

**CONSTRUCTION OF UNDERPASS
AT GRADE U-TURN ALONG SHABIR
SHARIF ROAD AVENUE -3, PHASE-
VI, DHA, LAHORE
ENVIRONMENTAL IMPACT ASSESSMENT REPORT**



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ENVIRONMENTAL IMPACT ASSESSMENT REPORT
CONSTRUCTION OF UNDERPASS AT GRADE U-TURN ALONG SHABIR SHARIF ROAD
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1 List of Abbreviations:

EIA	Environmental Impact Assessment
IEE	Initial Environmental Examination
EMP	Environmental Impact Assessment
PEPA	Pakistan Environmental Protection Act
PEQS	Punjab Environmental Quality Standards
WAPDA	Water and Power Development Authority
DHA	Defense Housing Authority (DHA)
PGEE	Pak green Enviro-Engineering Pvt. Ltd
EMP	Environmental Monitoring Program
NOC	No Objection Certificate
EMC	Environmental Monitoring Cell
EPA	Environmental Protection Agency
PEPC	Pakistan Environmental Protection Council
IAQS	Indoor Air Quality Standards
PIAQS	Professional Indoor Air Quality Standards
DWQS	Drinking Water Quality Standards
AWQS	Agricultural Water Quality Standards
RWQS	River Water Quality Standards
FAO	Food and Agriculture Organization
W.H.O	World Health Organization

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OHSA Occupational Health and Safety Management System

NAAQS National Ambient Air Quality Standards

Pak-EPC Pakistan Environmental Protection Council

NCS National Conservation Strategy

LAA Land Acquisition Act

P & D Planning & Development Department

dB (A) Decibel

PPM Parts Per Million

$\mu\text{g}/\text{m}^3$ Micro Gram per Cubic Meter

KVA Kilo Volt Ampere

MSW Municipal Solid Waste

PPEs Personal Protective Equipments

TDS Total Dissolved Solids

TSS Total Suspended Solids

COD Chemical Oxygen Demand

BOD Biological Oxygen Demand

PM Particulate Matter

RFT Running Foot

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Executive Summary

The subject project is the Construction of Underpass at grade U-turn along Shabir Sharif Road Avenue-3, Phase-VI, DHA Lahore. Proponent is submitting Environmental Impact Assessment (EIA) report of the subject project under section 12 of the Punjab Environmental Protection Act, 1997 (Amended 2012).

According to the Environmental Protection Agency, Government of the Punjab, Lahore-“List of Projects Requiring an IEE/EIA”, and the project under consideration categories falls in the category D, Clue 2 of Schedule II for EIA, of PEPA, Regulations, 2000, requiring Environmental Impact Assessment (EIA). Further, the client is required to fulfill the legal requirements of the Section-12 of the Punjab Environment Protection Act 1997(Amended 2012). Terms of References are attached as (Annexure-A).

Location of the project:

Area under study is located at Construction of Underpass at grade U-turn along Shabir Sharif Road Avenue-3, Phase-VI, DHA Lahore.

Co-ordinates for the site are;

North	Broadway Main Boulevard
South	Sector H
East	Lahore Ring Road interchange
West	Barki Road

Project Designs & Map for project area is attached as Annexure-B

Project Proponent

Director Project Colonel Muhammad Rashid Abbasi, Retired, from Defense Housing Authority (DHA) is the Proponent of the subject project. CNIC & Authority Letters are attached as Annexure-C.

Project Consultant

Pak Green Enviro-Engineering (Pvt.) Ltd, as independent consultants has been appointed by the proponent to conduct Environmental Impact Assessment (EIA).

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Brief outline of the proposal

The subject project is the Construction of Underpass at Grade U turn along Shabir Sharif Road Avenue-3 Phase-VI, DHA, Lahore. Total length of the ramp portion is 561.53M and barrel length is 62.09M.

It is a residential area but schools, hospitals and some shops can be seen along the road. Mostly people do jobs or have their shops, some people have their fruit and vegetable stalls along the road for living. Development of road in such urban area will provide easy access to main roads and it will helpful for the local public to carry out economic activities in the area.

Major Impacts

In order to identify all the activities associated with the project a thorough review has been conducted. This project is envisaged to have multi-dimensional impacts on the local people; improve logistics, transport infrastructure and quality of services, minimize fuel cost by providing easy access, improve environment, better communication, enhances economic activities and reducing driving stress.

Project will not have significant adverse impacts on the nearby community and on environment. Overall, the project will have positive impacts on the local population and nearby community.

Summary of Major Environmental Impacts

Pollutant	Constructional phase	Operational phase
Particulate matter (PM)/dust	Particulate matter during the construction and transportation activities at the site Due to raw materials loading/unloading	During the operational phase dust will only be generated due to the transportation of traffic

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Gaseous emissions	Flue gases will be generated due to machinery for the underpass construction and vehicles	Flue gases will be generated due to vehicles
Noise	Noise due to construction machinery and vehicles transporting materials	Noise due to vehicles/traffic movement
Solid Waste	Solid waste due to construction of underpass i.e. concrete solid waste	NA
Soil Contamination	Soil can be contaminated due to leaching of oil, fuel, any stored oil.	Soil can be contaminated due to leaching of oil, fuel, any stored oil and hazardous substance
Waste water	There is no Waste water generation from Construction of underpass	NA
Health and safety issues	Health and safety issues can be arose due to machinery handling and Construction of underpass activities	Health and safety issues can be arose improper driving practices, not following the safety signs, traffic rules etc.
Socioeconomic	Local residents of the area get troubled from the road construction machinery	Improved & easy access of the road for the local community.

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	Positive impact due to generation of Employment opportunity	Positive impact due to generation of Employment opportunity
Traffic problems	During construction phase people face Disturbance due to the road construction machinery & material transporting vehicles	Chances of road accidents

Recommendation for Mitigation measures

Pollutants	Recommendations during construction phase	Recommendations during Operation phase
Particulate matter (PM)/dust	Sprinkling of water is being done during the construction of underpass and rehabilitation of road. PPEs should be provided to labors in case of particulate matter/dust All constructional raw material should be kept covered	Post construction Monitoring should be conducted as per EPA PEQS Rules 2001
Gaseous emissions	Constructional machinery and vehicles should be tuned and maintained properly	Post construction Monitoring should be conducted as per EPA PEQS Rules 2001

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	PPEs should be provided to labors in case of particulate matter/dust All project vehicles should be checked regularly	
Noise	Vehicles to carry raw materials should be tuned properly and trainings for safe driving practices/HSE is recommended for drivers/machinery operators. Ear plugs/muffs should be provided in case of heavy noise All the raw material should be transported at the low traffic hours	Post construction Monitoring should be conducted on quarterly basis as per EPA PEQS Rules 2001
Solid Waste	Constructional solid waste should be utilized for land filling purposes	Waste bins should be placed at suitable places on the road.
Soil Contamination	Placed plastic sheets under leaching material to avoid leaching or the leaching material should be placed over concreted area	NA
Waste water	There is no waste water generation from the construction of underpass.	There is no waste water generation from the execution of the road.

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	But in case of rain water Proper drainage system should be recommended	But in case of rain water Proper drainage system should be recommended Post construction Monitoring should be conducted on monthly basis as per EPA PEQS Rules 2001
Health and safety issues	HSE Trainings of persons/labors involved in the construction and planning of the project is recommended Safe driving practices should be adopted PPEs should be provided to labors during constructional activities	NA
Socioeconomic	People should be informed in advance when work is about to start at the project site. Local people should be preferred for the employment	Community wellbeing should be considered and anticipated measures are recommended to preserve the local culture Local people should be preferred for the employment
Traffic Problems	Alternative routes should be identified by the contractor	Due to construction of underpass, chances of road accidents will be reduced,

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		improved flow of traffic and easy access.
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Proposed Environmental Monitoring

To oversee the environmental performance of the project during construction & post construction by enforcing the PEQS an Environmental Monitoring Program should be formulated which ensures effective surveillance of the environmental parameters at various constructional stages of the project development and compliances with PEQS and legal obligations. Monitoring for Environmental Parameters is recommended:

Particulate Matter/Dust

Regular monitoring for particulate matter should be conducted during construction and post construction

Ambient Air

Regular monitoring for ambient air should be conducted during construction and post construction.

Flue Gases

Regular monitoring for vehicular emissions should be conducted during construction and post construction.

Noise

Regular monitoring for noise level should be during construction and post construction.

Water quality

There is no wastewater during the Construction phase.

Recommendation: Environmental Monitoring data log book should be maintained by the project proponent.

CHAPTER # 1

1 INTRODUCTION

This section of the report provides an overview of the rational of the project, objective of the project, why it is to be constructed, purpose of the report an approach adapted to conduct Environmental Impact Assessment (EIA) Construction of Underpass.

1.1 Purpose of the study/report:

Defense Housing Authority (DHA) Lahore intends to Construction of Underpass at Grade U-Turn along Shabir Sharif Road Avenue-3 Phase-VI, DHA, Lahore. Proponent is submitting Environmental Impact Assessment (EIA) report of the subject project under section 12 of the Punjab Environmental Protection Act, 1997 (Amended 2012).

The Pak Green consultants have conducted Environmental Impact Assessment (EIA) as per advised by the Environment Protection Agency of Punjab for the project of Construction of Underpass at Grade U-Turn along Shabir Sharif Road Avenue-3 Phase-VI, DHA, Lahore. The EIA Report covers the examination of the physical, biological and environmental socioeconomic impacts at construction stage along with monitoring for environmental parameters to comply with Punjab Environmental Quality Standards (PEQS).

1.2 Identification of the project:

According to the Punjab Environmental Protection Act 1997 (Amended 2012) and its interpretation as per Review of IEE & EIA Regulations, 2000 for filling, review and approval of environmental assessments, the present project is categorized in the category D, Clue 2 of Schedule II for EIA, of PEPA, Regulations, 2000, requiring Environmental Impact Assessment (EIA). Further, the client is required to fulfill the legal requirements of the Section-12 of the Punjab Environment Protection Act 1997(Amended 2012).

Project Title:

The subject project to which Environmental Impact Assessment of (EIA) relates is entitled as 'Construction of Underpass at Grade U-Turn along Shabir Sharif Road Avenue-3 Phase-VI, DHA, Lahore

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Project Proponent:

Defense Housing Authority (DHA) is the Proponent of the subject project.

1.3 Details of the Project Consultants:

Pak Green Enviro-Engineering (Pvt.) Ltd, as independent consultants, has been appointed by the proponent to conduct Environmental & social Impact Assessment (ESIA).

Company office address is 46-M, Gulberg III, Lahore

Contact: 042-35441444, 0303-4442335.

The current work has been carried out by the following professionals:

Table 1-1: ESIA Team

Sr. No.	Designation	Name/Qualification	Experience
1.	Lead Environmental Professional	Abdul Hafeez Nasir PhD Scholar Environmental Management	12 Years' Experience as Environmentalist
2.	Environmental Professional	Iftikhar Ahmed M.Phil. Environmental Sciences	7 Years' Experience as Environmentalist
3.	Project Coordinator	Ahmed Raza B.com, PU, Lahore	8 Years' Experience

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4.	Associate Environmental Professional	Sabeera Tauheed M.Phil Environmental Sciences PU, Lahore	3 Year Experience as an environmentalist
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1.4 Introduction of the project:

1.4.1 Location of the project:

Area under study is located at Construction of Underpass at Grade U-Turn along Shabir Sharif Road Avenue-3 Phase-VI, DHA, Lahore

Co-ordinates for the site are;

North	Broadway Main Boulevard
South	Sector H
East	Lahore Ring Road interchange
West	Barki Road

1.4.2 Length of the road:

Total proposed construction length of the ramp portion is 561.53M and barrel length is 62.09M.

1.4.3 Cost of the project:

Cost involved for the improvement of the subject road is 1319 million Pakistani Rupees.

1.5 Methodology for EIA Report:

For the purpose of this report, environmental and social baseline data and conditions at/around the project site has been undertaken. The methodology adopted to conduct the EIA Study includes Review of Layout Plan, detail meetings with the representative of proponent, orientation session, development of data acquisition plan, Analysis of Data, review of existing data, primary & secondary data collection survey, Screening of Potential Environmental Impacts and Mitigation Measures and also interviews with people near the project area has been conducted to collect their opinion regarding the construction project and after findings it has been concluded that the project has mostly

positive impacts on the physical and socio-economic environment of the existing community.

1.6 Objective of the Report

Objectives to conduct IEE are as following:

- It is mandatory according to Punjab Environmental Protection Act-PEPA 1997 (Amended 2012).
- To identify the environmental issues pertaining to the operational site.
- To provide the maximum information to the proponent and other stakeholders about the existing environmental conditions and the implications of the project.
- Collection of available data, reports, drawings and other relevant information about study area
- Review of applicable existing environmental legislation and Punjab Environmental quality standards (PEQS).
- Devise mitigation measures to eliminate or to reduce the negative impacts to an acceptable level.
- Development of well-resourced environmental management and monitoring plans to identify mitigation strategies targeted towards avoidance, minimization and the impacts of construction.

1.7 Extent of the Study

In compliance of PEPA, 1997 requirements, an IEE has been conducted by M/S Pak Green Enviro-Engineering. This document covers the environmental impacts of the project in and around the project area comprising the physical, ecological and socio-economic aspects together with identification of the potential positive and negative impacts. Any developmental activities outside the project area like construction of underpass & rehabilitation the road.

1.8 Screening

According to nature of project, cost of project and by also reviewing the IEE / EIA Regulation 2000, the project falls under Schedule II of PEPA Regulations.

1.9 Scoping

Scoping is the preliminary stage of Environmental impact assessment where initial visits of the project site is done to assess the spatial and temporal boundaries of the project, to assess significant impacts and consult the local community about their issues regarding the project.

1.10. Spatial and temporal boundaries of the project

The project lies at grade U-turn along shabir sharif road avenue- 3 Phase VI DHA Lahore providing a connection between Barki Road towards Lahore Ring Road. Total underpass length under construction processes the ramp portion is 561.53M and barrel length is 62.09M. The detailed spatial and temporal boundaries of the project can be viewed on the map attached as annexure B.

1.10.1 Important issues and concerns raised during the project

Important issue and concerns raised by the community during consultation include the disturbance of traffic due to construction activity. However, the proponent ensured that alternative routes from within the defense housing society will be available for the smooth flow of traffic during construction. Another important impact was generation of dust and noise during excavation and use of heavy machinery for concrete mixing and other construction activities. The proponent ensured regular sprinkling will be done to avoid reduce dust generation. PPEs will be provided to construction worker to reduce impact of noise.

1.10.2 Significant impacts to be determined

Significant impacts include the impact of gaseous emissions and dust generation during construction activity. These impacts can be reduced by not running the machinery if not required. Regular sprinkling will be done to avoid dust emissions.

CHAPTER # 2

2. DESCRIPTION OF THE PROJECT

2.1 Type and category of the project:

The subject project is the Construction of Underpass at grade U-turn along Shabir Sharif Road Avenue-3, Phase-VI, DHA Lahore. This project is envisaged to have multi-dimensional impacts on the local people; improve logistics, transport infrastructure and quality of services, minimize fuel cost by providing easy access, improve environment, better communication, enhances economic activities and reducing driving stress.

According to the Environmental Protection Agency, Government of the Punjab, Lahore-“List of Projects Requiring an IEE”, and the project under consideration categories falls in the category D, Clue 2 of Schedule II for EIA, of PEPA, Regulations, 2000, requiring Environmental Impact Assessment (EIA). Further, the client is required to fulfill the legal requirements of the Section-12 of the Punjab Environment Protection Act 1997(Amended 2012).

2.2 Objectives of the Project:

Under this project DHA has planned to rehabilitate and construct underpass. The Environmental Impact Assessment report is being submitted to Environmental Protection Department for the issuance of NOC.

Present Project has following objectives;

- It is expected to benefit local population of rural area of Lahore
- To provide a safe, efficient, unobstructed transport route to road users of the locality
- Creation of job opportunities for locals in the project area during the construction phase of the road
- To improve the economy of the area
- To provide better infrastructure

2.3 Type and category of the project:

The subject project to which Environmental Impact Assessment (EIA) relates is entitled as 'Construction of Underpass at Grade U-Turn along Shabir Sharif Road Avenue-3 Phase-VI, DHA, Lahore.

According to the Environmental Protection Agency, Government of the Punjab, Lahore- "List of Projects Requiring an EIA", and the project under consideration categories falls in the category D, Clue 2 of Schedule II for EIA, of PEPA, Regulations, 2000, requiring Environmental Impact Assessment (EIA). Further, the client is required to fulfill the legal requirements of the Section-12 of the Punjab Environment Protection Act 1997(Amended 2012).

2.4 Location and site layout of the Project:

Co-ordinates for the site are;

North	Broadway Main Boulevard
South	Sector H
East	Lahore Ring Road interchange
West	Barki Road

2.5 Existing Land Use:

The study site is situated in the urban residential area of District Lahore. There is proper sewerage and solid waste management facilities available people normally use WASA water supply for drinking purposes. It is a residential area, but people own shops in the area for commercial activities. Some local people have fruit stalls along the road for their living.

2.6 Road Access:

Shabir Sharif Road to Barki road and Lahore ring road interchange is main access road.

2.7 Vegetation features of the project:

The project site has natural vegetation and tree. It is fully residential area and number of different trees can be seen in the area, but cutting is involved. During the construction of underpass there is no tree cutting and loss of vegetation involved.

2.8 Cost and magnitude of the operation

This project involves construction of underpass in urban area of district Lahore. The total construction length of the ramp portion is 561.53M and barrel length is 62.09M.

2.9 Schedule of Implementation

Detailed feasibility studies and designing of the project have been completed. Necessary legal, administrative and financial formalities are finalized. The project is expected to be completed within 6 months to 1 year. Subsequently the constructional and maintenance aspects of the project are being undertaken by the proponent during the process.

Table 2-1: Schedule of implementation

Activities		Year 2022		
	Month 1-2	Month 2-3	Month 3-8	Month 9-10
Feasibility studies				
Layout plan for the work				
Work in progress				
compilation of job				

2.10 Project Description

Present project relates Construction of Underpass at Grade U-Turn along Shabir Sharif Road Avenue-3 Phase-VI, DHA, Lahore.

2.10.1 Activities relating to project

Some aspects relevant to the project are listed below:

- Transportation and storage of construction material
- Maintenance of alternative routes

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- Maintenance of records for safe handling, safe work methods, control PPEs etc.
- Measures for environmental management of the site including handling of materials, air & noise emissions
- Proper placement of safety signs along the road
- Provision of the medical care facility for the workers and other staff.
- Provision and implementation of the Personal Protective Equipment PPEs to workers
- Environmental Audit and Compliance monitoring (Reports are annexed, (Annexure-D))

2.11 Salient Features of the Project

The salient feature of the project is as under: construction length of the ramp portion is 561.53M and barrel length is 62.09M.

Total length of the underpass	ramp portion is 561.53M and barrel length is 62.09M.
Total Construction cost	Rs. 1319 million
Raw Material	Cement, sand, crush, steel, base material, sub-base material, plasticizer, accelerator or retarder, water reducing admixture.
Construction machinery	Tractor, road roller, Grador, Concrete Plant, transit mixer, Concrete pump, paver machine, road, roller, water, tanker, pile driller, water bouzer, dumper, grader etc
Estimated Construction period	06 month
No. of workers during construction	10-15

2.12 Waste Products of Project Process

Waste products and emissions during the project are following;

2.12.1 Wastewater

It is not a manufacturing or production process, so there is no wastewater generation during the rehabilitation of road. Total water required during the construction is only for the sprinkling to avoid dust emissions and to keep the environment clean. Water requirements depend on the weather conditions.

2.12.2 Solid Waste

Solid waste generation is a result domestic activity. There is no extra solid waste generation during the project. Project supervisor and contractor both are responsible for the proper management of domestic solid waste. Other waste material from the construction is being reused in the construction process.

2.12.3 Atmospheric emissions

Atmospheric emissions may result from the vehicles used for transportation of construction material and operation of generators, it is the responsibility of the proponent and contractor to make sure vehicles are in good working conditions.

2.12.4 Noise Pollution

Noise pollution may be an issue on our project site, transportation of vehicles, trucks and construction machinery may cause noise pollution, also it is residential area there must not any disturbance due to higher sound levels during improvement of road. Noise profile of the area before construction activities is within the prescribed limits in Pak-PEQS for residential area (Results are given in chapter # 4). But it incorporated in the study that our instruments and vehicles must not impart any noise beyond the specified limits.

2.13 Restoration / Rehabilitation Plan

All possible precaution has been taken to prevent an untoward incident in terms of life and property losses. One completion of the project, all solid waste and raw material are being removed from the site in order to maintain aesthetics of the area. All measures have been undertaken for ensuring occupational safety, security and clean environment during the working hours.

2.14 Government approvals required by the project:

Project proponent will get NOCs from all concerned departments after the environmental approval from EPA.

2.15 Health, Safety & Hygiene

Health, Safety & Hygiene includes the following:

2.15.1 First Aid facility

At workplace workers and employers should have enough information, knowledge and training regarding first aid treatment in case of any emergency.

The subject project provides proper medical facilities to workers and staff to cope with any incidental accidents and proper training about first aid is provided to workers and staff.

2.15.2 Safety Trainings

Workers and all the staff should be provided with proper training about the work and safety practices.

2.15.3 Use of Drugs and Narcotics

Drugs and narcotics are strictly prohibited during working hours in working area. Smoking is only allowed in rest timings at properly isolated places.

2.15.4 Personal Protective Equipment (PPEs)

At subject project during working hours, PPEs like gloves, masks, boots, caps, earplugs, safety clothing etc. are available and provided to workers to protect at workplace.

Table 2-2: Types of PPEs used during construction activities

Protection	Occupational Hazards	PPEs
Head Protection	Falling objects, inadequate height clearance, and overhead power cords	Helmets with or without electrical protection

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Hand protection	Hazardous material, cuts or lacerations, vibrations, extreme temperatures	Synthetic or Rubber gloves, leather, insulating material etc
Eye and face protection	Flying particles, molten metal, liquid chemicals, gases or vapors, light radiation	Glasses, shield protective, etc
Hearing protection	Noise, ultra sound	Hearing protectors like ear plugs, ear muffs
Respiratory protection	Dust, fogs, fumes, gases, smokes, vapors, oxygen deficiency	Facemasks or air supply
Body protection	Extreme temperatures, hazardous materials, biological agents, cutting and laceration	Aprons, insulating clothing etc of appropriate materials

2.15.5 Safety signs/Safety boards

At any workplace Safety signs and symbols are very important to avoid many accidents. They must be in easy and understandable language to all the workers. Workers should have the knowledge of sign wordings and they must be trained and aware about them. Safety signs, symbols and boards must be provided by every department to protect the workers and employees from the risks of hazards that has not been controlled by other means. Safety signs and boards give safety message and they must be of different colors that workers could understand their meanings easily. At the subject project, safety signs and boards are placed to avoid the workers and staff from any risk.

CHAPTER # 03

3. CONSIDERATION OF ALTERNATIVES

3.1 Site alternatives:

To fulfill the commercial aspects of the project under reference of this EIA Report, it is to be sited at a place where commercial processing activity is either already going on or there are bright prospects of the same. Concurrently, it must also meet the legal requirements of the Punjab Environmental Protection Act, 1997 (Amended 2012). Availability of land at the best convenient place is equally important among other considerations for the site selection. Availability of access roads, communication facilities, electricity, basic infrastructure, sewerage etc. is yet the other necessary requirements.

The selected site is best suitable site for the proposed project because the flow of traffic is very high in peak hours. For the proper traffic management, the proponent has decided the proposed construction of project.

3.2 Technology Alternatives:

The proposed development will be constructed using modern, locally and internationally accepted technology and materials to achieve public health, safety, security and environmental aesthetic requirements. Equipment that saves energy will be given first priority without compromising on cost or availability factors. M/s DHA is an Environmental conscious company which intends to use modern and state of art machinery with minimum impacts on Environment.

3.3 Environmental alternative

The project is the construction of underpass at Grade U-Turn along Shabir Sharif Road Avenue-3 Phase-VI, DHA, Lahore. The project does not have any environmental impacts during operation. The project will improve the traffic flow and reduce the vehicular emissions caused during traffic jam. The only impacts will be during construction phase that are momentary and reversible. The project proponent is recommended to make sure that emission produced during the construction are within the PEQS limits.

3.4 Economic Alternatives

The project is economically favorable for the proponent as it will improve the accessibility of the society for the existing dwellers and for new home owners. This will lead to increase in the sales of plot and more revenue for the proponent.

The traffic load of existing roads will also be reduced as the traffic will be divided. The maintenance cost of the existing roads will be reduced as well.

CHAPTER 4

4. DESCRIPTION OF ENVIRONMENT

This section describes the baseline conditions, which cover the existing Physical, ecological and socio-economic environment of the project as well as study area.

Data was collected by reviewing secondary source and field survey and previous similar studies for the subject project in the District Lahore.

4.1 Physical Environment/ Resources

4.1.1 Topography:

Lahore is the capital of the Pakistani province of Punjab and the second largest city in Pakistan after Karachi. The city lies along the Ravi River, situated approximately 25 kilometers (16 mi) from the Wagah border crossing and is 32 kilometers (20 mi) from the Indian city of Amritsar.

Figure 4-1: Map of Lahore District wise



4.1.2 Soils:

These are river transported deposits (alluvium), which are quite thick and fairly homogeneous in extent. The top soil consists of brown, soft to firm clayey silt / silty clay having slight plasticity and contents of dissolved salts. The top layer is likely to extend

about 3 to 6 meter below natural ground, where it is underlain by silty fine sand/fine sand. This layer generally continues to deeper depths. These layers of silty clay and sandy gravel may also exist below 10 meter depth.

4.1.3 Climate:

This report describes the typical weather at the Allama Iqbal International Airport (Lahore, Pakistan) weather station over the course of an average year. It is based on the historical records from **1992 to 2012**. Earlier records are either unavailable or unreliable.

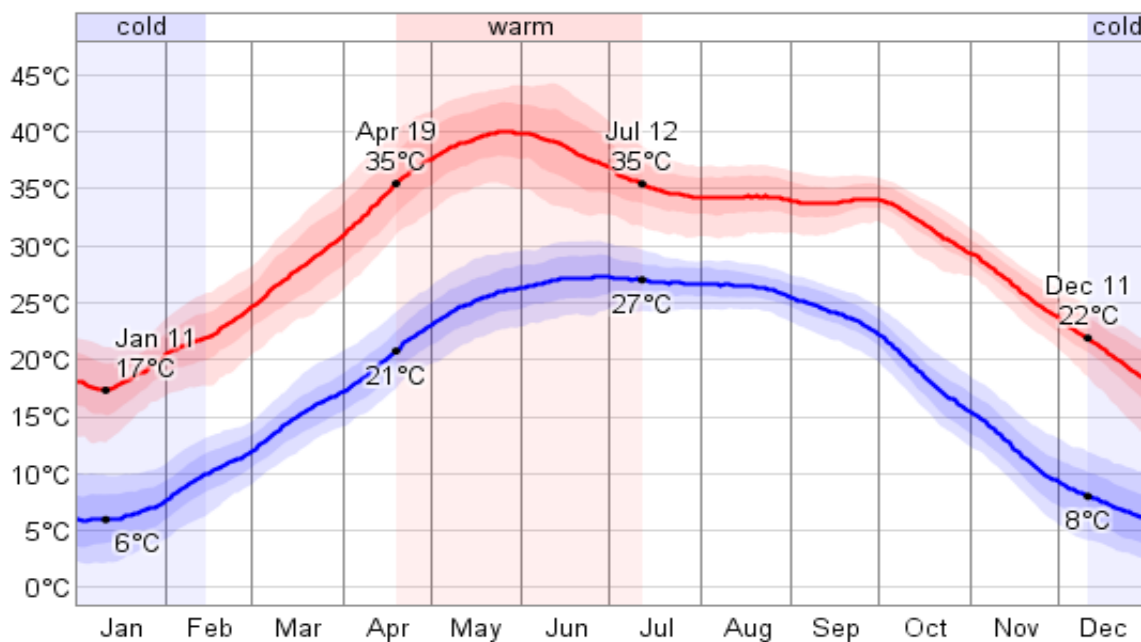
Lahore has a hot semi-arid steppe climate. The area within 40 km of this station is covered by croplands (95%) and built-up areas (3%).

Reference source: <https://weatherspark.com/averages/32865/Lahore-Punjab-Pakistan>

4.1.4 Temperature

Over the course of a year, the temperature typically varies from 6°C to 40°C and is rarely below 2°C or above 44°C.

Figure 4-2: Daily High and Low Temperature



The daily average low (blue) and high (red) temperature with percentile bands (inner band from 25th to 75th percentile, outer band from 10th to 90th percentile)

The **warm season** lasts from April 19 to July 12 with an average daily high temperature above 35°C. The hottest day of the year is May 26, with an average high of 40°C and low of 26°C.

The **cold season** lasts from December 11 to February 14 with an average daily high temperature below 22°C. The coldest day of the year is January 4, with an average low of 6°C and high of 18°C.

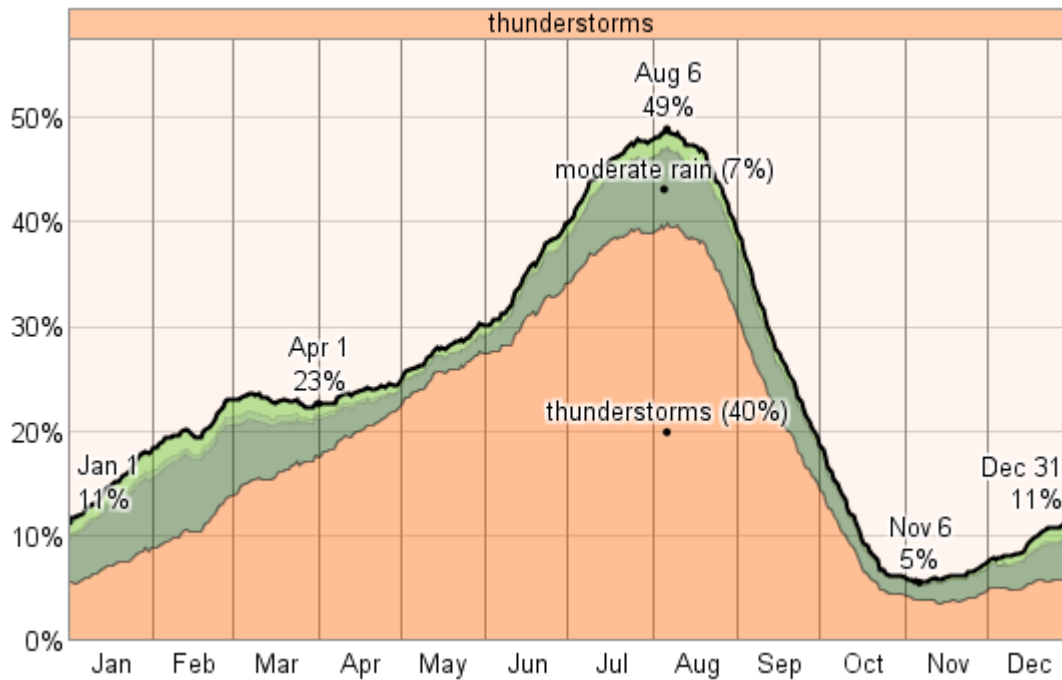
4.1.5 Precipitation

The probability that precipitation has been observed at this location varies throughout the year. Precipitation is most likely around August 6, occurring in 49% of days. Precipitation is least likely around November 6, occurring in 5% of days.

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Figure 4-3: Probability of Precipitation at Some Point in the Day



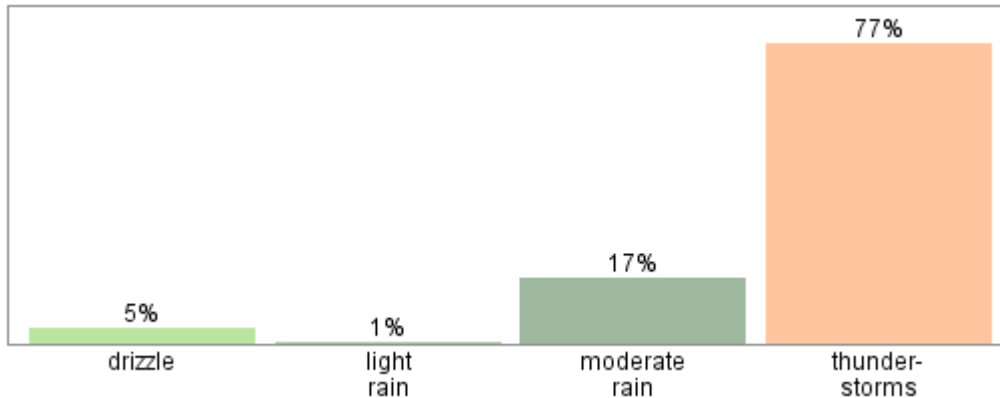
The fraction of days in which various types of precipitation are observed. If more than one type of precipitation is reported in a given day, the more severe precipitation is counted. For example, if light rain is observed in the same day as a thunderstorm, that day counts towards the thunderstorm totals. The order of severity is from the top down in this graph, with the most severe at the bottom.

Over the entire year, the most common forms of precipitation are thunderstorms and moderate rain.

Thunderstorms are the most severe precipitation observed during 77% of those days with precipitation. They are most likely around August 6, when it is observed during 40% of all days.

Moderate rain is the most severe precipitation observed during 17% of those days with precipitation. It is most likely around August 5, when it is observed during 7% of all days.

Figure 4-4: Types of Precipitation throughout the Year



Relative frequency of various types of precipitation over the course of a typical year

Figure 4-5: Warm Season Precipitation

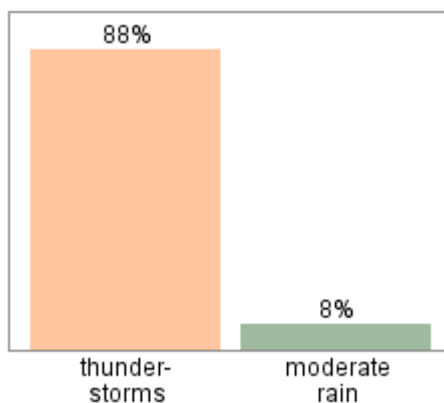
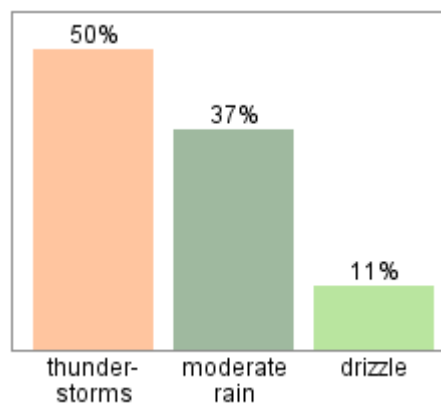


Figure 4-6: Cold Season Precipitation



Relative frequency of various types of precipitation during the warm and cold seasons respectively

4.1.6 Wind

Over the course of the year typical wind speeds vary from 0 m/s to 6 m/s (calm to moderate breeze), rarely exceeding 11 m/s (strong breeze).

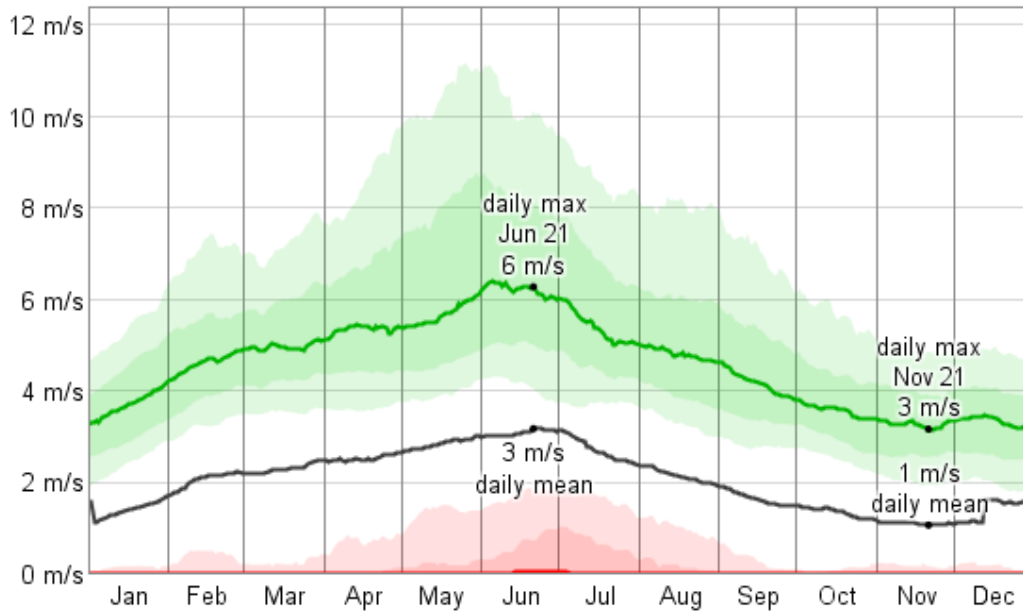
The *highest* average wind speed of 3 m/s (light breeze) occurs around June 21, at which time the average daily maximum wind speed is 6 m/s (moderate breeze).

The *lowest* average wind speed of 1 m/s (light air) occurs around November 21, at which time the average daily maximum wind speed is 3 m/s (light breeze).

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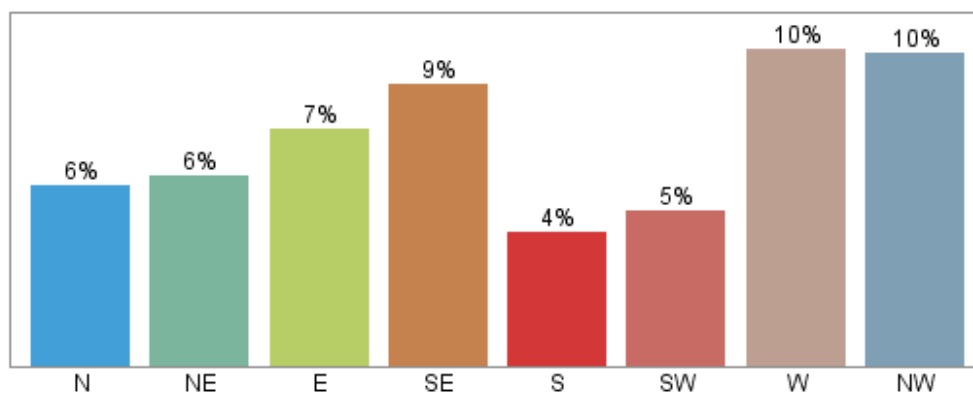
Figure 4-7: Wind Speed



The average daily minimum (red), maximum (green), and average (black) wind speed with percentile bands (inner band from 25th to 75th percentile, outer band from 10th to 90th percentile).

The wind direction is highly variable and is not predominantly from any single direction. The wind is least often out of the south (4% of the time) and south west (5% of the time).

Figure 4-8: Wind Directions over the Entire Year



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The fraction of time spent with the wind blowing from the various directions over the entire year. Values do not sum to 100% because the wind direction is undefined when the wind speed is zero.

4.1.7 Ambient Air Quality:

The project is located in urban area of District Lahore. The major sources of air pollution in the area are surrounding commercial activities and transportation or vehicular traffic.

To record the baseline ambient air quality of the project area, monitoring was conducted at advised locations to assess the concentration of priority pollutants (Carbon monoxide, Nitrogen dioxide, Sulphur dioxide and PM₁₀) in the air.

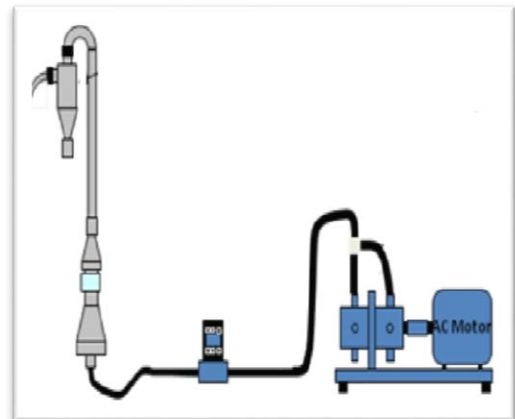


Instruments used for monitoring Ambient Air Quality.

Ambient air monitoring was conducted by using Lamotte Kit.

4.1.7.1 Particulate Matter (PM₁₀)

For PM₁₀ mini volume air sampler was used. In PM₁₀ Sampler air is drawn into the omnidirectional inlet head at a flow rate of 20 LPM. The air is then accelerated toward the first impaction stage where particulate with aerodynamic diameters greater than 10 µm are collected (filtered out). The air stream, carrying particulate 10 microns and smaller, continues down the inlet toward the second impaction stage where particles larger than 2.5 microns are collected. Finally, particulate 2.5mm and smaller continue down the inlet where they are collected on a 46.2 mm diameter, ring supported filter media disc.



4.1.7.2 Lab results for Ambient Air Quality

Laboratory analysis results are annexed (Annexure-D)

4.1.8 Noise Level Monitoring:

Basic Environmental conditions:

During the measurement following conditions were prevailed on workplace

Metrological Conditions:

During the noise level monitoring weather was dry and sky was clear. Air was blowing at normal speed

4.1.8.1 Monitoring Instrument:

The description of the instrument used for the noise level monitoring is given below:

Name: Digital sound level meter

Model: AR824

Company: Intel Instruments plus

Features:

- ✓ +/-1.5 dB accuracy with 0.1 dB resolution
- ✓ A&C weighting
- ✓ Four Measurement Level Ranges
- ✓ Overall range: 30-130 dB
- ✓ Frequency Range: 31.5 Hz to 8 kHz
- ✓ AC and DC output
- ✓ Record Max values over time
- ✓ Over range indication
- ✓ Auto power off and Max Hold functions
- ✓ Utilizes 0.5"(12.7mm) condenser microphone



Calibration:

Self-calibration time: 10 sec (every turn on)

Specification:

- ✓ Display: Large 5 Digit LCD
- ✓ Resolution: 0.1 dB
- ✓ Overall Range: 30 to 130 dB "A", 35 to 130 dB "C"
- ✓ Sound Level Ranges: 30-80 dB, 50-100 dB, 60-110 dB, 80-130 dB
- ✓ Basic Accuracy: +/-1.5 dB
- ✓ Time Weighting: Fast or Slow
- ✓ Sampling Frequency: 2/sec

4.1.8.2 Methodology adopted:

Noise level measurements were carried out in a way that monitoring round was completed in one go.

4.1.8.3 Sources of Noise Pollution

Major sources of noise generation are commercial activities and vehicular traffic along the main road and within the market. Noise levels were monitored within and outside of boundary walls of the project site.

4.1.8.4 Lab Results for Noise level

Laboratory analysis are attached as Annexure-D

4.1.9 Water Quality:

4.1.9.1 Ground water:

Underground water is available and its quality is good at higher depths. Local population use WASA water supply for drinking purposes and other activities as well.

4.1.9.2 Wastewater:

Wastewater from the nearby areas is collected in drains through pipe lines. Proper sewerage system is available in the area and managed by WASA.

4.2 Demographics:

4.2.1 Population

According to the 1998 census, Lahore's population was 6,318,745. Mid-2006 government estimates put the population at somewhere around 10 million, which makes it the second largest city in Pakistan, after Karachi. It is considered to be one of the 30 largest cities of the world.

4.2.2 Language

Punjabi is the native language of the province and is the most widely spoken language in Lahore. Punjabi is the primary means of communication in both the city and adjoining peri urban areas. Punjabi has no official status in Lahore and some Punjabi activists has raised demands for recognition of Punjabi. English has become increasingly popular with educated and younger people due to its official status in government and preferred language status for business. Many Punjabi speakers in Lahore are known as *Majha Dialect of Punjabi*. According to the 1998 census, 86.2% or 6,896,000 of the population are Punjabis; 10.2% or 816,000 are Urdu speakers and the Seraikis, at 0.4%, number about 32,000.

4.3 Ecological Resources

4.3.1 Fisheries:

The project area is almost free from any commercial fishing activity. There are no lakes, even natural water ponds in the vicinity. Therefore, Fishery or any worth mentioning aquatic biology in this area is out of question.

4.3.2 Biodiversity:

Natural capital of a country mainly includes all of the country's wilderness areas and scenic landscapes, including also with their associated flora and fauna. Pakistan has a total of nine major ecological zones. The contribution of the "Natural Capital" is recognized at three distinct levels: species, genera, and communities (habitat and ecosystem) both collectively and within each level, the range or variety of the resources are referred to as the "Biological Diversity". The term has relevance for each of Pakistan's administrative units district, province, and particularly country. The more the number of

species, genera, and habitats and ecosystems present within these units, the greater is said to be the Biodiversity. The biodiversity of the area, with this background, is discussed as under.

4.3.3 Flora:

Common trees of Lahore include:

- *Alstonia scholaris* - locally termed ditabark - native to South Asia
- *Bombax malabaricum*- locally termed sunbalor silk cotton tree - native to the Himalayas
- *Callistemon citrinus* - locally termed bottle brush - native to Australia
- *Dalbergia sissoo* - locally termed shisham - native to South Asia
- *Delonix regia* - locally termed gulmohar - native to Madagascar
- *Erythrina suberosa* - locally termed coral or gul nister - native to Burma
- *Ficus benghalensis* - locally termed banyan - native to Bangladesh
- *Ficus religiosa* - locally termed pipal - native to South Asia
- *Ficus retusa* - locally termed bobari - native to Malaysia
- *Kigelia pinnata* - locally termed gul-e-fanoos or sausage - native to Africa
- *Livistona chinensis* - locally termed bottle palm - native to China
- *Mangifera indica* - locally termed aam - native to South Asia
- *Mimusops elengi* - locally termed molseri - native to South Asia
- *Pongamia pinnata* - locally termed sukh chayn or Indian beech - native to Himalayas
- *Syzygium cumini* - locally termed jamu - native to South Asia
- *Ziziphus zizyphus* - locally termed jujube - native to Himalayas

Project site is free of any type of densely populated floral species or vegetation. Few and scattered amount of vegetation include shrubs and grasses are present otherwise land is clear and plain.

4.3.4 Fauna:

Lahore Zoo is the main preserver of Lahore's fauna. The Changa Manga forest near Lahore is a hotspot for wildlife in Punjab. Wildlife within the borders of the plantation includes

small remnant populations of nilgai, hog deer, wild boar and possibly axis deer. Jackal and Asiatic wild cat can be found there as well. Jallo Park is also a public recreation and wildlife site located in Lahore District, Punjab, Pakistan. It is one of the three main wildlife parks located in Lahore, the other two being Changa Manga and Lahore Zoo Safari. It includes the species of Common pheasant, Indian peafowl, Asian Black Bear, Bactrian camel, Chital etc. There is no any fauna in the selected site except cats, dogs, some reptiles etc.

4.4 Rare or endangered species:

There are no game reserves or protected lands/areas or endangered or rare species either in the area in the range of 5km from the project site.

4.5 Social and Cultural Study

4.5.1 Education:

Lahore is known as Pakistan's education capital, with more colleges and universities than any other city in the country. Lahore is Pakistan's largest producer of professionals in the fields of science, technology, IT, engineering, medicine, nuclear sciences, pharmacology, telecommunication, biotechnology and microelectronics. Most of the reputable universities are public, but in recent years there has also been an upsurge in the number of private universities. The current literacy rate of Lahore is 74%. Lahore hosts some of Pakistan's oldest educational institutes: Government College Lahore (now Government College University), established in 1864; Forman Christian College, a chartered university established in 1864; University of the Punjab, established in 1882; Kinnaird College, established in 1913; and University of Engineering and Technology, Lahore (UET Lahore), established in 1921. UET is also Pakistan's oldest technical degree-awarding institute and its first university in the field of engineering and technology.

Lahore's institutes in the fields of computer science, IT, and engineering include the National University of Computer and Emerging Sciences (NUCES or FAST-NU) and Punjab University College of Information Technology. Notable architecture schools include Beaconhouse National University, COMSATS Institute of Information Technology, University of South Asia, National College of Arts and University of Engineering and Technology, Lahore. Notable business schools include the Lahore University of

Management Sciences (LUMS), Lahore School of Economics, Forman Christian College, and University of Management and Technology. University of Education, established in 2002, is Pakistan's first specialized university in the field of education.

Lahore also provides education in many fields of health sciences. Notable medical colleges offering MBBS degrees include Allama Iqbal Medical College, Fatima Jinnah Medical College, King Edward Medical University, Lahore Medical and Dental College, Services Institute of Medical Sciences, Shaikh Khalifa Bin Zayed Al-Nahyan Medical and Dental College and Shalamar Medical and Dental College. Important postgraduate institutes are Punjab Institute of Cardiology and University of Health Sciences, Lahore. University of Veterinary and Animal Sciences is the only college in Lahore providing education in the field of veterinary medicine. De'Montmorency College of Dentistry is an important college of dentistry. There are many institutes offering education in fields of nursing and pharmacy as well.

Notable schools include Aitchison College, St. Anthony's College, Lahore College of Arts and Sciences, Lahore Grammar School and Salamat School System.

4.5.2 Culture

Lahore is referred to as the cultural heart of Pakistan as it hosts most of the arts, cuisine, festivals, music, film-making, gardening and intelligentsia of the country. The city has always been a centre for publications where 80 percent of Pakistan's books are published, and it remains the foremost centre of literary, educational and cultural activity in Pakistan. It is also an important religious centre as it is home to hundreds of temples, mosques, churches and shrines like Data Durbar Complex.

4.5.3 Recreational Resources and Development:

The project area has many recreational facilities.

4.5.4 Aesthetic Values:

Like the general trend among the citizens of area, most of the people have low awareness about environment. Even then, some people take cleanliness and neatness of the environment lightly. Some people throw municipal solid wastes (MSWs) on the streets.

Sense of personal responsibility to keep the environment clean as good citizens is even now lacking among people.

4.5.5 Archaeological and Historical Treasures:

Archaeological or historical treasures areas are Shalimar Garden, Madhu Lal Hussain Darbar, Other Darbars and old Markets & Shopping places

CHAPTER # 5

5. ENVIRONMENTAL POTENTIAL IMPACTS AND MITIGATION MEASURES

The following chapter describes the overall possible impacts of project on the physical, biological and socioeconomic environment because of construction and operation phases and mitigation measures to minimize the significance of the possible impacts up to an acceptable level. The anticipated impacts related to design, construction and operation of the project have been assessed and mitigation measures provided accordingly.

The evaluation of impacts has been carried out on the basis of developing matrix, in which impacts have been rated on the basis of their significance. For rating impacts significance following criterion has been developed;

NA – Not Available

O – Insignificant (No or minimal impact)

LA – Low Adverse (Short term, reversible or less damage to environment)

MA- Medium Adverse (Long term reversible damage to environment)

HA – High Adverse (severe irreversible adverse damage to the environment)

LB – Low Beneficial (Short term benefits or less beneficial to the environment)

MB – Medium Beneficial (Long term benefits to environment)

HB – High Beneficial (Continuous benefits to environment)

Table 4-1: Environmental Impact Matrix – underpass construction

	Physical Environment							Biological Environment		Socio-Economic Environment									
Environmental Component \ Project	Topography & Drainage	Soil Quality	Landscape	Surface water	Ground water quality	Air quality	Noise	Flora	Fauna	Agricultural	Health & Safety	Disruption of Public	Employment	Population	Disturbance	Social Disorder	Cultural Values	Traffic Management	
Construction camps, Workshops etc.	O	O	LA	LA	O	LA	O	O	O	LA	LA	O	B	LA	LA	O	LA		
Excavation Operations	O	MA	MA	MA	O	LA	MA	O	O	LA	LA	O	B	LA	O	O	LA		
Transportation of construction material	O	O	O	LA	O	LA	MA	O	LA	LA	MA	LA	B	LA	O	O	LA		
Open storage of construction materials, fuels etc.	O	LA	MA	MA	LA	LA	O	O	LA	O	MA	O	B	LA	O	O	LA		
Earthwork operations	O	MA	MA	LA	O	LA	MA	O	O	O	MA	MA	B	LA	LA	O	LA		
Operations of Concrete batching plants	O	MA	MA	O	O	MA	MA	O	O	O	MA	O	B	O	LA	O	LA		
Operation of asphalt plants	O	LA	LA	O	O	MA	MA	O	O	O	MA	O	B	O	LA	O	O		

Crushing operations	O	LA	LA	MA	O	HA	HA	O	O	LA	MA	O	B	LA	LA	O	LA
Use of generators	O	LA	LA	LA	LA	MA	M A	O	O	O	HA	O	B	LA	LA	O	LA
Construction of embankments	LA	LA	LA	LA	O	LA	LA	O	O	O	MA	LA	B	LA	O	O	LA

Legend:

O=Negligible/No impacts

B=Beneficial

LA=Low Adverse

MA=Medium Adverse

HA=High Adverse

The mitigation measures to reduce the impacts on geology, topography, water resources and soil are as follow:

5.1 General Measures

- Thick vegetation clearing is minimized and felling of trees has been avoided.
- Unnecessary clearing of vegetation is strictly prohibited.
- Dozers are not being used to minimize drop damage.
- The movement of machinery is restricted to the work corridor.
- Construction machinery is not left unattended
- Impose speed limits to avoid accidents
- Loading & unloading of the construction materials must be done in less rush hours
- Project supervisor must take care for the problems of nearby residents & workers
- Timings for the working are managed during less rush hours
- All necessary measures have been taken to avoid pollution during execution phase of the subject project.

5.2 Rapid Environmental Assessment Procedure

In order to give correct categorization to the present project Rapid Environmental Assessment Procedure was followed. It revealed that there are no adverse impacts of the project although it has many positive impacts on health & safety and environment. Only a few and moderate/minor impacts are projected. According to Pakistan Environmental Assessment Procedures, 1997 and in the light of Section 12 of Punjab Environmental Protection Act 1997 (Amended 2012), there is requirement of carrying out EIA Study.

5.3 Screening and Categorization

5.3.1 Screening

It is the first step of the environmental study. It identifies the factors that may influence the project environments. Level of the assessment is also determined.

5.3.2 Categorization

Categorization of the project is done as per Pak EPA, Review of IEE and EIA Regulations, 2000. Accordingly, the project falls in Schedule II for which an EIA level study is needed.

5.4 Consultations with Public and Stakeholders

5.4.1 Consultations

Scoping sessions, focused group discussion and way side consultations were held with the relevant stakeholders, shopkeepers and workers in the area. These included local government departments, NGOs, public representatives and local residents. The purpose of such consultations is to obtain the feedback from the relevant persons.

5.4.2 Concerns of Stakeholders

During these discussions the participants gave their candid views about the environmental issues and their potential impacts. There was unanimous positive view about the construction of underpass. However, they opined that mitigating measures need to be taken to minimize the environmental degradation and ward off an untoward incident/accident. Some of their main concerns are given below:

- The wastes/ silt will not be thrown in the local canals/drains.
- The wastes will not be spread along the road
- The locals will be consulted during every phase of the project.
- Some health facilities will be provided to the workers of the project.
- The project will not cause environmental degradation in any shape.

5.5 ENVIRONMENTAL IMPACTS DUE TO PROJECT LOCATION:

If the project proponent maintains HSE conditions and comply with the PEQS limits than, there will not be any significant impacts of the project on the environment.

If the mitigation measures are effectively implemented, the residual impact of the Subject project activities on the area's geophysical environment is expected to be insignificant.

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Impact significance: Low to moderate

Nature of impact: Direct

Duration: Long-term

Timing: Construction & Operation phase

Reversibility: NA

Likelihood: Low

Consequences: Mild or may be positive

Mitigation Measures

- Location can be considered as the positive impacts due to improvement of accessibility for the people living in DHA phase VI and IX.
- The project will also have positive socioeconomic impacts because of provision of jobs to the local residents of the area.
- The issue of congestion of traffic would be reduced as this road project will provide an alternative route

5.6 ENVIRONMENTAL IMPACTS DUE TO THE PROJECT DESIGN

Area for parking, Septic tank and solid waste management will be present in design of building. Firefighting plan, health & safety plan, tree plantation plan, emergency response plan will be the part of unit.

Following are the major Environmental impacts due to the development related to the design:

- Low utilization of available space
- Soil structure and soil bearing capacity
- I
- Low social acceptability & functionality of design

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Impact significance: moderate to high

Nature of impact: direct

Duration: Long-term

Timing: Designing Phase

Reversibility: NA

Likelihood: moderate to high

Consequences: moderate to high

5.6.1 Mitigation measures and recommendations

Following are the mitigation measures and recommendations to minimize the anticipated impacts:

- Structure stability of the building should be ensured.
- Design should be professional which accommodate the maximum space and has high social acceptability & functionality.

5.7 ENVIRONMENTAL ISSUES DURING EXECUTION OF CONSTRUCTION OF UNDERPASS PROCESS:

This section deals with the environmental impacts and its mitigation measures during the design phase. Presently project is at preconstruction and its alignment has been finalized by complete survey of the area (Topography of the area is described in chapter#04: Description of the Environment). This survey is followed by the environmental & socio economic survey for the collection of baseline data.

5.7.1 Topography:

The project has not changed the topography of the area as it is not a new construction; it is only a rehabilitation of the existing road. The infrastructure of the area is to be maintained after the construction activities end.

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Mitigation measures:

The project design included measures to maintain the project landscape that matched the pre project natural green features achievable through extensive plantation. Project activities have been executed in a way that they did not harm naturally available resources. The Drawing of Map & Underpass technical specifications are attached as Annexure-B.

Residual Impact:

The residual impact of project activities on the topography of the area is insignificant.

The residual effects are summarized below:

Nature of impact: Indirect

Timing: Construction & Operation Phase

Duration: Nil

Likelihood: Nil as project is not involved any new construction

Consequences: Nil

Impact significance: Not significant

5.7.2 Land Acquisition Resettlement:

One of the major impacts includes acquisition of land from the land owners and the resulting displacement of their families and disturbances in the livelihood of the affected persons (AP) in the project area. But present project does not involve in any type of land acquisition and resettlement activity.

5.7.3 Changes in Land Use:

The current land use is mainly agricultural cum residential. Project is expected to increase land use value particularly near the main road creating new economic and employment opportunities for locals. But it may cause noise and accidents because of more number of vehicles.

Mitigation measures:

The impact of increase in traffic has been minimized by placing safety signs and cautions. Speed limits are defined for the present road so it may not cause noise or accidents.

5.7.4 Physical & Cultural Impacts:

Solid waste management:

Potential Impact:

Proper solid waste management system is necessary for the prompt, timely and efficient disposal of solid waste for the reduction of its impacts. Impacts due to solid waste are to be temporary and minor in nature.

Mitigation measures:

- solid waste disposal sites has been planned with reasonable distance from the human settlements
- A minimum distance of 1 km has been maintained between the solid waste disposal site and nearest human settlement
- guidelines for the safe handling, storage & disposal has been devised & developed

5.8 Air Quality Potential Impact:

Air emissions from project-related activities are likely to include:

- Dust due to construction activities.
- Dust raised on dirt tracks by project-related vehicles.
- Dust from excavation
- Particulate matter from construction material storage areas
- Combustion products (nitrogen oxides, sulfur dioxide, particulate matter, carbon monoxide, and volatile organic compounds) from engine to generate electric power
- Combustion products from vehicles used for project-related activities

Assessment of Impact

1) Dust Emissions:

Dust emissions caused by vehicular traffic on dirt track are an important concern, primarily when such traffic passes near community settlements. It is not uncommon to see a huge cloud of dust following vehicles traveling on unpaved roads. Where these roads are paved, the problem is usually not as serious. The exception is when two vehicles coming from opposite directions cross on a single-lane paved road two to three meters wide. In such situations, usually one or both the vehicles are partially forced off the paved surface, producing dust emissions since the road willer is generally unpaved.

Dust emissions cause the amount of particulate matter in the air to increase, and thus become a health concern. Dust clouds also reduce road visibility, creating a traffic hazard.

2) Gaseous Emissions:

Exhaust from Vehicles and Construction Machinery:

Emissions produced by vehicles and equipment are similar to those produced by generators in terms of the resulting pollutants (SO₂, NO_x, PM, etc.). However, the extents to which they are produced were considerably lower, since much smaller engines are used in vehicles and construction machinery.

Mitigation Measures

None of the potential effects discussed above has exceeded acceptable limits.

The mitigation measures given below further reduced their impact, and ensured that they remain within acceptable limits.

- Water was sprinkled on the raw material storage site minimized the dust pollution.

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- All equipment, generators, and vehicles used during the project has been properly tuned and maintained in good working condition in order to minimize exhaust emissions.
- Vehicle speed has been reduced on track passing through or close to settlements.
- Speed limits have been imposed and encouraged more efficient journey, management reduced the dust emissions produced by vehicular traffic. Water was sprinkled where necessary to contain dust emissions.

Residual Impact:

After implementing the mitigation measures listed above, the residual impact of the project activities on ambient air quality was insignificant, as shown below:

Nature of impact: Direct

Duration: Short term

Timing: construction & operation

Reversibility: Not applicable

Likelihood: Low (unlikely) as mitigation measures ensured that air pollution remains within acceptable limits.

Consequences: Mild, as pollutant levels in the ambient air were well within acceptable limits.

Impact significance: Low, based upon low likelihood and mild to moderate consequence.

5.8.1 Impact on Biological Environment

Natural Vegetation

Potential Issue:

Project activities that may affect the area's natural vegetation include the construction of access roads and clearing of vegetation for the project site.

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Assessment of Impact:

A significant impact has been interpreted if unnecessary or excessive removal and burning of plants for fuel wood is observed. The vegetation of the area is facing increasing pressure from live-stock. Signs of habitat degradation caused low rain fall and by grazing are visible. Woody species are being exploited for fuel and fodder purposes. No rare, sensitive or vulnerable species are recorded or reported in the project area. Most of the plants present in the area have the properties to grow in more than one habitat and have populations large enough to ensure their genetic diversity. The removal of a small portion of vegetation is not likely to harm the overall diversity of plant communities and the genetic diversity of species.

Mitigation Measures:

The following mitigation measures were implemented to reduce any adverse impact on vegetation:

- The clearing of vegetation along project site were minimized as far as possible.
- Dense vegetation and tree cutting was avoided.
- Unnecessary damage to vegetation was strictly avoided.

Residual Impact:

Given the current state of the vegetation, and proper implementation of the mitigation measures, there is no significant residual impact on the natural vegetation of the, as shown below:

Nature of impact: Direct

Duration: Short-to medium-term

Timing: Construction & Operation phase

Reversibility: Possible

Likelihood: Low (unlikely), as the mitigation measures ensured that vegetation clearing is minimized

Consequences: Mild, as no rare plant species are present in the areas.

Impact significance: Low, based upon low likelihood and mild consequence

5.8.2 Impact on Social and Cultural Environment

Impact Assessment

Following parameters were adapted to assess' social and cultural impacts.

Community Well-being Parameters:

Parameters for the assessment of the well-being of the poor people near the project site were used to assess the social, economic, and cultural impacts of the project.

Primary Health: Health indicators, such as infant mortality rates, access to community health services (public and private), and the general life expectancy in a region represent the state of general well-being of a certain community. Health is also closely correlated with labor productivity and efficiency. Improving the overall health of a community enhances its income-earning potential.

Primary Education: Education is also directly related to income-level; the higher the income level, the more likely the presence of educational facilities. People below the poverty line, on the other hand, are less likely to have access to education. In general, education strengthens human and social capital and enhances gender equality. In the long run, access to education is instrumental in enhancing the level of awareness that provides the intellectual tools to analyze evaluate and adapt to new situation with exit opportunities. It gives empowerment, increased political participation, and reduced birthrates, addressing the long-term needs of an entire community and particularly its women.

Availability of Drinking Water: Water supply system by WASA is used for drinking and sanitary purposes. Availability of fresh water for these purposes is important for the

wellbeing of the primary stakeholders i.e., the villagers in the project area. The effect of project on the area's water resources is important in measuring the impact of the project on the socioeconomic environment of the area.

Land Use: land in project area is used for agriculture cum residential.

Employment: Employment is largely restricted to the urban centers

Gender Equity: Gender equity, or the lack of it, reflects women's access to and control of natural resources, public health, and education services, their participation in decision-making and political processes, and their ownership of productive assets in comparison with men.

Residual Impact:

Project has provided jobs to local community thus there was improvement in all above mention parameters.

5.8.3 Community Health and Safety

Health:

People from the project area regularly travel to other cities, and thus cannot be considered isolated from the rest of the country. They are regularly exposed to illnesses common to urban populations, and have similar levels of immunity. The management conducted medical examinations before being hired, and was screened for communicable diseases. The project was therefore very unlikely to lead to an epidemic of any sort among local communities.

Safety:

Project activities could become a hazard as it is near residential area where local people, especially children, are likely to gather around to watch the activity. The other safety issue is that of traffic, especially along access roads close to settlements. To reduce the hazards, the following mitigation measures have been implemented:

- Local people were informed in advance when work is about to start in an area. This may result in people keeping young children away from work areas.
- Machinery was never left unattended.
- Safe driving practices were adopted, particularly while passing through settlements.

5.9 Environmental issues during operation phase

The project has positive environmental impacts as this underpass will have the environmental impacts such as vehicular emissions due to traffic congestion.

5.10. Potential Environmental Enhancement Measures

Following necessary measures should be adopted during operational phase of the project and most of them are being adopted:

- Sprinkling of water will be done on dusty roads and tracks.
- Machinery should never be left unattended.
- Efforts should also be made to discuss traffic conditions so that regular traffic is not disturbed. Transporters engaged for the project would be forced to adhere to the load specifications of the access road. No overloading should be allowed in any case.
- Machinery will be kept maintained.
- Waste water will be treated through septic tanks that were installed within the premises of the subject project.
- Proper SOPs are being followed with proper schedule along with the HSE conditions.
- A proper tree plantation plan will be formulated to save the environment.
- Solid waste will be handed over to local contractors.
- Noise will be controlled by adopting proper measures.
- PPEs will be provided to workers during working.
- Hygienic conditions will be ensured and proper quality will be maintained by quality control testing.

CHAPTER # 6

6 ENVIRONMENTAL MONITORING & MANAGEMENT PLAN

6.1 Aim of Monitoring

The aim of monitoring is to oversee the environmental performance of the project through its lifecycle enforcing the PEQS. Timely implementation of mitigation measures leads to sustainable environmental management of the project.

6.2 Objectives of Monitoring

Salient objectives of the environmental monitoring program are as under:

- To ensure effective surveillance of the environmental parameters at various stages of the project development
- To enable the management, undertake the required mitigation measures when needed
- To ensure compliance with the PEQS and legal obligations

6.3 Environmental Monitoring Plan

- The monitoring was carried out in accordance with PEQS.
- Monitoring program was undertaken for compliance of mitigation measures.
- Monitoring for various parameters would be done during construction of underpass as per direction from EPA.

6.4 Performance Indicators

The performance indicators / parameters having significant impact on physical, biological and socio-economic environments were evaluated. These are given below:

- Ambient Air Quality

PM₁₀, CO, NO_x, and SO₂

- Water Quality

TDS, TSS, COD, oil and grease, chloride, lead, zinc and cadmium

- Noise Levels
- Tree plantation

6.5 Management Approach regarding Monitoring program:

The overall responsibility for compliance with the environmental management plan rests with the project proponent and contractor.

A certain degree of redundancy is inevitable across all management levels, but this is in order to ensure that compliance with the environmental management plan is crosschecked.

6.6 Purpose and Objectives of the EMP:

Environmental management plan was designed to improve the environmental conditions, health and safety and provide the mitigation measures for further improvements.

The primary objectives of the EMP were to:

- Facilitate the implementation of the mitigation measures identified in the EMP.
- Define the responsibilities of the project proponent.
- Define a monitoring mechanism and identify monitoring parameters in order to:
 - a) Ensure the complete implementation of all mitigation measures
 - b) Ensure the effectiveness of the mitigation measures
- Provide a mechanism for taking timely action in the face of unanticipated environmental situations
- Identify training requirements at various levels.

6.7 Management Approach regarding EMP:

The overall responsibility for compliance with the environmental management plan rests with the project proponent.

A certain degree of redundancy is inevitable across all management levels, but this is in order to ensure that compliance with the environmental management plan is crosschecked.

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Table 6-1: Environmental Management Plan

<i>Sr. No.</i>	<i>Impacts from the project Activities</i>	<i>Impacts</i>	<i>Mitigation Measures</i>	<i>Responsibility</i>
Construction Stage				
1.	Disturbance to the people	Minimum disturbance to everyday life of people	Inform residents of the area about detail of work, likely disturbances, and their duration and to whom they should address their complaints. Establishing good community relationship so that any disruption can be resolved with due consideration of community.	Construction Contractors (CC), Environment specialist & Safe guard officer
2.	Surface and ground water contamination	surface and ground water contamination from oil leakage of construction machinery & generators	Proper arrangement for collection of oil base products. Oil storage was done on paved area	CC

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			For Oil change of vehicle & generators isolated areas were designated	
3.	Dust	Air Pollution	Construction activities causing dust were not carried out on excessively windy days. To cover stockpiles of excavated material with tarpaulins. It is recommended to provide masks to the workers. Minimize exhaust emissions from Construction machinery, vehicles and generators. Regular Sprinkling of water on road to minimize dust emissions Air quality monitoring has been conducted for baseline study and lab results are attached. (Annexure-D)	CC
5.	Noise	Noise Pollution	Confining noisy work to normal working hours in the day.	CC

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			Provide ear muffs and plugs to the workers. Noise level monitoring has been carried out for baseline study and lab results are attached. (Annexure-D)	
6.	Soil Erosion / Surface Run-off	Aesthetic degradation	There was no activity causing soil erosion Stockpiles was not formed within such distances behind excavated or natural slopes that would reduce the stability of the slopes Contractor of the site has arranged to monitor and adjust working and adopt suitable measures to minimize soil erosion during the construction period.	CC

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7.	Decommission and Waste Management	Degradation in Aesthetic and social acceptance	Used oil and lubricants were recovered and reused or removed from the site in full compliance with the national and local regulations.	
8.	Traffic control	Traffic jams and congestion may take place and cause inconvenience to the people where the construction take place	Efforts was made to accommodate the traffic along the road as far as practically possible; Provision of signboards directing the drivers about the diversion; Movement of vehicles carrying construction material was restricted in day timings;	CC, District officer Road

6.8 Environmental Action Plan

The Environmental Action Plan provided the framework for the implementation of mitigating measures and environmental management and monitoring during the execution of road rehabilitation project. This document detail all commitments made in the EIA Report and can be used as a reference document to ensure all environmental protection measures are implemented.

6.9 Responsibility of EMP

Overall responsibility for implementation of EMP was that of HSE/contractor. He acted as Environmental Manager. He was assisted by supervisor of project and In-charge Administration. Project Manager was responsible report to Project Proponent in all respects. He made liaison with all stakeholders and EPA Punjab.

6.10 Proposed EMP monitoring and reviewing procedures

It was in the fitness of the things to operate this project under the Environmental Management Plan (EMP). The EMP ensured that even all type of pollutants from project was within the prescribed limiting values of the PEQS. Thus the environment and human health around the project has been safeguarded.

Regular monitoring of all the significant environmental issues is essential to check the compliance status of EMP. The main objective of the monitoring was;

- To verify the results of the environmental study with respects to the project.
- To estimate the trends of concentrated values of the issues, which have been identified as critical and then planning the mitigating measures.
- To assess the efficiency of pollution control mechanism.
- To ensure that any additional parameters, other than those identified in the EIA Report, do not turn critical after the commissioning of project.

6.11 Training Schedule

Training for the management and workers on environmental aspects of the project will be arranged during the construction phase of the project.

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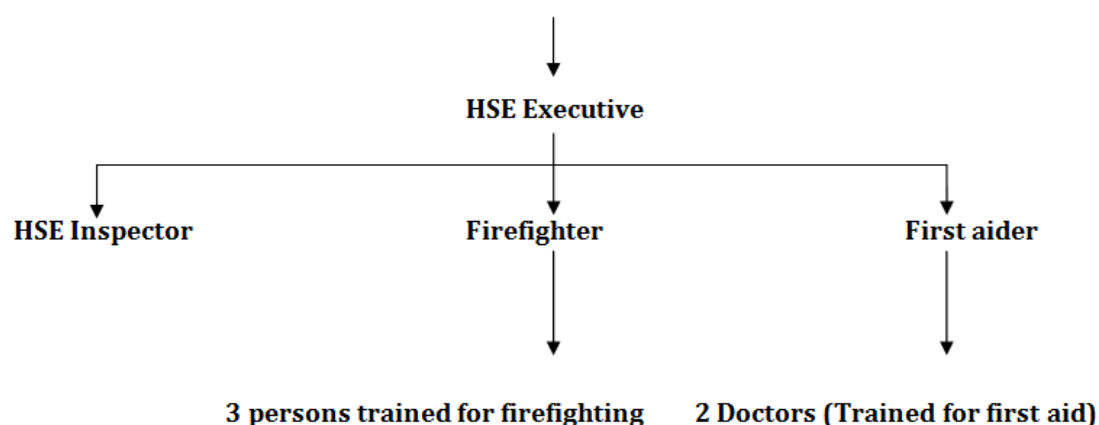


Figure 8: Institutional Capacity for the Implementation of EMP

Management of DHA will be hiring or appointing HSE officer. HSE officer will be responsible for conducting the training of the labor, which will be organized either by the management. Following schedules of training will be implemented:

Table 7: Training Programs

Sr. No.	Description of program	Labor/ Personnel involved	Time/ duration
1)	General HSE Training	Trainers and whole labor	Quarterly for 1 hour
2)	Instrument use/ workplace specific items	Trainers and whole labor	Quarterly for 1 hour
3)	PPEs use and safe work practices at work site.	Trainers and whole labor	Quarterly for 1 hour
4)	Reporting and investigating accidents/ incidents	Trainers and whole labor	Quarterly for 1 hour
5)	Emergency procedures	Trainers and whole labor	Quarterly for 1 hour
6)	Medical and first aid	Trainers and whole labor	Quarterly for 1 hour
7)	Health and safety promotion	Trainers and whole labor	Quarterly for 1 hour

In order to raise the level of professional and managerial staff, there is a need to upgrade their knowledge in the related areas. HSE/Project Manager should play a key role in this respect and arrange the training programs. HSE/Project Manager will provide training to staff and workers about the best environmental management practices. The training modules will include air, noise and water pollution monitoring, social awareness, Environmental Laws, Punjab Environmental Quality Standards (PEQS), Usage of personal protection equipment's, and health and safety related issues on the Project site.

The HSE/Project Manager will train all workers & staff in basic sanitation and health care issues (e.g., how to avoid malaria and transmission of Sexually Transmitted Infections (STI) HIV/AIDS and in general health and safety matters, and on the specific hazards of their work. Training should also consist of basic hazard awareness, site specific hazards, safe work practices, and emergency procedures for fire, evacuation.

HSE/Project Manager will be conducted Training on quarterly basis regarding health & safety, hygiene, firefighting and first aid

CHAPTER # 07

7 STAKEHOLDERS PARTICIPATION

This section deals with the social acceptability of the project and the area. Consultation with the stakeholders is a tool for managing two-way communication between the project proponent and the affected public. Its goal is to improve decision making and build understanding by actively involving individuals, groups and organizations, which have stake in the project. This involvement increases project's long term viability and enhances its benefits to locally affected people and other stakeholders.

In order to evaluate the socioeconomic and environmental impacts, filed surveys are extremely essential. In addition to the surveys at the preliminary stage, consultation with the community and their active participation plays a vital role in successful implementation of the project. To identify the different types of stakeholders and ascertain their perceptions about the project, an initial environmental examination was conducted. Informal group discussions were also held as an additional tool for obtaining feedback from the stakeholders that are being discussed in the following pages.

7.1 Objectives of Consultation

Public consultation plays a vital role in studying the effects of the project on the stakeholders and in the successful implementation and execution of the subject project. Public involvement is a compulsory feature of environmental assessment, which leads to better and more acceptable decision making. The objective of the consultation with stakeholders is to help 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 construction of the road.

The important general objectives of the consultation process are:

- Information dissemination, education and liaison;
- Identification of problems and needs;
- Collaborative problem solving;
- Reaction, comment and feedback on project;
- Documenting mitigation measures proposed by the stakeholders;

7.2 Methodology of consultation:

The IEE team carried out public consultations at various locations around the Project Site. The stakeholder's consultation during this phase of the work targeted the project area, administrative and private offices, Govt. offices, shops, etc. near the Project area:

- Selection of the stakeholders for consultation, reconnaissance of the project site and initial discussions with the neighboring factory workers, residents, shopkeepers, drivers etc.
- Environmental consultants and social specialists and documenting the opinions of the stakeholders expressed during the meetings etc.

7.3 Proponent

Possible impacts and mitigation measures related to the subject project were discussed with the project proponent and management. They assured to take all suggested mitigation measures to control any discrepancy arose by the project and to make the project environmental friendly.

7.4 The Responsible Authority

Management of the subject project is the responsible authority to take all measures prior to the activity.

7.5 Other Departments and Agencies

For the impact analysis detailed meetings were held with the management of the subject project, local community, education institutes, health institutes, hospital and NGOs. Issues were discussed that may affect the environment and also the implementation of proposed project. All possible mitigation measures were considered and incorporated in the Environmental Management Plan.

Scoping sessions, focused group discussion and way side consultations were held with the relevant stakeholders in the area. The purpose of such consultations is to obtain the feedback from the relevant persons.

7.6 Environmental Practitioners and Experts

Team of M/s Pak Green visited the project site, had discussions with stakeholders and consulted with the workers of the existing unit and nearby people to evaluate the project socio-economic impacts. People provide the massive information about the project and have positive remarks regarding the project development.

7.7 Affected & Wider Community

There is no affected community present in the radius of our study area. PGEE team has consulted with the inhabitants along the project site. They provided positive remarks regarding the subject project and in the favor of the subject activity for the proposed housing farm house. Stakeholders participation Performa's and socioeconomic questionnaire were get filled by the inhabitants to evaluate the project socio-economic impacts. Stakeholders' participation Performa & socioeconomic questionnaire annexed in **Annexure E**.

7.8 Issues Discussed:

Following issues were discussed during the stakeholder consultation:

- Overall activities of the project;
- Possible impacts on natural vegetation, land and properties;
- Possible mitigation measures;
- Benefits of the project specifically for the local people.

7.9 Findings of the Overall Discussion:

- After the completion of the project the site will be used for transportation
- It will provide easy access to nearby area
- It will enhance the socio-economic conditions/values of the area.
- Project will increase revenue generation for the Government.
- It will create employment opportunities.
- Construction of underpass project should be completed in the designated timeframe to limit adverse impacts of construction.

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- There will be no significant additional load on the existing infrastructure i.e., utilities of water, telephone, electricity etc. due to the development of the project.

Majority of people favored the project in a sense that the construction of underpass will provide easy excess to market for local people and enhance the socioeconomic conditions and infrastructure of the area. Performa's are attached as Annexure-E.

CHAPTER # 8

8 CONCLUSION AND RECOMMENDATIONS

8.1 CONCLUSIONS

Construction of Underpass at grade U-turn along Shabir Sharif Road Avenue-3, Phase-VI, DHA, Lahore is a project of Defense Housing Authority (DHA) Lahore, to provide easy access to residence of nearby areas of Phase VI- Phase IX, DHA. It will enhance the infrastructure of the area and will be beneficial for the economy of local public.

This report has been prepared within the framework of the Punjab Environmental Protection Act 1997 (Amended 2012) and Guidelines for the preparation of Initial Environmental Examination reports”.

- The EIA study reveals that the project is economically viable, socially acceptable and environment friendly.
- It has generated additional jobs during construction
- The proponent has committed to implement the project in the environment friendly manner.
- Defense Housing Authority (DHA) Lahore intends to register the project with local Government.
- Defense Housing Authority (DHA) Lahore has prepared and implemented very comprehensive Emergency Preparedness and Response Standard Operating Procedures.

Main environmental issues are as under:

- Production of Solid Waste
- Gaseous emissions
- Generation of particulate matters
- Generation of noise

The present site meets all the requirements of a safe, spacious and clean environment.

8.2 Recommendations

- In view of the comprehensive screening process and findings of the present study there is no need of conducting further investigations.
- Solid waste must be managed properly.

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- Tree plantation is recommended after the construction complete.
- High standards of biosecurity and safety should be enforced.
- Safety of the workers should be top priority for the management.
- The project manager needs to assist the local communities as a corporate/social responsibility.

The present EIA Report is enough to meet the administrative and legal framework. Therefore, the environmental approval may be accorded for the present project.