construction period
- Raincoats: 1 Raincoat for each labourer

9.9 Plantation Plan

The plantation plan recommends planting 5,000 mature plants along boundaries of Shah Allah Ditta Road and any nearby designated area. The practice of plantation of mature plants will enhance the beauty and environment of the project area.

CDA, Islamabad will ensure the provision of the budget for the implementation of the plantation plan.

The plantation of recommended indigenous species will be carried out at a distance 8 feet having a distance of 8-10 feet among rows (in case of multiple rows). The recommendations about the new plantations are based upon the fact that currently there are few trees at the project site with wild vegetation cover.

The plantation plant consists of trees and shrubs.

Trees (20 ft. and above): A total of 5,000 trees comprising of shady, flowering, fruit trees have been recommended for plantation along boundaries as well as designated plantation sites in the vicinity.

Table 9.5: Recommended Trees

Sr.#	Botanical Name	Local Name
1	*Pinus roxburghii*	Chir
2	*Olea ferruginea*	Zaitoon
3	*Dalbergia sissoo*	Shisham
4	*Vachellia nilotica*	Kikar
5	*Melia azedarach*	Dharek

9.9.1 Plantation Plan Cost

A total number of 5,000 trees will be planted. The cost of plantation includes the cost of equipment, initial planting (including restocking during the first 2 years) and maintenance cost for the first four years of plantation. The cost of raising one plant and its maintenance for 4 years is Rs. 1,185.

The tentative cost of equipment for is given below in **Table 9.6.**

Table 9.6: Tentative Cost of Equipment

Sr.	Equipment	Numbers	Cost in PKR
1	Grub hoe (earth digging tool) and others	Lump-sum	30,000
2	Lift Pump for Water	2	50,000
3	Others	Lump-sum	20,000
	The total cost of equipment		**100,000**

The cost break-up of plantation and maintenance for a period of four years is mentioned in **Table 9.7** to **Table 9.11.**

Table 9.7: Estimated Cost of Unit Plantation (5000 Plants)

Sr. #	Activity	Quantity	Rate (PKR)	Amount (PKR)
1	Clearance of Site (12,111)	5000	5/plant	25,000
2	Layout/ unit	5000	2/plant	10,000
3	Digging of Pits	5000	50/pit	250,000
4	Average cost per unit plant	5000 plants	500/plant	2,500,000
5	Carriage/unit of plants from Nursery to Site including loading/unloading	5000 plants	10/plant	50,000
6	Plantation of plants with ball of earth/unit	5000	30/plant	150,000
7	Addition of Manure 1 cft. / Pit	100 cft.	Lump-Sum	100,000
8	Hand watering 100 times Approx. x 5,000 = 500,000	500,000	1/watering	500,000

9	Weeding 4 times 5,000x4	20,000	5/plant	100,000
10	Miscellaneous/ Contingencies	Nil	Lump Sum	200,000
Total				**3,885,000**

Table 9.8: Estimated Unit Cost of Plantation of (1000 Plants) & Maintenance for 2nd Year in case of 20% Mortality

Sr. #	Activity	Quantity	Rate (PKR)	Amount (PKR)
3	Re-Digging of Pits	1000	5/pit	5000
4	Average cost per unit plant	1000 plants	215/plant	215,000
5	Carriage/unit of plants from Nursery to Site including loading/unloading	1000 plants	10/plant	10,000
6	Plantation of plants with a ball of earth/unit	1000	30/plant	30,000
7	Addition of Manure 1 cft. / Pit	1000 cft.	Lump-Sum	100,000
8	Hand watering 100 times Approx. x1,000=100,000	100,000	1/watering	100,000
9	Weeding 4 times 1,000x4=4,000	4,000	5/plant	20,000
10	Miscellaneous/ Contingencies	Nil	Lump Sum	200,000
Total				**680,00**

Table 9.9: Estimated Cost of Plantation Unit (300 Plants) & Maintenance for 3rd Year

Sr. #	Activity	Quantity	Rate (PKR)	Amount (PKR)
3	Re-Digging of Pits	300	50/pit	15,000
4	Average cost per unit plant	300 plants	215/plant	64,500
5	Carriage/unit of plants from Nursery to Site including loading/unloading	300 plants	15/plant	4,500
6	Plantation of plants with a ball of earth/unit	300	30/plant	9,000
7	Addition of Manure 1 cft. / Pit	100 cft.	Lump-Sum	100,000
8	Hand watering 50 times Approx. x300=15,000	15,000	1/watering	15,000
9	Weeding 3 times 300x3=900	900	5/plant	4,500
10	Miscellaneous/ Contingencies	Nil	Lump Sum	200,000
Total				**410,250**

Table 9.10: Estimated Cost of Maintaining 500 plants for 4th Year

Sr. #	Activity	Quantity	Rate (PKR)	Amount (PKR)
1	Hand watering 50 times 5000x50=25,000	250,000	1/time	250,000
2	Weeding	15,000	5/unit	75,000
3	Trimming/pruning of plants	5000	5/unit	25,000
4	Miscellaneous			500,000
			Total	**850,000**

Table 9.11: Final Cost per Tree Planted

Activity	Amount (PKR)
Total cost of planting and maintaining 5,000 plants for 4 years	5,825,000
Cost of equipment	100,000
Total cost	5,925,000
Cost for raising one plant and its maintenance for 4 years	**1,185**

9.10 Restoration and Rehabilitation Plan

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

Following measures will be adopted for site restoration and rehabilitation:

- All equipment and machinery at the project site will be de-mobilized.
- All waste at the project site will be disposed of according to the requirement of EIA.

- Septic tank with soakage pit at the campsite will be properly dismantled.
- All the un-necessary pits at the project site will be backfilled.

9.11 Environmental Monitoring & Mitigation Cost

The cost required to effectively implement the mitigation measures is important for the sustainability of the project both in the construction and operational phases of the Project. The summary of the cost of monitoring environment and mitigation cost is shown in **Table 9.12**.

Table 9.12: Summary of Environmental Mitigation & Monitoring Cost

Activity	Basis	Cost (Rs)
Environmental Monitoring Cost	Ambient Air, Noise and Water Quality Monitoring & Cost of Hiring Environmental Consultant for HSE Monitoring Quarterly.	525,000
Health & Safety Plan for Workers	For 73 employees for the provision of dust masks, safety shoes, gloves, first aid box, ear plugs, safety helmets and safety jackets (Hi-Vis) and Provision of dust bins, warning tap, safety cones, safety sign boards and water sprinkling	382,540
Plantation Plan	Implementation of Plantation Plan	5,925,000
Cost of environmental training	For the whole construction period	100,000
	Grand Total	**6,932,540**

9.12 Traffic Management and Construction Material Transportation Plan

- All the contractor's construction material will be transported to the project site via Margalla Avenue.
- 20 km/hr speed limited will be maintained at the project site.
- All the vehicles will be parked in a designated area.
- Speed breakers will be constructed at appropriate distances.
- All the experienced and license holders (drivers & operators) will be hired for transportation.
- All the heavy machinery will be checked properly and inspected on a regular basis.
- Speed limit signboards will be installed at the project site.
- All the (headlights, backlights, Indicator, etc.) will be checked and maintained regularly.
- All the warning light, reverse back alarms will be maintained properly.
- All the routes within the project site will be marked and designated properly.

9.13 Emergency Preparedness, Response and Site Evacuation Plan

- The Contractor will always be ready for response in any kind of emergency at the project site.
- Special assembly points will be established at the project site.
- Close coordination will be carried out with all law enforcement agencies (police) in case of any aggressive mob of people in the shape of any kind of protest.
- First Aid Box will be available at the project site around the clock.

- All the new entrants will be oriented regarding the required awareness towards the hazardous and risky situation and control.
- The entire workforce will be provided with all the mandatory PPEs for the risk-free environment.
- Proper water sprinkling will be carried out at service road along within the project site for dust control to avoid any hazardous and risky situation which can be a cause of transport emergency.

9.14 Fire Fighting Plan

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

At all the campsite, emergency alarms will be installed. Persons will be nominated to ring the emergency alarm in case of any emergency situation or any emergency risk.

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

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

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

9.15 Reporting/ Communication and Documentation

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

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

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

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

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

Reporting: The monitoring body will produce daily, weekly, monthly and other periodic reports, as well as a final report of the project based on the information collected. The site representative and the PPI management will prepare a weekly environmental report.

9.16 Change Management Plan

The EIA for the Rehabilitation of the Shah Allah Ditta Road recognizes that changes in the EMP may be required and therefore provides a Change Management Plan to manage such changes. Overall responsibility for the preparation of change management statements will lie with The Deputy Director CDA.

9.17 Post Project Monitoring

The Deputy Director CDA or his representative shall prepare a brief post project report describing the conduct of the actual operation, any changes from the operation for which approval was obtained, the degree to which the recommendations of the EIA were adhered to, any damages to the environment and the mitigation or compensation provided, and monitoring information of scientific or environmental interest that is not propriety in nature. The plan will be used as a management and monitoring tool for the implementation of the mitigation measures required by the EIA. The plan entails the required mitigation measures recommended in the EIA.

10 Conclusion and Recommendations

10.1 Introduction

This Chapter presents the assessment of the possible environmental impacts of the Rehabilitation/Up-Gradation of Road from Shah Allah Ditta to Alexander Well, ICT Limits, Islamabad. The study presents the purpose of the EIA as to the description of the site, the impact of the project during and after implementation, the mitigation measures, and residual impacts.

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

10.2 Conclusions

The major conclusions of the EIA are:

- The Capital Development Authority intends to Rehabilitate/Up-Grade of Road from Shah Allah Ditta to Alexander Well, ICT Limits, Islamabad.
- Total length of the road is 7.5 km including 3.5 km Rigid Paved Road from Shah Allah Ditta to Buddha Caves and 4 km Flexible Road from Buddha Caves to Alexander well.
- The objectives of the project are to improve the socio-economic conditions of rural population in villages, provide easy access to different areas of the village, and to raise the social status of the rural community.
- Significant environmental management issues may arise during construction and operational phase include air pollution, sewage disposal, solid waste, noise pollutions, vehicular traffic, and water consumption.
- The project operational activities can potentially affect the natural resources of the area, especially the natural vegetation. These adverse impacts can be largely reduced by implementing the appropriate mitigation measures, which has been discussed in this report.
- The local residents have shown their satisfaction for the project as it will provide employment opportunities at and help in the socio-economic development of the project area.
- Based on the recommended mitigation measures in Chapter 8, the impacts identified in **Table 8.3** will be reduced with residual impacts having insignificant levels. The impact assessment and mitigation matrix present the assessment of the residual impacts (mitigated).

10.3 Recommendations

- A plantation plan has been proposed in the EIA report, which needs to be strictly implemented.
- A traffic management plan during construction phase needs to be developed to ensure the existing surrounding road infrastructure is not impacted in a negative way.
- In accordance with the Islamabad Nature Conservation and Wildlife Management Act, 2023, CDA should obtain approval from board to ensure that the rehabilitation of the road will not adversely impact the conservation, protection and preservation of nature in the National Park.

- Clear and reflective traffic signs should be installed at strategic locations as mentioned in EIA report, to provide information about road conditions, speed limits, and directions. Make sure signs are visible from a distance.
- Surveillance systems should be implemented, such as security cameras, to monitor road conditions and traffic in real-time. These can help identify and respond to incidents promptly.

On the basis of the overall impact assessment, more specifically, nature and magnitude of the residual environmental impacts identified during present EIA, it is concluded that Rehabilitation/Up-Gradation of Road from Shah Allah Ditta to Alexander Well, ICT Limits, Islamabad is likely to cause minor environmental impacts mainly during its construction phase. However, these impacts can be mitigated by the implementation of proposed mitigation measures.

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

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

Name	Project Position	Qualification and Experience	Tasks assigned / TORs of individual Specialist
Mr. Saadat Ali	Team Leader/ Environmental Engineer	Postgraduate Diploma in Sanitary Engineering, International Institute for Hydraulic and Environmental Engineering, 1984 B. Sc Civil Engineering, Engineering College, University of Peshawar, 1978	▪ Overall management of the Project (Supervision, site visits, guidance, inputs and suggestion, recommendation and discussion and report presentations ▪ To review overall environmental issues and mitigation measures. ▪ To prepare the draft and final study reports.
Mr. Ali Abdullah	Environmental Engineer	M. Sc. Environmental Engineering, Newcastle University (2016) B. Sc. Civil Engineering, The University of Lahore, Lahore (2010-1014) A Levels, The City School (2008-2010)	▪ Suggest mitigation measures for impacts that impact the environment. ▪ Identification of site for baseline data collection for water, wastewater, noise, soil, traffic and ambient air quality.
Ms. Amna Saeed	Environmental Engineer	B. Sc. Environmental Engineering, UET Lahore (2018-2022)	▪ Identifying any rare, endemic, protected or endangered species in the Project area ▪ Review of EIA Report ▪ Public Consultation
Mr. M. Ali Qureshi	Environmental Engineer	M. Sc. Environmental Engineering, NUST Islamabad (2022-ongoing) B. Sc. Environmental Engineering, UET Taxila (2018-2022)	▪ Preparation of draft report ▪ Field work for baseline data collection in the area under study ▪ Secondary data collection for desk review ▪ Field work for baseline data collection in the area under study ▪ Draft Environmental management plan for successful management of expected environmental impacts from the Project.

Annexure-2: List of the People Consulted During the EIA Study

No.		Name of Person	Designation
1	Stakeholders	Akram Jatt Sandhu	Deputy Director Roads Division I
2		Mr Sajjad Hussain Shah	Assistant Capital Development Authority
3		Mr. Sami Naeem Khan	Director, ERS Pvt. Limited
4		Dr. Irshad Ahmed	Director HSEQ
5		Mr. Anwar Kamal	Assistant Director, Emergency and Disaster Management Directorate
6		Mr. Zulqarnain	Emergency and Disaster Management Directorate
7		Mr. Sher Afzal	Assistant Director, Islamabad Electric Supply Company

No.	Area	Name	Age	Education	Occupation	Marital Status
1	Shah Allah Ditta Road	M. Ramzan	54	Middle	Businessman	Married
2		M. Adnan	30	Inter	Businessman	Married
3		M. Sharif	41	Matric	Shopkeeper	Married
4		Zafarullah Khan	35	Inter	Shopkeeper	Married
5		M.Ilyas	30	Matric	Driver	Married
6		M.Waseem	28	Matric	Masonry worker	Married
7		M.Nazim	30	Illiterate	Electrician	Married
8		Asif Nawaz	32	Illiterate	Driver	Married
9		M. Ilyas	25	Illiterate	Shopkeeper	Single
10		Rafi Ullah	30	Matric	Masonry worker	Married
11		Sahirullah	35	Inter	Businessman	Married
12		Zahoorullah	38	Inter	Shopkeeper	Married
13		Zarwar Khan	40	Matric	Driver	Married

Annexure-3: Glossary

Air pollution	Air is made up of a number of gases, mostly nitrogen and oxygen and, in smaller amounts, water vapor, carbon dioxide and argon and other trace gases. Air pollution occurs when harmful chemicals and particles are emitted to the air – due to human activity or natural forces – at a concentration that interferes with human health or welfare or that harms the environment in other ways.
Ambient air quality	Ambient air quality refers to the quality of outdoor air in our surrounding environment. It is typically measured near ground level, away from direct sources of pollution.
Archaeology	The study of human history and prehistory through the excavation of sites and the analysis of artefacts and other physical remains.
Biodiversity	The variety of plant and animal life in the world or in a particular habitat, a high level of which is usually considered to be important and desirable.
Bye-law	A rule made by a local authority to govern activities within the area it controls. Examples include bye-laws covering waste disposal, traffic or public events or signs.
Carbon dioxide (CO_2)	A colorless gas that is naturally produced from animals and people in exhaled air and the decay of plants.
Carbon monoxide	A highly poisonous, odorless, tasteless and colorless gas that is formed when carbon material burns without enough oxygen.
Climate	The pattern of weather in a particular region over a set period of time, usually 30 years.
Compost	A rich soil-like material produced from decayed plants and other organic matter, such as food and animal waste, that decomposes (breaks down) naturally.
Composting	The process of deliberately allowing food, garden and other suitable organic wastes to break down naturally over time to produce compost.
Conservation	Preserving or protecting animals and resources such as minerals, water and plants through planned action (such as breeding endangered species) or non-action (such as not letting taps run unnecessarily).
Deforestation	The reduction of trees in a wood or forest due to natural forces or human activity such as burning or logging.
Effluent	Liquid wastes such as sewage and liquid waste from industries.
Energy efficiency	Actions to save fuels, for example, better building design, changing production processes, developing better transport policies, using better road vehicles and using insulation and double glazing in homes.
EIA	An environmental impact assessment (EIA) is an analytical process that systematically examines the possible environmental consequences of the implementation of projects, programs and policies.
EMP	An environmental management plan (EMP) is a site-specific plan developed to ensure that all necessary measures are identified and implemented in order to protect the environment and comply with environmental legislation.
Fauna	The animals of a particular region, habitat, or geological period.
Flora	The plants of a particular region, habitat, or geological period.

Habitat	The area occupied by a community or species (the group of animals or plants), such as a forest floor, desert or seashore.
Initial Environmental Examination	Initial environmental examinations describe the environmental condition of a project, including potential impact, formulation of mitigation measures, and preparation of institutional requirements and environmental monitoring.
Landfill	A site that is specially designed to dispose of waste and operates with a license granted by the Environmental Protection Agency (EPA).
PEQS	The Punjab Environmental Quality Standards (PEQs) are quality standards to regulate the air emissions and effluents of industry and other big polluters.
Noise Pollution	Noises that disturb the environment and people's ability to enjoy it, for example, continually sounding house alarms, loud music, air conditioning or other electrical units and aircraft or motor engines.
Seismology	The branch of science concerned with earthquakes and related phenomena.
Topography	The arrangement of the natural and artificial physical features of an area.

Annexure-4: Terms of Reference

An EIA will be carried out with the following objectives:

- Establishing the environmental baseline in the study area and identifying any significant environmental issue.
- Assessing these impacts and providing for the requisite avoidance, mitigation, and compensation measures.
- Integrating the identified environmental issues in project planning and design.
- Developing appropriate management plans for implementing, monitoring, and reporting of the environmental mitigation and enhancement measures suggested.
- Respond to queries generated by Pak-EPA until issuance of the NOC.

Annexure-5: Ambient Air, Noise Monitoring and Water Quality Testing and Validation Results

ESPAK

ENVIRONMENTAL SERVICES PAKISTAN

CHEMICAL ANALYSIS TEST REPORT (AMBIENT AIR)

Reference Number: ESPAK/0210I/23/AA/5914/00537 **Date:** 10/10/2023

Name of Industry/Client: Project Procurement International

Address: Office #26, 2nd Floor, Silver City Plaza, G11 Markaz, Islamabad

Telephone No.: ----

Nature of Sample: Ambient Air

Monitoring Location: Shah Allah Ditta Road to Alexander Well (Location-1 GPS: 33.720697°N, 72.914548°E)

Date of Sample Collection: 06/10/2023

Grab / Composite: Continuous 24- Hours

Sample Collected/Sent By: Nadeem Malik, Analyst (Field), ESPAK

Date of Completion of Analysis: 07/10/2023

S. No	Parameters	Limit Values (NEQS-24 Hours)	Concentration	Method / Equipment Used	Remarks
1	Carbon Monoxide (CO)	5 mg/m³ (8 Hours)	1.5 mg/m³	Non Dispersive Infrared Absorption (NDIR)	Within Prescribed Limits
2	Sulfur Dioxide (SO_2)	120 µg/m³	11.5 µg/m³	UV Fluorescence (UVF)	Within Prescribed Limits
3	Ozone (O_3)	130 µg/m³ (1 Hour)	21.0 µg/m³	Non Dispersive UV Absorption	Within Prescribed Limits
4	Oxides of Nitrogen as NO	40 µg/m³	13.7 µg/m³	Chemiluminescence Detection	Within Prescribed Limits
5	Oxides of Nitrogen as NO_2	80 µg/m³	26.5 µg/m³	Chemiluminescence Detection	Within Prescribed Limits
6	Particulate Matter $PM_{2.5}$	35 µg/m³	34.6 µg/m³	Particulate Sensor	Within Prescribed Limits
7	Particulate Matter PM_{10}	150 µg/m³	133 µg/m³	Particulate Sensor	Within Prescribed Limits
8	Suspended Particulate Matter (SPM)	500 µg/m³	458 µg/m³	Particulate Sensor	Within Prescribed Limits

NEQS: National Environmental Quality Standards for Ambient Air, 2010

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

Note:

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- **The report data is not intended to be used legally by the client.**

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

Name: Imran Malik
General Manager
Date: 10/10/2023

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ENVIRONMENTAL SERVICES PAKISTAN

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Report Reference	ESPAK/0210I/23/AA/5914/00537							
Name of Industry/ Client	Project Procurement International							
Address	Office #26, 2nd Floor, Silver City Plaza, G11 Markaz, Islamabad							
Monitriong Location	Shah Allah Ditta Road to Alexander Well							
Location-1 GPS Coordinates	33.720697°N, 72.914548°E							
Monitoring Date	06-10-2023 to 07-10-2023							
Date - Time	CO	SO_2	O_3	NO	NO_2	$PM_{2.5}$	PM_{10}	TSP
	mg/m^3	ug/m^3	ug/m^3	ug/m^3	ug/m^3	ug/m^3	ug/m^3	ug/m^3
06-10-23 10:30	1.8	15.0	21.0	17.4	27.2	40.7	137.9	
06-10-23 11:30	1.3	12.7		11.0	26.4	41.1	139.3	
06-10-23 12:30	1.8	15.7		12.5	29.0	40.7	137.9	
06-10-23 13:30	1.4	10.3		15.8	26.3	37.0	125.3	
06-10-23 14:30	1.2	12.3		12.2	26.0	37.6	142.2	
06-10-23 15:30	1.7	10.5		16.0	26.4	35.2	142.6	
06-10-23 16:30	1.1	12.4		12.4	26.1	34.4	154.5	
06-10-23 17:30	1.6	12.0		11.7	25.3	30.6	145.7	
06-10-23 18:30		12.0		14.6	27.2	33.0	103.1	
06-10-23 19:30		11.5		11.9	25.8	24.5	110.3	
06-10-23 20:30		9.7		14.8	26.3	25.1	141.6	
06-10-23 21:30		11.7		14.2	26.0	34.8	138.2	458
06-10-23 22:30		11.4		13.7	26.7	33.1	126.9	
06-10-23 23:30		11.8		14.4	25.6	35.7	124.0	
07-10-23 0:30		10.0		16.4	27.1	35.2	134.1	
07-10-23 1:30		11.9		13.7	25.7	34.4	142.5	
07-10-23 2:30		10.1		11.9	27.2	34.6	143.3	
07-10-23 3:30		11.8		14.3	27.1	36.1	125.8	
07-10-23 4:30		10.3		12.1	27.3	34.3	127.3	
07-10-23 5:30		12.3		14.2	27.0	34.4	119.2	
07-10-23 6:30		11.2		12.5	26.1	34.6	116.6	
07-10-23 7:30		10.0		14.4	27.1	34.0	128.5	
07-10-23 8:30		10.6		12.6	24.7	34.3	142.3	
07-10-23 9:30		10.1		14.6	27.2	34.8	133.7	
Average	1.5	11.5	21.0	13.7	26.5	34.6	132.6	458
Maximum	1.8	15.7	21.0	17.4	29.0	41.1	154.5	458
Minimum	1.1	9.7	21.0	11.0	24.7	24.5	103.1	458
Monitored By:	Nadeem Malik							

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ENVIRONMENTAL SERVICES PAKISTAN

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CHEMICAL ANALYSIS TEST REPORT (AMBIENT AIR)

Reference Number: ESPAK/0210I/23/AA/5914A/00539 **Date:** 10/10/2023

Name of Industry/Client: Project Procurement International

Address: Office #26, 2nd Floor, Silver City Plaza, G11 Markaz, Islamabad

Telephone No.: ----

Nature of Sample: Ambient Air

Monitoring Location: Shah Allah Ditta Road to Alexander Well (Location-2 GPS: 33.724695°N, 72.922854°E)

Date of Sample Collection: 08/10/2023

Grab / Composite: Continuous 24- Hours

Sample Collected/Sent By: Nadeem Malik, Analyst (Field), ESPAK

Date of Completion of Analysis: 09/10/2023

S. No	Parameters	Limit Values (NEQS-24 Hours)	Concentration	Method / Equipment Used	Remarks
1	Carbon Monoxide (CO)	5 mg/m³ (8 Hours)	1.6 mg/m³	Non Dispersive Infrared Absorption (NDIR)	Within Prescribed Limits
2	Sulfur Dioxide (SO_2)	120 µg/m³	12.7 µg/m³	UV Fluorescence (UVF)	Within Prescribed Limits
3	Ozone (O_3)	130 µg/m³ (1 Hour)	23.1 µg/m³	Non Dispersive UV Absorption	Within Prescribed Limits
4	Oxides of Nitrogen as NO	40 µg/m³	15.1 µg/m³	Chemiluminescence Detection	Within Prescribed Limits
5	Oxides of Nitrogen as NO_2	80 µg/m³	29.2 µg/m³	Chemiluminescence Detection	Within Prescribed Limits
6	Particulate Matter $PM_{2.5}$	35 µg/m³	**38.0 µg/m³**	Particulate Sensor	Exceeding Prescribed Limits
7	Particulate Matter PM_{10}	150 µg/m³	**153 µg/m³**	Particulate Sensor	Exceeding Prescribed Limits
8	Suspended Particulate Matter (SPM)	500 µg/m³	**503 µg/m³**	Particulate Sensor	Exceeding Prescribed Limits

NEQS: National Environmental Quality Standards for Ambient Air, 2010

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2. **Name of Chief Analyst with Seal:** Muhammad Arfan
3. **Signature of Incharge of the Environmental Laboratory:**

Name: Imran Malik
General Manager
Date: 10/10/2023

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Report Reference	ESPAK/0210I/23/AA/5914A/00539
Name of Industry/ Client	Project Procurement International
Address	Office #26, 2nd Floor, Silver City Plaza, G11 Markaz, Islamabad
Monitriong Location	Shah Allah Ditta Road to Alexander Well
Location-2 GPS Coordinates	33.724695°N, 72.922854°E
Monitoring Date	08-10-2023 to 09-10-2023

Date - Time	CO	SO_2	O_3	NO	NO_2	$PM_{2.5}$	PM_{10}	TSP
	mg/m^3	ug/m^3	ug/m^3	ug/m^3	ug/m^3	ug/m^3	ug/m^3	ug/m^3
08-10-23 11:15	2.0	16.5	23.1	19.1	29.9	44.8	151.7	
08-10-23 12:15	1.5	14.0		12.1	29.1	45.2	153.3	
08-10-23 13:15	2.0	17.3		13.7	31.9	44.8	151.7	
08-10-23 14:15	1.5	11.4		17.4	29.0	40.7	137.9	
08-10-23 15:15	1.4	13.5		13.4	28.6	41.3	156.5	
08-10-23 16:15	1.9	11.5		17.6	29.1	38.7	156.9	
08-10-23 17:15	1.2	13.7		13.6	28.7	37.8	169.9	
08-10-23 18:15	1.8	13.2		12.8	27.8	33.7	160.3	
08-10-23 19:15		13.2		16.1	29.9	36.3	153.4	
08-10-23 20:15		12.7		13.1	28.4	26.9	141.3	
08-10-23 21:15		10.7		16.3	28.9	27.6	155.8	
08-10-23 22:15		12.8		15.6	28.5	38.3	152.0	
08-10-23 23:15		12.5		15.1	29.4	36.4	159.6	503
09-10-23 0:15		13.0		15.8	28.2	39.2	136.4	
09-10-23 1:15		11.0		18.0	29.8	38.8	147.6	
09-10-23 2:15		13.1		15.0	28.3	37.8	156.8	
09-10-23 3:15		11.1		13.0	29.9	38.1	157.6	
09-10-23 4:15		12.9		15.8	29.8	39.7	148.4	
09-10-23 5:15		11.3		13.3	30.0	37.7	140.0	
09-10-23 6:15		13.5		15.6	29.7	37.9	151.2	
09-10-23 7:15		12.3		13.7	28.7	38.0	158.2	
09-10-23 8:15		11.0		15.8	29.8	37.4	161.3	
09-10-23 9:15		11.7		13.8	27.2	37.7	156.5	
09-10-23 10:15		11.1		16.0	29.9	38.3	147.1	
Average	1.6	12.7	23.1	15.1	29.2	38.0	152.6	503
Maximum	2.0	17.3	23.1	19.1	31.9	45.2	169.9	503
Minimum	1.2	10.7	23.1	12.1	27.2	26.9	136.4	503
Monitored By:	Nadeem Malik							

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NOISE MONITORING REPORT

Reference Number: ESPAK/0210I/23/N/5915/00622 **Date:** 10/10/2023

Name of Industry/Client: Project Procurement International

Address: Office #26, 2nd Floor, Silver City Plaza, G11 Markaz, Islamabad

Telephone No.: ----

Nature of Sample: Noise

Date of Sample Collection: 06/10/2023 **Grab / Composite:** Continuous 24-Hours

Sample Collected/Sent By: Nadeem Malik, Analyst (Field), ESPAK

Date of Completion of Analysis: 07/10/2023

Method/Equipment Used: Sound Level Meter

S. No	Measurement Point	Limit Values (NEQS)	Noise Level in dB(A) Leq	Remarks
1	Shah Allah Ditta Road to Alexander Well (Location-1 GPS: 33.720697°N, 72.914548°E) - Day time	65 dB(A)	**67 dB(A)**	Exceeding Prescribed Limits
2	Shah Allah Ditta Road to Alexander Well (Location-1 GPS: 33.720697°N, 72.914548°E) - Night time	55 dB(A)	**60 dB(A)**	Exceeding Prescribed Limits

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

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

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

Name: Imran Malik
General Manager
Date: 10/10/2023

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NOISE MONITORING REPORT

Reference Number:	**ESPAK/0210I/23/N/5915A/00624**	**Date:**	10/10/2023
Name of Industry/Client:	Project Procurement International		
Address:	Office #26, 2nd Floor, Silver City Plaza, G11 Markaz, Islamabad		
Telephone No.:	----		
Nature of Sample:	Noise		
Date of Sample Collection:	08/10/2023	**Grab / Composite:**	Continuous 24-Hours
Sample Collected/Sent By:	Nadeem Malik, Analyst (Field), ESPAK		
Date of Completion of Analysis:	09/10/2023		
Method/Equipment Used:	Sound Level Meter		

S. No	Measurement Point	Limit Values (NEQS)	Noise Level in dB(A) Leq	Remarks
1	Shah Allah Ditta Road to Alexander Well (Location-2 GPS: 33.724695°N, 72.922854°E)- Day time	65 dB(A)	**73 dB(A)**	Exceeding Prescribed Limits
2	Shah Allah Ditta Road to Alexander Well (Location-2 GPS: 33.724695°N, 72.922854°E)- Night time	55 dB(A)	**64 dB(A)**	Exceeding Prescribed Limits

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

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

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ENVIRONMENTAL SERVICES PAKISTAN

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CHEMICAL ANALYSIS TEST REPORT (GROUND WATER)

Reference Number: ESPAK/0210I/23/GW/5916/00913 **Date:** 12/10/2023

Name of Industry / Client: Project Procurement International

Address: Office #26, 2nd Floor, Silver City Plaza, G11 Markaz, Islamabad

Telephone No.: ----

Nature of Sample: Ground Water (GPS: 33.713237°N, 72.918870°E)

Date Sample Received: 04/10/2023 **Grab / Composite:** Grab

Date of Sample Collection: 03/10/2023

Sample Collected / Sent By: Nadeem Malik, Analyst (Field), ESPAK

Date of Completion of Analysis: 09/10/2023

S. No	Parameters	Limit Values (NSDWQ)	Concentration	Method / Equipment Used	Remarks
1	Total Coliforms	----	ND	SMWW 9221 B	----
2	Fecal Coliform Bacteria	Must not be detectable in any 100mL sample	ND	SMWW 9221 F	Within Limits
3	E. Coli	Must not be detectable in any 100mL Sample	ND	SMWW 9221 F	Within Limits
4	Color	≤15 TCU	ND	SMWW 2120 C	Within Limits
5	Taste	Non Objectionable / Acceptable	Acceptable	Organoleptic	Within Limits
6	Odor	Non Objectionable / Acceptable	Acceptable	Organoleptic	Within Limits
7	Turbidity	<5 NTU	0.2 NTU	SMWW 2130B	Within Limits
8	Total Hardness as $CaCO_3$*	<500 mg/L	380 mg/L	SMWW 2340C	Within Limits
9	Total Dissolved Solids (TDS)*	<1000 mg/L	418 mg/L	SMWW 2540C	Within Limits
10	pH*	6.5-8.5	7.1	SMWW 4500H+B	Within Limits
11	Aluminum (Al)	≤0.2 mg/L	ND	U.S. EPA-200.7	Within Limits
12	Antimony (Sb)	≤0.005 mg/L	ND	U.S. EPA-200.7	Within Limits
13	Arsenic (As)	≤0.05 mg/L	ND	U.S. EPA-200.7	Within Limits
14	Barium (Ba)	0.7 mg/L	0.2 mg/L	U.S. EPA-200.7	Within Limits
15	Boron (B)	0.3 mg/L	ND	U.S. EPA-200.7	Within Limits
16	Cadmium (Cd)	0.01 mg/L	ND	U.S. EPA-200.7	Within Limits
17	Chloride (as Cl^-)*	<250 mg/L	6 mg/L	SMWW 4500Cl^-B	Within Limits
18	Chromium (Cr)	≤0.05 mg/L	ND	U.S. EPA-200.7	Within Limits
19	Copper (Cu)	2.0 mg/L	ND	U.S. EPA-200.7	Within Limits
20	Cyanide (CN^-)	≤0.05 mg/L	ND	SMWW 4500 CN^- F	Within Limits
21	Fluoride (F^-)*	≤1.5 mg/L	0.4 mg/L	U.S. EPA 9214	Within Limits
22	Lead (Pb)	≤0.05 mg/L	ND	U.S. EPA-200.7	Within Limits

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23	Manganese (Mn)	≤0.5 mg/L	ND	U.S. EPA-200.7	Within Limits
24	Mercury (Hg)	≤0.001 mg/L	ND	U.S. EPA-200.7	Within Limits
25	Nickel (Ni)	≤0.02 mg/L	ND	U.S. EPA-200.7	Within Limits
26	Nitrate (NO_3^-)	≤50 mg/L	16 mg/L	SMWW 4500NO_3^-B	Within Limits
27	Nitrite (NO_2^-)	≤3 mg/L	ND	SMWW 4500NO_2^-B	Within Limits
28	Selenium (Se)	0.01 mg/L	ND	U.S. EPA-200.7	Within Limits
29	Residual Chlorine	0.2-0.5 mg/L	ND	SMWW 4500-Cl B	----
30	Zinc (Zn)	5.0 mg/L	ND	U.S. EPA-200.7	Within Limits
31	Phenolic Compounds (as Phenols)	NGVS	ND	SMWW 5530 C	----

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

- Laboratory tests and measurements were carried out at 25 ± 5 °C and 50 ± 20 % Relative Humidity conditions unless required otherwise.
- Uncertainty of Measurement (UoM) data will be provided on request, where available. The statement of conformity, if provided in the report, is based on the decision rule of simple acceptance or rejection with equal shared risk due to measurement uncertainty.

Note:

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

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

Name: Imran Malik
General Manager
Date: 12/10/2023

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

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