LAHORE SMART CITY

ENVIRONMENTAL IMPACT ASSESSMENT REPORT FOR THE PROJECT NAMELY

CONSTRUCTION OF LAHORE SMART CITY INTERCHANGE BY M/S LAHORE SMART CITY

LOCATED AT

Lahore Smart City Kala Shah Kaku, Tehsil Ferozewala, District Sheikhupura

PROJECT PROPONENT: MR. MAZHAR LATIF

PREPARED BY

ASIF ALI AND ASSOCIATES (PVT) LTD

LIST OF ABBREVIATIONS

CO_2	Carbon dioxide
dB(A)	A weighted decibel scale
EIA	Environmental Impact Assessment
EMMP	Environmental Management and Monitoring Plan
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
EPD	Environmental Protection Department
EPO	Environmental Protection Ordinance
IEE	Initial Environmental Examination
Ltd.	Limited
LTI	Loss Time Injury
LWI	Loss Work Injury
m^3	Cubic meter
m^3/h	Cubic meter per hour
MW	Megawatt
M/S	Messrs
NEQS	National Environmental Quality Standards
No.	Number

NOC	No Objection Certificate
NO_x	Oxides of Nitrogen
PEPC	Pakistan Environmental Protection Council
PEPA, 1997	Pakistan Environmental Protection Act, 1997
PEPA, 2012	Punjab Environmental Protection (Amendment) Act, 2012
PEPO	Pakistan Environmental Protection Ordinance
PKR	Pakistani Rupees
PM	Particulate Matter
PPEs	Personal Protective Equipment
Pvt.	Private
SMART	Self-Monitoring and Reporting
SOPs	Standard Operating Procedures
SO_x	Oxides of Sulfur
WAPDA	Water and Power Development Authority

EXECUTIVE SUMMARY

INTRODUCTION

Lahore Smart City (LSC) is a modern, sustainable, and technology-driven housing project being developed near the Lahore Bypass, close to Kala Shah Kaku. The project is designed on the concept of a "smart city", focusing on advanced urban planning, sustainable infrastructure, digital connectivity, and eco-friendly living. With state-of-the-art facilities such as automated traffic management, smart energy systems, efficient waste management, and high-tech security, Lahore Smart City aims to redefine modern lifestyle standards in Pakistan.

Its strategic location, just minutes away from the Lahore-Islamabad Motorway (M-2) and in proximity to GT Road, makes it highly accessible. The society offers residential, commercial, and recreational zones, promising an integrated community where innovation, sustainability, and comfort blend seamlessly.

Now, Lahore Smart City (LSC) for the ease of residents and visitors has intended to construct an interchange on Lahore Eastern Bypass. For this purpose, the company has engaged Asif Ali and Associates (Pvt) Ltd to prepare Environmental Impact Assessment (EIA) Report in accordance with Punjab Environment Protection Act, 1997 (amended 2012, 2017). The company has submitted application to National Highway Authority (NHA) to get permission for construction of subject interchange.

The main objectives of this EIA are to establish baseline environmental conditions, identify potential impacts and suggest suitable mitigation measures for the execution of the said project. This study has been accomplished in line with the provisions – guidelines and directives of Punjab Environmental Protection Agency.

This executive summary presents an overview of the main findings of the EIA Report for the aforesaid project i-e Construction of Interchange Lahore Smart City

PROJECT OUTLINE (Details are given in Chapter 2)

Salient features of project:

Proponent Name:	**Mr. Mazhar Latif (Authorized Person)**
Designation	General Manager (Lahore Smart City)
Project Title:	Construction of Interchange Lahore Smart City
Project Location:	Lahore Smart City Kala Shah Kaku, Tehsil Ferozewala, District Sheikhupura

Total Area required for construction of Interchange	44 Kanals and 5 Marla
Name of Consultant Firm	M/S Asif Ali and Associates (Pvt) Ltd
Source of Water	Groundwater through Lahore Smart City
Cost of Project	PKR 1.1 Billion approx.
Nearest Receptors	Chak 42, Ferozewala (500 m) Lahore Eastern Bypass (adjacent) GT Road (300 m)
Source of Power:	WAPDA and power generators
Wastewater:	Wastewater during construction will be treated primarily before final disposal. (approval has been obtained)
Solid Waste Management:	Debris, Cement Bags, Construction Materials etc Contract with certified body will be done for safe disposal.
Air Emissions	Air emissions during construction will be controlled through water sprinkling and maintenance of machinery
Tree Plantation	At designated areas
Type of Project	Construction of interchange at Lahore eastern bypass
Details of Construction Material	• Coarse aggregates (crush) • Fine aggregates (sand) • Steel • Water • Asphalt • Reinforcement • Cement
Manpower	150-160 during construction
Time Duration of Completion of Project	8 Months

MAJOR IMPACTS AND RECOMMENDED MITIGATION MEASURES:

The construction of the proposed project will have positive and negative impacts during the construction and operational phases, for which proper mitigation measures are prepared. During the field survey,

significant efforts were made to identify the main social, cultural and environmental issues related to the construction of the proposed project. Following is the list of main issues and concerns which have been considered in the study report:

Beneficial/Positive Impacts:

- Reduced travelling time;
- Reduced the fuel consumption and transportation cost
- Create job opportunities for laborer's and semi-skilled staff during constructional phase;
- Reduced air emissions from vehicular exhaust especially in case of traffic congestion
- Easy access of residents by avoiding long route and traffic.

Negative Impacts:

Impacts	Mitigation measures
Construction phase	
Dust emissions	Most of the dust generating activities during construction will last for a brief period, when construction works will be executed. Thereafter, vehicular movement will generate most of the dusts. Dust will be suppressed using water bowser to spray exposed land surfaces and particularly areas likely to be disturbed by trucks and other vehicles during the construction of the factory premises. Vehicular speed limits of 20 km/h will be ensured in order to minimize dust generation. Further mitigation measures will be: • Covering haulage vehicles transporting aggregate, soil and cement • Covering onsite stockpiles of aggregate, cement, soil, etc. • Providing workers with the necessary Personal Protective Equipment (PPE) e.g. dust masks and ensure that they are worn • Operating well maintained vehicles and equipment

Wastewater	• Portable toilets with septic tanks will be provided to workers during construction phase
Impacts of accidental oil spillages	• The integrity of storage facilities will be ensured • Drip pans will be made available where necessary
Safety	• Safety signage will be put in relevant places within the construction site • Reckless driving by construction workers will be prohibited and monitored. • Workers will be given PPEs such as; helmets, mask, ear-plugs/muffs, safety boots, safety goggles, safety jackets, harnesses etc. and its use was strictly enforced • Workers will be trained on regular basis regarding personal safety • Incidents will be reported directly to the concerned authority
Solid waste management	• Recycling or reuse of waste wherever possible. • Application of a good strategy to collect, remove and safely dispose of waste on daily basis to ensure a clean environment in the factory site • Integrated waste management system will be adopted for the proper management of the waste at site • At the end of the each week, left-over waste will be removed as per practices of area • All the idle machinery and equipment will be immediately removed from the site • Scrap and the debris will be removed from the site at the end of the construction stage after appropriate segregation of the material

Traffic Congestion	• Alternate routes will be provided for the traffic movement. • Sign boards for traffic diversions will be placed • Alternate routes will be shared earlier with residents to avoid in disturbance. • Nighttime driving of project vehicles will be limited where possible. • Speed limits will be observed. • All vehicle drivers will be trained in community safety aspects. Drivers will be trained in responsible and safe driving practices; safe speed limits for vehicles will be followed. (detail traffic management plan is provided with annexure)
Noise Emissions	• Effective noise suppression design and plan will be made for all noise producing equipment • PPEs will be provided to workers • Proper tree plantation will be been done • Noise monitoring will be carried out periodically.
To minimize loss work injury/hazards/incidents/accidents	• Proper training will be provided for the proper usage of machineries and personal protective equipment (PPE) will be provided. It will be ensured that the individual who has received the correct training is operating a particular machine. • Site supervisor or health and safety should be present on site • Risk Assessment will be done on daily basis • OSHA polices will be implemented on site • Regulation of the health and safety polices will be done on regular basis . • Training of staff in the handling of lifting materials. • Implementation of work rotations, provision of regular work breaks.

	• At workplace, first aid facilities will be maintained at readily accessible places.
SMOG Control	• Burning of waste will be avoided and waste will be removed periodically. • Training on SMOG awareness will be provided to workers so that the rules might be implemented. • Road construction will lead to air pollution, sprinkling of water will be done. • The machinery used during process will be regularly maintained. • High quality fuel will be used in plant machinery. • Air emission equipments will be equipped with emission control technologies i-e catalytic converters etc and it will be the responsibility of contractor to regularly check and report the fitness certificates of equipments • As tree plantation plan has been proposed in this project, tree plantation will not only be done alongside the road • Plantation alongside canal will be done. • Plantation drives at Schools and Colleges will be done as per directions of Assistant Commissioner • Designing highways to reduce congestion and therefore reduce vehicle emissions will eventually reduce the air pollution.
Batching and Asphalt Plant	• Material preparation plants will be regularly optimized. • Asphalt plant will be equipped with air emission control technology. • Regular testing of asphalt plant will be done by EPA certified body. • High quality fuel/ generator will be used to run the machinery.

ENVIRONMENTAL MANAGEMENT & MONITORING PLANS:

During construction, ambient air quality for dust level in particular noise level (tests), solid waste management and soil contamination, and community and workers' safety (visual) need to be monitored. During operation, stack emissions, noise level, air quality, wastewater quality and workers' safety will be monitored. Plan has been included in **Chapter-7** of this EIA Report.

CONCLUSION & RECOMMENDATION

It can be concluded that all the major and minor adverse environmental impacts from the Construction of Interchange Lahore Smart City has been mitigated in environmental friendly manner and the Environmental Impact Assessment is being done in the light of guidelines recommended by Punjab EPA. Hence Environmental Approval may be accorded to the subject project for construction phase.

Recommendations:

Following Recommendations are suggested:

- All the workers should be given with proper PPE's during operation phase
- EMP should be properly implemented.
- Regular inspection of site for HSE, Environment and other regulations should be done.
- The construction and installation should be completed in guidelines of accorded Environmental Approval.

LIST OF ANNEXURE

Following Documents are attached as annexure.

ANNEXURE I:	PROPONENT CNC
ANNEXURE II:	PROPERTY DOCUMENTS
ANNEXURE III:	LAYOUT MAP/ ALIGNMNET PLAN
ANNEXURE IV:	ENVIRONMENTAL MONITORING REPORTS
ANNEXURE V:	GLOSSARY
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INTRODUCTION

CHAPTER 1: INTRODUCTION

1.1 GENERAL

Lahore Smart City (LSC) is a modern, sustainable, and technology-driven housing project being developed near the Lahore Bypass, close to Kala Shah Kaku. The project is designed on the concept of a "smart city", focusing on advanced urban planning, sustainable infrastructure, digital connectivity, and eco-friendly living. With state-of-the-art facilities such as automated traffic management, smart energy systems, efficient waste management, and high-tech security, Lahore Smart City aims to redefine modern lifestyle standards in Pakistan.

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Now Lahore Smart City (LSC) for the ease of residents and visitors has intended to construct an interchange on Lahore Eastern Bypass. For this purpose, the company has engaged Asif Ali and Associates (Pvt) Ltd to prepare Environmental Impact Assessment (EIA) Report in accordance with Punjab Environment Protection Act, 1997 (amended 2012, 2017). The company has submitted application to National Highway Authority (NHA) to get permission for construction of subject interchange

This Report presents the Environmental Impact Assessment (EIA) for aforesaid unit. The purpose of this study is to identify the environmental baseline i.e. physical, biological and socio-economic/cultural conditions and assess all possible impacts arising during the construction and operation phase of the project with the aim to find out appropriate measures for their mitigation, to either eliminate those impacts or to bring them to acceptable level and formulate Environmental Management Plan (EMP) for implementation of the project in environment-friendly manner.

The report provides relevant information, as required under the officially approved format, to facilitate the decision makers i.e. EPA Punjab for the issuance of Environmental Approval.

1.2 THE PROPONENT

Name	Mr. Mazhar Latif
CNIC	32303-0682597-3
Designation	General Manager (Lahore Smart City)
Address	Valencia Housing Society, House No 27, Block H Lahore, Lahore City, District Lahore
Email Address	info@lahoresmartcitypk.com
Contact Number	0306-3784848

1.3 THE PROJECT

1.3.1 Nature of Project

The said project is the Construction of Interchange Lahore Smart City Its salient features have been described later in this Chapter, Chapter 3 and briefly in Executive Summary of this EIA Report.

1.3.2 Project Layout

The instant project will be the construction of interchange by Lahore Smart City at Lahore Eastern Bypass. The geographical coordinates of construction of interchange are

1.3.3 Size of Project

The total area of interchange construction will be 44 kanals and 5 marla, the land which will be covered in this interchange is owned by management of Lahore Smart City.

Key features of the project road are given below:

Location	**Punjab**
No. of lanes	2-Lanes
Carriageway Width	7.3 m (Loop)
Design Speed	40 km/hr

1.3.4 Location of Project

Said Project is located at Lahore Smart City Kala Shah Kaku, Tehsil Ferozewala, District Sheikhupura.

Figure 1.1 Location of Housing Scheme where Interchange will be constructed

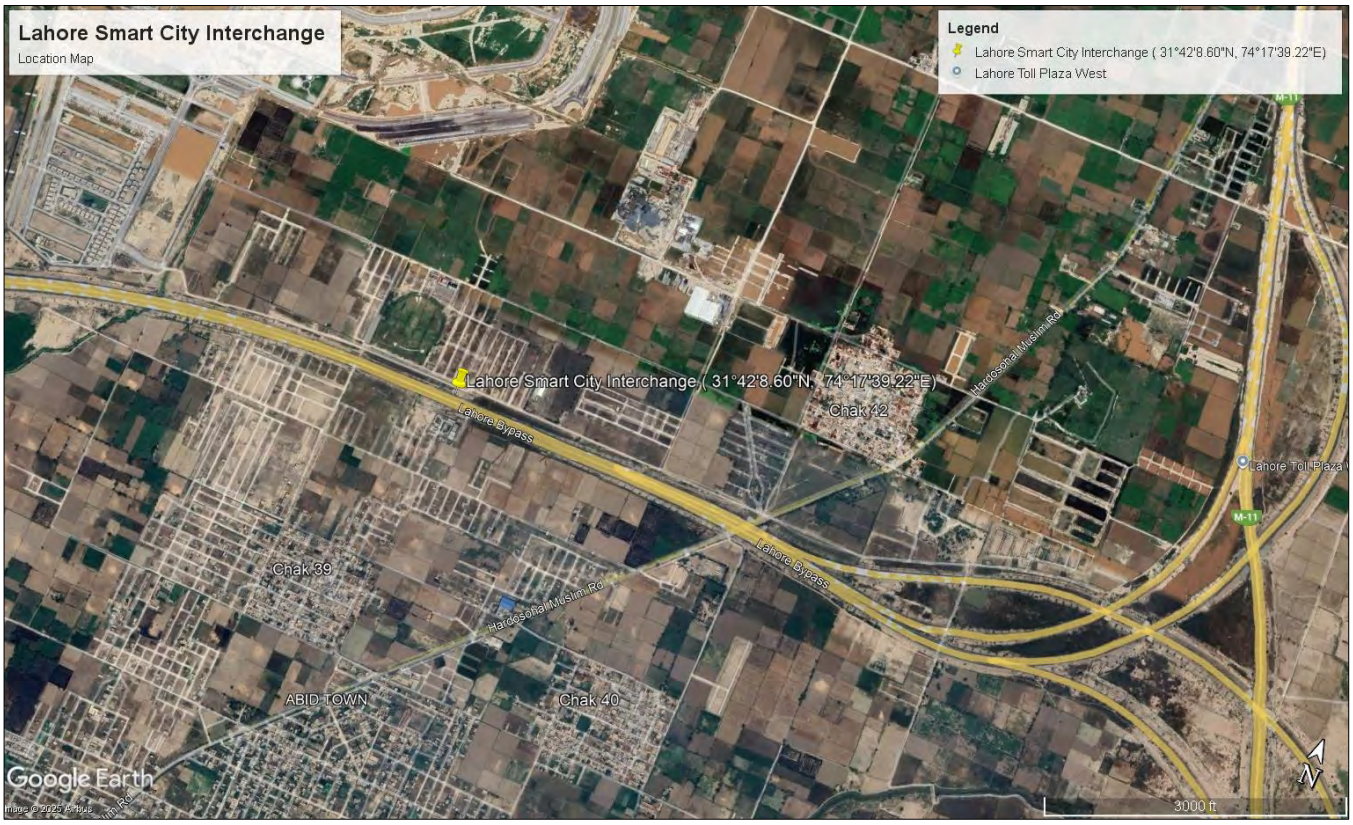

Figure 1.2 Location Map of the Interchange

1.3.5 Total area

Total area required for said project is approx. 44 Kanals and 5 Marla.

1.3.6 Cost of the Project

Cost of project has been estimated at Approx. PKR 1.1 Billion

1.4 DETAILS OF CONSULTANTS

1.5 DETAILS OF CONSULTANTS

M/S Asif Ali and Associates (Pvt) Ltd has been awarded this project's responsibility to acquire Environmental Approval from EPA, Punjab. Team comprising of environmental engineers, chemical engineers, environmental experts and environmentalists has worked on this report.

Contact Details:

Table 1.1 Contact Details of Consultant

Company Name	M/s Asif Ali & Associates (Pvt.) Ltd.
Address	139, G-Block, First Floor, Commercial Area, Phase 1, Defence Housing Authority, Lahore
Contact No.	Tel: 042-35690824-5

Study Team

A multidisciplinary team was formulated to conduct the EIA study. The team comprised the following professionals:

Table 1.2 List of Experts

Sr. No	Name	Company Designation	Role during the Project
1.	Usman Riaz	Director / Team Leader	Project Lead
2.	Dr. Kiran Farhan	Senior Environmentalist	Report Writing
3.	Salman Akhtar	Senior Environment Engineer	Report Review
4.	Muhammad Maaz	Environmental Engineer	Report Writing
5.	Hassan Tariq	Environmentalist	Data Collection
6.	Muhammad Hamza	Sociologist	Baseline Data Collection and Social Survey

1.6 PURPOSE OF REPORT

The development of any Project leads to positive and adverse changes in environmental and change in social settings of the Project Area. The intensity and level of change, however, depends upon the nature of the Project and the baseline environmental conditions of the area. The development and commencement of said project will cause minor to moderate adverse environmental and social impacts

on the surrounding area. Thus, an environmental and social study is mandatory to establish the baseline conditions, evaluate the possible adverse impacts if any, and devise the mitigation measures.

Section 12 of Pakistan Environmental Protection Act, 1997 (PEPA, 1997) states ***"No proponent of a project shall commence construction or operation unless he has filed with the Provincial Agency an Initial Environmental Examination (IEE) and, where the project is likely to cause an adverse environmental effect, an Environmental Impact Assessment (EIA), and has obtained approval from the Provincial Agency in respect thereof."*** Later on, Punjab Environmental Protection Agency (Review of IEE and EIA) Regulations, 2022 provided the guidelines for categorizing the Projects. The main objectives of this EIA study were:

- To determine and document the state of the environment of the project area to establish a baseline in order to assess the suitability of the said project in that area.
- To identify pre-construction, construction and operation activities and to assess their impacts on environment.
- Provide assistance to the proponent for planning, designing and implementing the project in a way that would strengthen environment, improve ecological resilience, eliminate or minimize the negative impact on the biophysical and socio-economic environment and maximizing the benefits to all parties in cost effective manner.
- To present Mitigation and Monitoring Plan to smoothly implement the suggested mitigation measures and supervise their efficiency and effectiveness.
- To provide opportunity to the public for understanding the project and its impacts on the community and their environment in the context of sustainable development.
- Prepare an EIA Report for submittal to the Environmental Protection Agency, Punjab for according Environmental Approval.

1.7 Structure of Report

This EIA reviews information on existing environmental attributes of the Study Area. Geological, hydrological and ecological features, air quality, noise, water quality, soils, social and economic aspects and cultural resources are included. The report predicts the probable impacts on the environment due to the said project. This EIA also proposes various environmental management measures. Details of all

background environmental quality, environmental impact/pollutant generating activities, pollution sources, predicted environmental quality and related aspects have been provided in this report. The structure of the assessment report will be as follow;

Section l: **Introduction** briefly presents the project background, objectives, methodology and need of the EIA study.

Section 2: **Screening and Scoping** comprise screening about category of project and study of alternatives.

Section 3: **Description of the Project** furnishes information about the location of the proposed Project, cost and size of the project, its major components and alternatives considered for the proposed project to select at the preferred alternative for detailed environmental assessment.

Section 4: **Environmental Baseline Profile** establishes baseline conditions for physical, biological and socio-economic conditions prevalent in the project area.

Section 5: **Public Consultation** identifies the main stakeholders and their concerns rose through scoping sessions, and deals with the measures to mitigate the social impacts.

Section 6: **Anticipated Environmental Impacts and Mitigation Measures** identifies, predicts and evaluates impacts of the project activities during the construction and operation stages and deals with the measures proposed to mitigate potential environmental impacts of the proposed project.

Section 7: **Environmental Management and Monitoring Plan** outlines institutional arrangements for the implementation of the proposed mitigation measures, training needs of the staff for implementation of the mitigation measures, monitoring requirements and monitoring cost.

Section 8: **Conclusions and Recommendations** provide the outcome of the study and major observations of EIA and suggestions for environmental management and pollution control.

CHAPTER 2

SCREENING & SCOPING

CHAPTER 2

SCREENING AND SCOPING

2.1 General

This section of the study concentrates on details of the project screening and scoping, and selection of alternatives. The spatial and temporal boundaries are also determined in this section of EIA.

2.2 Type and Category of Project

As per Review of Initial Environmental Examination (IEE) and Environmental Impact Assessment (EIA) Regulations, 2000 the Project of Establishment of Project fall in "**D (2)" Category of Schedule II i-e Highways, Motorways, Expressways or major roads**

2.3 Objectives of Project

Following are the main objectives of said interchange:

1. Reduced travelling time;
2. Reduced the fuel consumption and transportation cost
3. Create job opportunities for laborers and semi-skilled staff during constructional phase
4. Smooth Traffic flow
5. Direct access from eastern bypass to the Housing Scheme.

2.4 Alternatives

The analysis of the alternatives is a part of the EIA process to select the best among all possible project options. The alternatives of a project are defined as the options that can help to meet the objectives of a project by different means including alternative project sites, Environmental alternative etc. The key criteria when identifying alternatives is that they should be feasible and reasonable.

Selection of preferred alternative is based on scores of factors including cost, schedule of delivery, environmental and social impact and the cost for their redressal. The drivers that affect potential alternative options and scenarios include: availability of project sites, current technologies; design changes that need to be introduced, operational situation, capital & recurrent costs, environmental & social issues, their potential impacts, and costs of mitigation.

The details of the site alternatives and project alternatives are discussed below

2.4.1 Site Alternatives

No other site alternative was available to be considered as feasible option for the construction of interchange as proposed project site is owned by the M/S Smart City and is well connected to Lahore Eastern Bypass The proposed site was selected because of the following reasons;

- The selected site is closest to Lahore Eastern Bypass
- The selected site will make way to direct reach to the housing scheme through Lahore Eastern Bypass
- The site will be well connected to the other parts of the country through Lahore Eastern Bypass
- No human settlements displacement or relocation is associated with the project development and operation.

No important religious, archaeological, recreational site or ecologically/declared protected area and human settlement exists within close proximity of the selected site. In view of these facts, it can be concluded that the selected site is best suited for the project, and will not pose any adverse impact or threat on any component of the environment.

2.4.2 Project Alternative

2.4.2.1 Labor

Cheap labor has always been the backbone of the economy of Pakistan. Cheap and ample supply of labor strengthens the industrial and agriculture sector of the country. There are approximately 7 upstream and 6,000 downstream production units in the country which provide employment directly and indirectly to ~ 600,000 people. Of the downstream units, only 700 belong to the organized sector while the remaining 5,300 units operate in the unorganized sector. Also, this project will emphasize to hire local labors as many as possible increasing the occupational status of the area.

Considering the above-mentioned factors, no project alternative can be envisaged.

2.4.3 Environmental alternatives

No environmental sensitive area falls near the project site. The project will be constructed on the land owned by the management and there is no ecological sensitive, forest area or any other area present in

close proximity of the project. Also, the project will help in reducing the travelling time of the residents reducing the consumption of fuel as well.

CHAPTER 3
DESCRIPTION OF PROJECT

CHAPTER 3: DESCRIPTION OF PROJECT

This section of the study concentrates on details of the project and its salient features; such as its location, objective, site layout, cost and magnitude of operation at various phases and process employed for the subject process.

3.1 Particulars of Project Site

Details of location of project are provided in table below:

Table 3: Particulars of Project Site

Particulars	Details
Latitude	31°42'8.60"N
Longitude	74°17'39.22"E
Location Address	Lahore Smart City Kala Shah Kaku, Tehsil Ferozewala, District Sheikhupura
District	Sheikhupura
Road connectivity	Lahore Eastern Bypass

3.2 Location and Layout of Project

3.2.1 Location of the Project

Project site is located at Lahore Smart City Kala Shah Kaku, Tehsil Ferozewala, District Sheikhupura. Google map is given below:

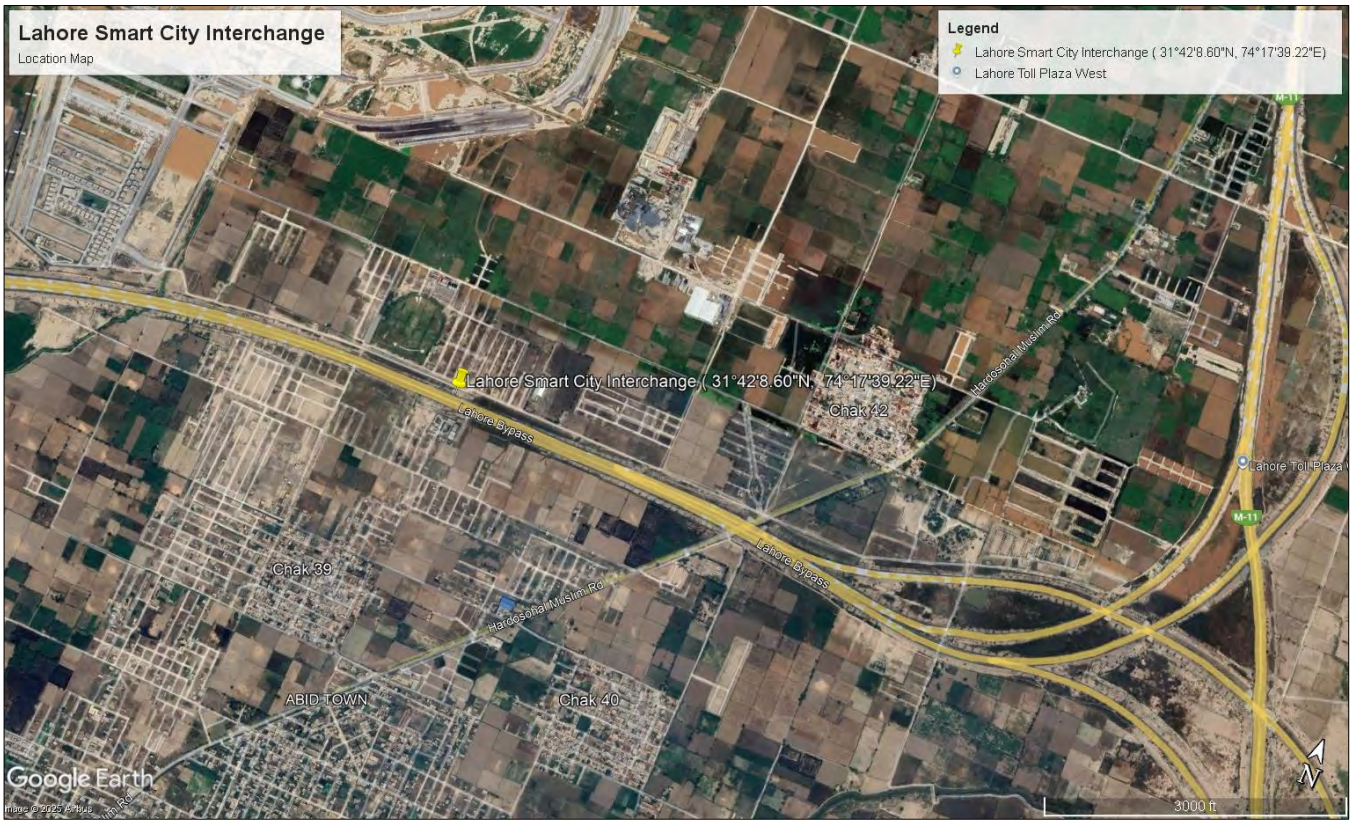

Figure 3.1 Location Map of Project Site

3.3 Nature of Area

Said area is residential in nature.

3.4 Land Ownership

The land is owned by Lahore Smart City. Copy of property documents has been attached as **Annexure II.**

3.5 Government Approvals

The management of Lahore Smart City has obtained applicable approvals. The details of NOC's obtained so far are presented below:

Table 4 Approvals obtained by the management

Sr. No	NOCs	Department	Reference
1.	Land Clearance	Lahore Development Authority (LDA)	LDA/DMP-IV/700 dated 08/04/2021
2.	Environmental Clearance	Environmental Protection Agency (EPA)	AD(EIA)/EPA/F-91(IEE)/0107/2021/329 dated 11/11/2021
3.	Flood Prone Status	Irrigation Department	1823/28-W dated 08/12/2020
4.	Wastewater Disposal	Water and Sanitation Agency (WASA)	D(PHS)/1833-35 dated 08/12/2020
5.	Landscape Plan	Parks and Horticultural Authority (PHA)	DHZ-VI/PHA/-4-21/07 dated 01/04/2021
6.	External Electrification Approval	Lahore Electric Supply Company Limited (LESCO)	14787/DRW/1968/LESCO dated 06/04/2021
7.	Gas Network Plan	Sui Northern Gas Pipelines Limited (SNGPL)	EO-BD/3441-2021 dated 17/05/2021
8.	Clearance of Land from RUDA	Ravi Urban Development Authority (RUDA)	Shm/SMBR LA/001/2020 dated 26/11/2020
9.	Clearance of Land from Assistant Commissioner	Assistant Commissioner office, Ferozewala	AC/F/786 dated 12/08/2022

3.6 **Land Use on Site**

The land use on the site will be commercial only as interchange will be constructed. There is no settlement, grassland or preserved area in the proximity of the project area that could be damaged or dismantled.

3.7 Road Access

The said Project area has road accessibility as it is accessible through Lahore Eastern Bypass and GT Road

Figure 3.2 Road Access

3.8 Vegetative Features on Site

The area around the project area is residential in nature, the vegetative features of the area include; green open fields safeda, bari, neem and kikar.

Figure 3.3 vegetation features at selected proposed site

3.9 Cost and Magnitude of Operation

Cost includes land cost, Building & Infrastructure cost, machinery cost, land scaping cost and running cost. Total cost of the project is PKR 1.1 Billion (Approx.).

3.10 Schedule of Implementation

The schedule of implementation for the commencement of the civil work involved for the installation construction and operational maintenance is approximately 08 months and the detail timeline of the construction period is given in Table below:

Description	Months							
	1	2	3	4	5	6	7	8
Excavation								
Embarkment								
Sub-Base								
Agg Base Course								
Asphalt Concrete								
Bitmounas Coating								
Concreting								

Table 5: Timeline for Project Development

3.11 **Description of the project:**

The proposed project is planned to be constructed at Lahore Eastern Bypass. Bypass starts at Kala Shah Kaku interchange, cross Kala Khatai – Narang Mandi Road, while giving access to Lahore Gateway Project, and cross River Ravi and finally meet Lahore Ring Road. Approximate length of this bypass is about 13.5 Kms. The areas in the project length through which the alignment passes is mostly consist of plains. Our Proposed interchange is towards north side at Intersection of Hardoshal road with M-2 Link Road as marked in Figure below. There is an existing KSK interchange on western side and GT Road N-5 on southern side from proposed interchange.

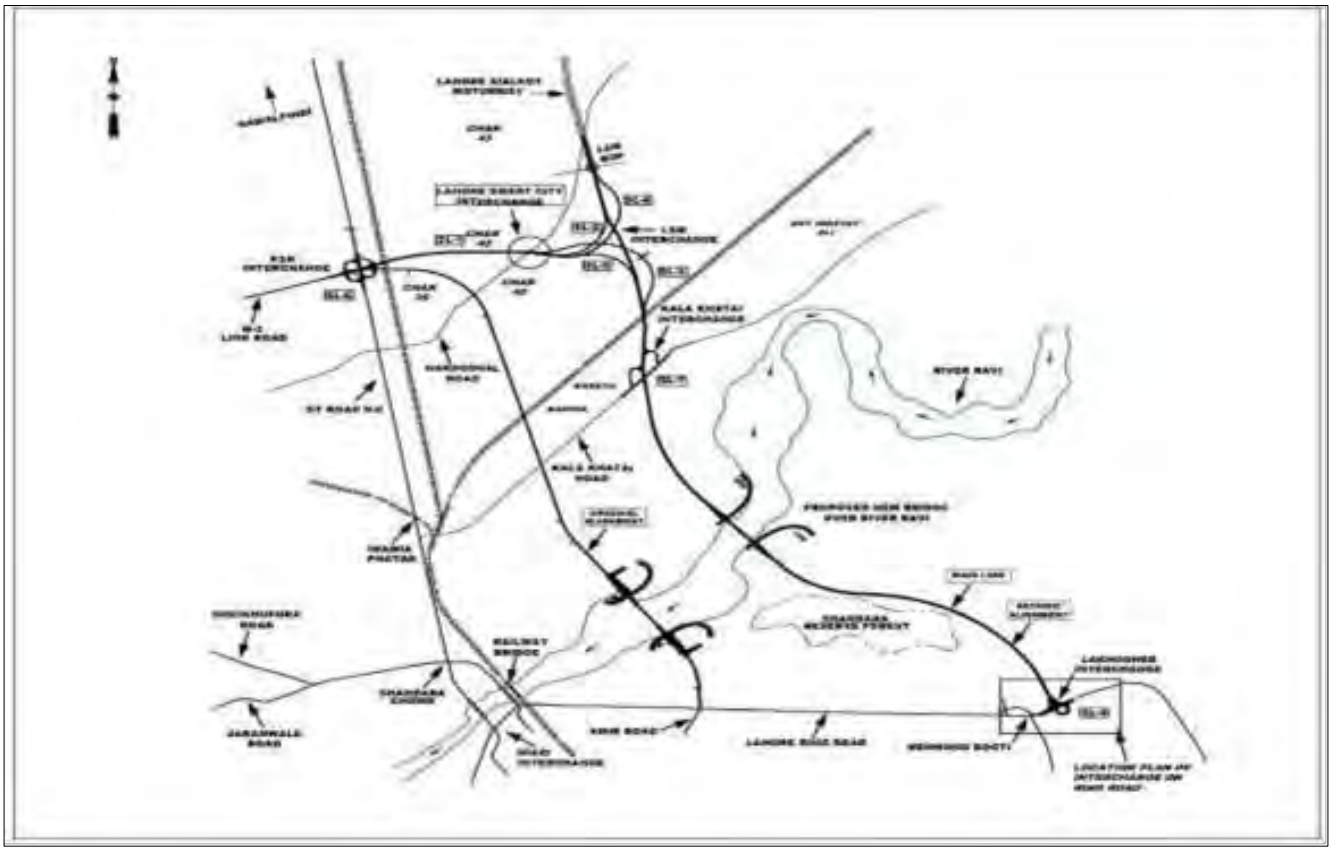

Figure 3.4 Location of Lahore Smart City Interchange

3.11.1 Design Criteria of the Interchange:

Criteria adopted for design of loops of Interchange is given as Table below:

Table 6 Design Criteria of Interchange Construction

Sr. No.	Items	Specified Min. Value
1	Road Classification	Loops of Interchange
2	Design Speed	40 km/h
3	Min Stopping Sight Distance	50 m
4	Min. Passing Sight Distance	140 m
5	Max. Rate of Super elevation	6 %
6	Horizontal Curvature	
	Absolute Min Radius	43 m
7	Road Formation Width	11.5 m

8	Width of travelled way	7.3 m
9	Width of Shoulder	3 m (outer) 1.0 m (inner)
10	Cross Slope (travelled way)	2 %
11	Cross Slope (shoulder)	4 %
12	Maximum Vertical Gradient	Up to 4 %
13	Minimum Vertical Gradient	0.3%
14	Rate of Vertical Curvature	
	i) K Value for Crest Curve	4
	ii) K Value for Sag Curve	9
15	Fill Slopes	2:1
16	Min Vertical Clearance over roadway	5.1 m
17	Min Vertical Clearance over railway (rail top)	6.1 m
18	Right of Way	50 m

3.11.2 **Geomatics of Project**

Geometric Design describes the horizontal and vertical shape of the highway and plays the most important part in the design.

In Pakistan, AASHTO standards are followed for the geometric design of highways and Interchanges especially for the following parameters:

- Typical Cross-Section
- Horizontal curve radii
- Horizontal curve lengths
- Curve Widening
- Sight Distances
- Vertical Gradients
- Vertical curve lengths
- Super-elevation.

It is very important for the designers to conform to the standards as a little mistake in the design can lead to the serious accidents and loss of precious lives. On the other hand, sometimes it becomes very difficult to follow the standards exactly in the hilly areas where certain unavoidable constraints

exist and one has to compromise on some deviations. But serious effort should be made to follow the criteria as much as one can.

3.11.3 Typical Cross Section

Typical Cross-Section ensures the cross-sectional design accommodates traffic volume and vehicle types, providing appropriate lane widths, shoulders, and clear zones for safety and efficiency.
All the X-sections for Lahore Smart City are deigned keeping in view the traffic volume. Appropriate lane widths shoulders are designed prioritizing safety and efficiency.

3.11.4 Horizontal Alignment

Horizontal Curves are one of the two important transition elements in geometric design for highways (along with Vertical Curves). A horizontal curve provides a transition between two tangent strips of roadway, allowing a vehicle to negotiate a turn at a gradual rate rather than a sharp cut. The design of the curve is dependent on the intended design speed for the roadway, as well as other factors including drainage and friction. These curves are semicircles as to provide the driver with a constant turning rate with radii determined by the laws of physics surrounding centripetal force.

PC = Point of Curvature at Beginning of Curve
PI = Point of Intersection of Tangents
PT = Point of Tangency at end of Curve
L = Length of Curve T = Tangent length Δ = Degree of Curve

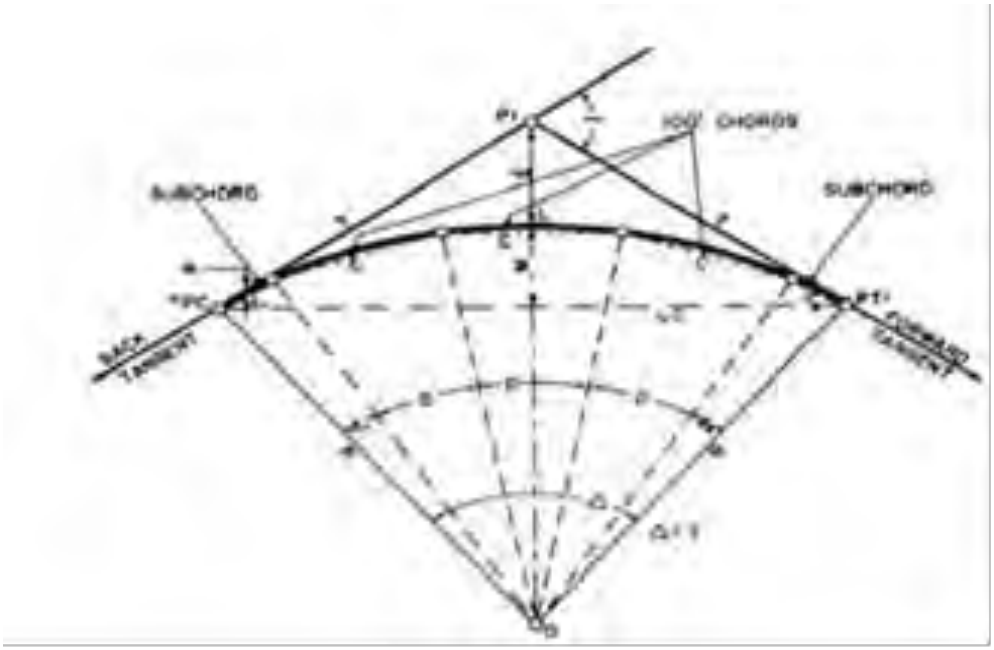

Figure 3.5 Horizontal Alignment of the interchange design

3.11.5 **Vertical Alignment**

Considering design speed, algebraic difference of gradients, Passing Sight Distance and K value vertical alignment design has been done using ROADCALC software program. Vertical Curve lengths and gradients have been adjusted. Detail of which is given for three sections separately as given below: -

Rate of vertical curvature, K is the length of curve per percent of algebraic difference in intersecting grades (A). Value of K has not been kept less than 40 because the road along with interchange will be used by trucks so it has been kept above design standard.

For quick perception of Sag & Crest Vertical Curves along with, definition of all geometric variables pertaining to these curves are narrated by the following figures: -

Crest Vertical Curve

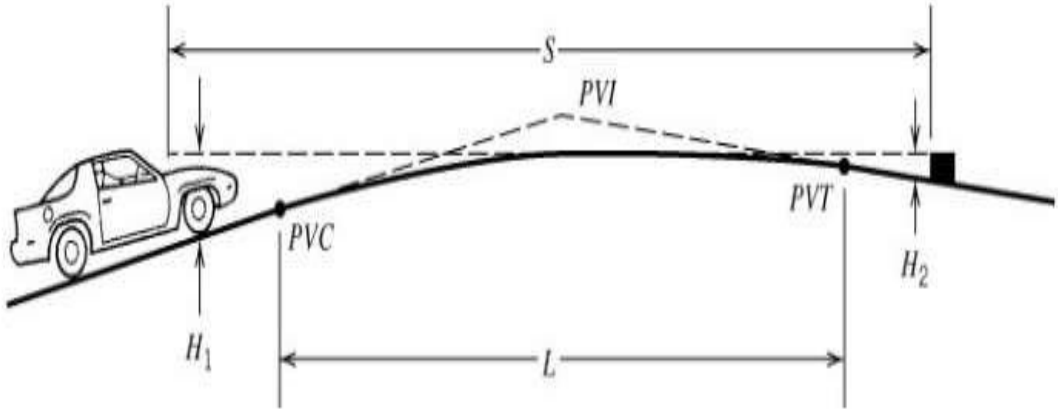

Figure 3.6 Crest Vertical Curve

Definitions:

PVI = Point of vertical intersection of tangent lines

PVC = Point of vertical curvature PVT = Point of vertical tangency L = Length of curve

G_1 = initial roadway grade in percent G_2 = final roadway grade in percent

A = absolute value of difference in grades

h_1 = Height of eye above roadway, measured in meters or feet

h_2 = Height of object above roadway, measured in meters or feet

S = Sight distance

Sag Vertical Curve

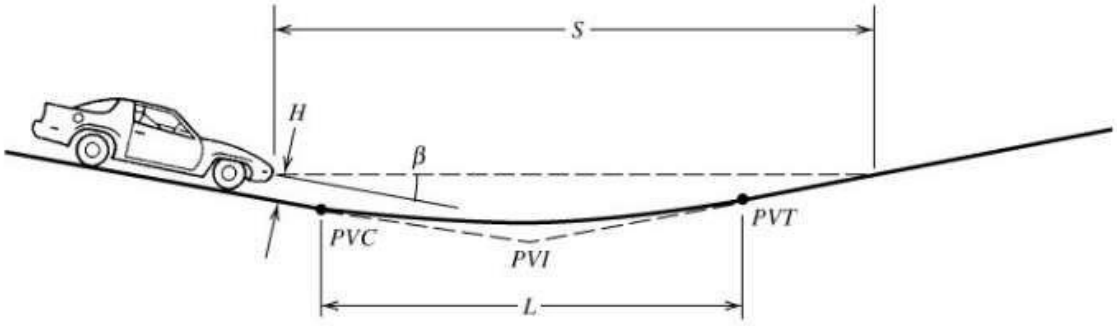

Figure 3.7 Sag Vertical Curve

Where:

H = height of headlight above road surface β = inclined

angle of headlight beam

Definition of PVI, PVC, PVT, L & S are the same as given for Crest vertical curve.

3.11.6 Vertical Curve Lengths

Vertical Curve Lengths determine the lengths of vertical curves to provide smooth transitions between different grades, enhancing comfort and minimizing abrupt changes in elevation.

According to ASHTO Design Guide 2018, the minimum lengths of vertical curves are expressed as about 0.6 times the design speed in km/h, $L_{min} = 0.6V$, where V is in kilometres per hour and L is in meters, or about three times the design speed in mph, [$L_{min} = 3V$], where V is in miles per hour and L is in feet. Criteria of Vertical Curve Lengths have been taken into account while designing of interchange.

3.11.6.1 Max K-Value Crest Vertical Curve for SSD

According to AASHTO guidelines, the recommended minimum k value for crest vertical curves is 4 for design speed of 40kph. This criterion is established to ensure safe and efficient roadway design, accommodating factors such as driver comfort, visibility, and vehicle stability.

All the crest vertical cuvees are designed in compliance with AASHTO Design Guide

3.11.6.2 Max K-value Crest Vertical Curve for PSD

It ensures sufficient Passing Sight Distance (PSD) for safe overtaking by providing clear visibility of oncoming traffic. It minimizes collision risks, complies with safety standards, and balances driver comfort with cost- effective road design.

3.11.6.3 Max K- Value Sag Vertical Curve for SSD

It is critical for ensuring Stopping Sight Distance (SSD) because it affects night-time visibility under headlights and driver comfort during transitions. A higher K-value provides a flatter curve, allowing adequate headlight reach for safe stopping, compliance with safety standards, and smoother road design.

According to AASHTO guidelines, the recommended minimum k value for Sag vertical curves is 9 for design speed of 40kph. This criterion is established to ensure safe and efficient roadway design, accommodating factors such as driver comfort, visibility, and vehicle stability.

All the Sag vertical curves are designed in compliance with AASHTO Design Guide

3.11.6.4 Vertical Gradients

According to TORs, the maximum grade is 4% for design speed of 40. All the vertical curves are in compliance with this criteria

3.11.6.5 Cross Slope Pavement

AASHTO standards with a cross slope of 2% for level terrains, ensure proper drainage and road safety. This compliance prevents water accumulation on the road surface, reducing the risk of hydroplaning and pavement damage. This project is in compliance with the design criteria.

3.11.6.6 Cross Slope Shoulder

The shoulder's cross slope is designed to facilitate drainage and provide a safe area for stopped vehicles. It is generally steeper than the main pavement to enhance water runoff. According to TORs, the cross slope of shoulders is 4% This project is in compliance with the design criteria.

3.11.6.7 Formation Width

According to TORs, Formation width will be kept 11.5m. This criteria ensures adequate space for vehicle operation, safety, and effective drainage for providing a safe and efficient roadway design suitable for rural local roads. This project will be in compliance with the Formation Width design criteria.

3.11.6.8 Fore Slopes / Fill Slopes

Fore Slopes, ensure safe and stable road conditions. By incorporating maximum foreslope rates appropriate to local soil conditions and design constraints, the road promotes safety, facilitates maintenance, and supports sustainable roadside vegetation. According to TORs, Fore Slopes / Fill Slopes is kept 2:1. This project is in compliance with the design criteria.

3.11.6.9 Shoulder Width

Shoulder width ensures safety and accessibility emphasizing local context while adhering to international standards for road infrastructure. Shoulder width provides a safety buffer for stopped vehicles, supports pavement stability, and accommodates pedestrians or cyclists. It also aids in drainage and maintenance.

According to TORs, shoulder width for inner shoulder is 1m while for outer shoulder is 3m

This project is in compliance with the design criteria.

3.11.6.10 Lane Width

The lane width of a roadway influences the comfort of driving, operational characteristics, and, in some situations, the likelihood of crashes. The lane width of the project is 3.65m.

Figure 3.8 alignment of the project site

3.11.7 Civil Works

Pavement Design

Design Life: 10 Years

Design CBR: A design CBR value of 8% is adopted at sub-grade level in dualizing / new construction

Tentative Pavement Thickness

Based on calculated from the traffic data, two options for the pavement thickness for new construction, based on preliminary pavement design, were worked out as follows:

Option -I: Based on AASHTO Design:

- Asphaltic Wearing Course 50 mm
- Asphaltic Base Course 80 mm
- Aggregate Base Course 350 mm

- Granular Subbase 300 mm

Option-II: Based on Road Note 31 Design:

- Asphalt Wearing Course 50 mm
- Asphaltic Base Course 100 mm
- Aggregate Base Course 250 mm
- Granular Subbase 175 mm

3.11.8 Construction Materials

The materials used in construction of this bypass include coarse aggregates (crush), fine aggregates (sand), soil, water, asphalt, reinforcement, cement etc. Almost all these raw materials are locally available in the country.

i. Crushed Aggregate

A well-developed source of crushed aggregate is available at Chiniot, Pull-11, Taxila & Sargodha which consist of a combination of particles of different sizes. These are to be divided into coarse aggregate having particles of sizes suitable for construction.

ii Fine Aggregate (Sand)

Lawrencepur or more precisely Qibla Bandi Sand Deposits are located at about 360-400 km from the project area.

iii Sub-grade Material

Large quantity of sub-grade (soil) is abundantly available at various locations near the Project site. Borrow pits of suitable material at a reasonable reach will be selected.

iv Asphalt, reinforcement and cement

Asphalt, reinforcement and cement will be transported from National Refinery Karachi, Attock Refinery and Lucky Core Cement.

Mixing Proportions of raw materials is attached herewith as annexure

Figure 3.9 Layout showing Camp Sites, Borrow Areas, Dumping Site for subject Project

3.12 List of Machinery/ Expected Equipment

The machinery is owned by management of Lahore Smart City. List of Machinery is as under:

Table 3.7: List of Machinery

List of Machinery	
Dump Truck	Three Wheel Rollers
Front End Loader	Tandem Roller
Dozer	Asphalt Plant
Grader	Paver
Vibratory Roller	Self -Propelled Pneumatic Roller
Water Tankers	Asphalt Distributor
Generators	Batching Plant
Concrete Transit Truck	Concrete Pump
Excavator	Water Pumps
Cranes	Vibrators

3.13 Amenities

The following social amenities are present at site and the management of the waste (construction waste, solid waste and effluents) is explained in sub-sections below:

3.13.1.1 Manpower Requirements

The manpower requirement during construction of the project will be one hundred (100) including managerial staff, skilled and unskilled labour which will be arranged by Design Contractor.

3.13.1.2 Construction Camps

Already existing camp sites of Lahore Smart City will be utilized for construction of Interchange. Facilities like washrooms, mess, prayer area, temporary apartments are provided to the workers. The committee has been formed which inspect the areas on regular basis.

Proper septic tanks are being constructed for wastewater disposal. The sewerage line of these septic tanks are connected by the main sewerage line of housing scheme and after primary treatment, wastewater is being disposed off in approved drain.

3.13.2 **Water Consumption**

Calculation for Water Consumption

Water Requirement = 180 L/day/Capta

Total Water Requirement = No. of persons X 180 L/day

As no of persons required for project are 100

So, Total Water Requirement = 100 X 180 L/day

= 18,000 L/day

The water consumption during the construction phase of the project is estimated to be **18 m^3/day**.

3.13.3 **Waste Water Generation**

Wastewater Generation Rate = Total Water Consumption X 0.8

= 18,000 X 0.8

Wastewater Generation Rate = 14,400 L/day

The waste water generation is estimated to be **14,400 Liter/day** during the construction phase of the project. The depth of ground water is approx. 150 ft.
The dimensions are the least values where sedimentation process can work smoothly.

Primary Sedimentation Tank:

Flow: 27 m^3/day

Length: 2.5 m

Width: 1 m

Depth: 3 m

Area of Tank: 2.5 m^2

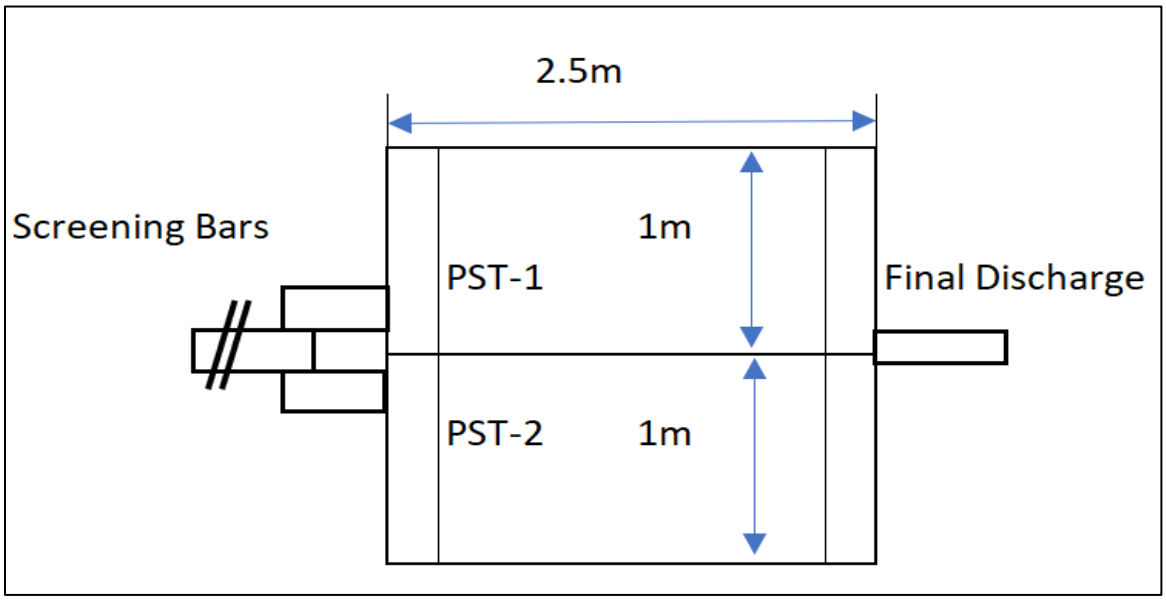

Figure 3.10 Layout of Primary Sedimentation Tank for the proposed project

3.14Solid Water Generation

The solid waste generation comprises of two parts: labor and raw materials.

Solid waste from labor activities can be categorized as domestic type of solid waste which is estimated to be 0.5 kg / capta / day. As the man power required for construction of subject project is 100 so expected solid waste generation from domestic purposes will be 50 kg / day. Solid waste generation from the construction of material will be recyclable and can be used again for different process. The solid waste will be handled by certified contractor.

3.14.1 Safety Trainings

Skilled, semi-skilled and un-skilled staff will be provided with proper training about the work and safety practices that need to adopt during the process activities.

Traffic Management Plan

Interchange will be constructed in various sections and stages and there will be no blockage of road for locals. However, alternate routes shall be provided along the road for locals by the proponent where necessary.

Small to medium size population centers in the vicinity of the proposed alignment may face problem due to movement of vehicles carrying construction materials. The increased traffic load may cause further deterioration of the existing condition of the road. The movement of vehicles

along the haulage routes may cause soil compaction and alteration of percolation, vegetation pattern and damage to properties and utilities.

3.14.2 Use of Drugs and Narcotics

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

3.14.3 Personal Protective Equipment

Following Personal Protective Equipment (PPEs) will be provided to the workers:

- Safety Helmet
- Safety Shoes
- Dust Mask
- Safety Gloves
- Safety goggles
- Ear plugs/ muffles

3.15 Energy Sources

Energy will be fulfilled by the help of generators owned by management of Lahore Smart City. 2 generators of 500 KVA and 1 MW will be utilized for batching and asphalt plant as required. Fuel of the generators will be diesel and natural gas.

CHAPTER 4
DESCRIPTION OF ENVIRONMENT

CHAPTER 4: DESCRIPTION OF THE ENVIRONMENT

This chapter provides baseline data (physical, biological and socio-economic parameters) related to the project and study area. The information has been compiled by using primary and secondary data resources. This chapter also refers to the theoretical analysis of the methodology adopted for collection of baseline data. The underlying principles and practices adopted in this regard are also discussed.

4.1 Methodology

The methodology employed to collect the baseline data and information regarding the social structure and various related parameters as discussed in sub-sections below:

4.2 Data Collection

The primary data was collected by visiting the project area and its communities in its nearby vicinity. The secondary data regarding physical parameters (topography, geology, seismology, and climate) was obtained by visiting relevant various government departments and their official websites. The biological parameters such as flora and fauna were studied by preparing a floristic list based on visual observation and fauna was studied by using opportunities approach. The species were recorded with reference to their existence in the project area. Information on wildlife fauna species (mammals, amphibians, reptiles, birds, etc.) in the assessment area was compiled based on opportunistic observation, gathering the existing information and consultation with local experts, community members and government and Non-Government Organizations (NGOs). The socioeconomic aspects were studied and analyzed by studying detailed village profile and by conducting household surveys.

4.3 Social Survey

The purpose of social survey was to record the present condition of the people living in the project area and to assess the expected project impacts on their life, subsistence systems and socio-cultural conditions. Prior to conducting the field surveys, the following steps were taken:

- ✓ Clear boundaries of the project area were identified

- ✓ Decided the sampling procedure in order to draw a representative sample size of the target population and households
- ✓ Developed the tools for data collection i.e. questionnaires to access the socio-economic status of the area

4.4 Sampling Design

Social baseline data of the persons residing in the study area has been estimated and collected through random sampling by using pre-developed questionnaires.

4.5 Questionnaires

In order to test the validity and reliability of the proposed questionnaires, they were reviewed to assess whether questions needed to be clarified, changed or re-sequenced and then a final editing of questionnaires was conducted prior to their application in the project area. The socio-economic questionnaires used for social survey are attached as of this EIA Report.

4.6 Data Editing and Analysis

The filled questionnaires and recorded information were compiled by the same field investigators who were involved in the data collection. This was done immediately after completing the field investigations. Data sets were processed. Analysis of the data and preparation of conclusions in the minimum possible time was done using statistical techniques of data analysis.

4.7 Review of Legal and Administrative Framework

The objective of reviewing legal and administrative framework is to obtain information on all legislation pertaining project development. The Socio-Environment Team of Asif Ali Associates (Pvt) Ltd reviewed the environmental policies, national, international and provincial laws and guidelines relevant to the development of project which helped in systematic identification of impacts.

4.8 Baseline Conditions

Baseline conditions refer to the existing physical, environmental and socio-economic status of the project area. On the basis of baseline information, the project interventions are assessed and

mitigation measures are proposed. The baseline information also helps to indicate the specific issues to be monitored during construction and operational phases. The baseline data (physical, biological and socio-economic parameters) related to the project area is described below. Information provided is based on primary and secondary data collected by site visits, desk studies and consultation with locals respectively. This section gives the overview of the topology, geology, seismology and meteorological conditions of whole city whereas, it gives detailed information about the surface water, ground water and air quality of the project area. The detail of each parameter is discussed in sub-sections below:

4.9 Physical Resources

The physical environment consists of existing land form and land use at the project site including geology, pedology, hydrology, meteorology and climatology. The pre-project condition (i.e. baseline) of these components of the physical environment is described in detail. To identify the potential impacts on the physical, biological and socio-economic environment that is likely to arise from the project activities.

4.9.1 Geography and Geology

The Sheikhupura lies 31°42'51.16"N latitude and 73°59'3.49"E longitude. The city is well connected with its surrounding big urban centers like Lahore (35 km) Faisalabad (94 km), Sargodha (143 km) and Gujranwala (54 km). Sheikhupura is also a railway junction. District Sheikhupurais spread over an area of 3,241km^2 and comprises 5 Tehsil such as; Sheikhupura, Ferozewala, Sharaqpur Sharif, Muridke and Safdarabad.

Figure 4.1 Location of the City

The area is a part of Rachna Doab, and consists of some recent sediment brought by spill channel from River Chenab. There are some old channel levee remnants and old basins filled up with clay materials. It is probably of late Pleistocene Age derived from mixed calcareous, sedimentary and metamorphic rocks of the lower Himalayas.

4.9.2 Topography

Topography of Sheikhupura City is flat. The area is a part of Rachna Doab and consists of sub-recent sediments brought by spill channel from the River Chanab. There are some old channel levees remnants and old basins filled up with clay materials. The material is probably of Late Pleistocene Age derived from mixed calcareous sedimentary and metamorphic rocks of Lower Himalayas. The area of the Sheikhupura District is comprised of the fluvial deposits of River Ravi. The topography of the project area is flat and surrounded byfertile agricultural land.

4.9.3 Climate

The District Sheikhupura has extreme climate conditions and summer season starts from April and continues till October. During the summer season, temperature ranges from 30°C to 48°C. The

winter season starts from November and continues till March. December and January are the coldest months with a mean minimum temperature of about 3-5°C. The dust storms occur occasionally during the hot season, June, July and August.

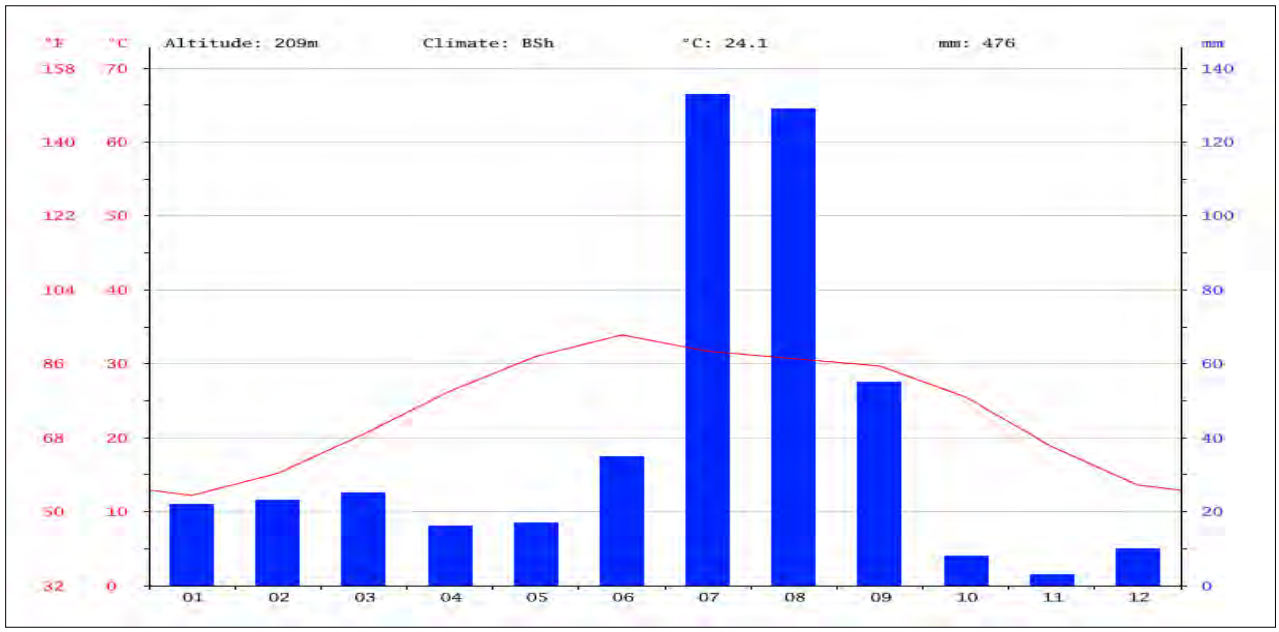

Figure 4.2 Annual Mean Temperature

Rainy weather alternates with oppressive weather. The rainfall is 500 mm per annum. In the recent year, the maximum average precipitation occurred in September and it was around 50-100mm.

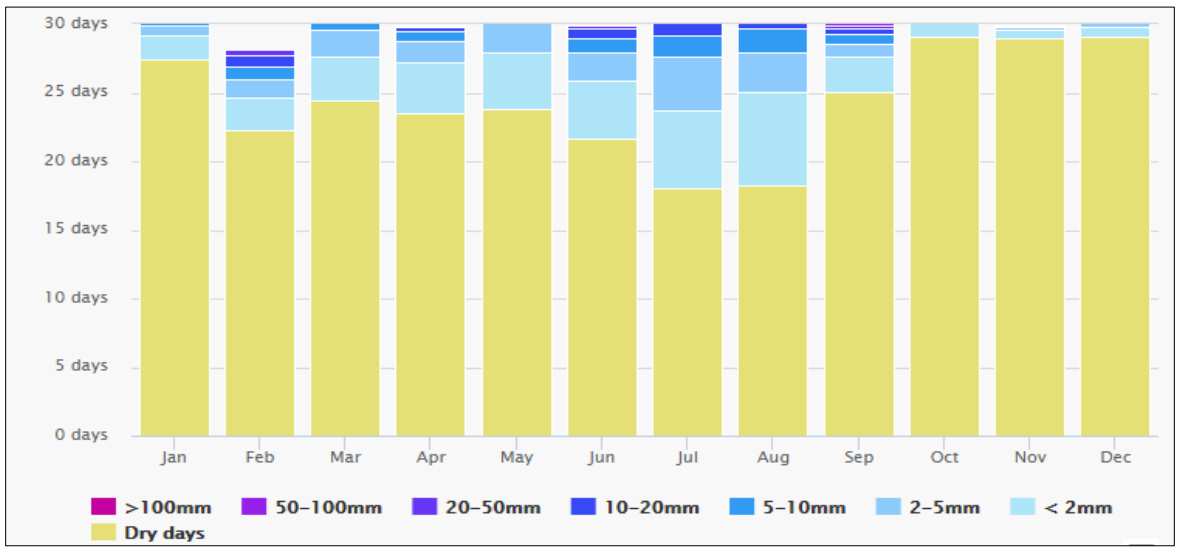

Figure 4.3 Average Annual Precipitation

The average daily wind speed was highest in July which was 38 km/h. In recent years, the maximum sustained wind speed has reached 38 km/h.[1]The diagram shows how many days within one month can be expected to reach certain wind speeds. Monsoons create steady strong winds on the Tibetan Plateau from December to April, but calm winds from June to October.

The wind speed directly affects the dispersion and transport of plume. So, the greater is the wind speed, the greater will be the dispersion and the distance at which plume strikes ground and the lesser will be the pollution concentration.

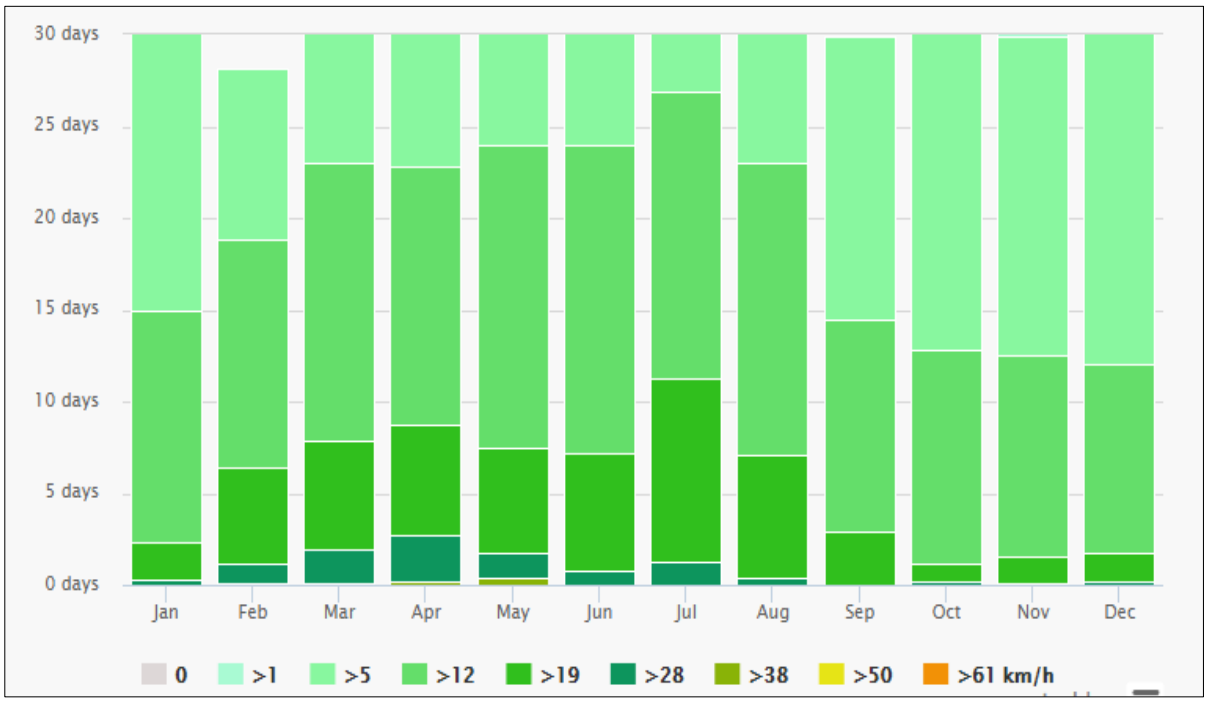

Figure 4.4 Average Wind Speed

[1]http://www.myweather2.com/City-Town/Pakistan/Shekhupura.aspx

4.9.4 Seismicity

According to Seismic Zoning of Pakistan, the project area lies in Zone 2A and represents minor to moderate damage due to earthquakes.

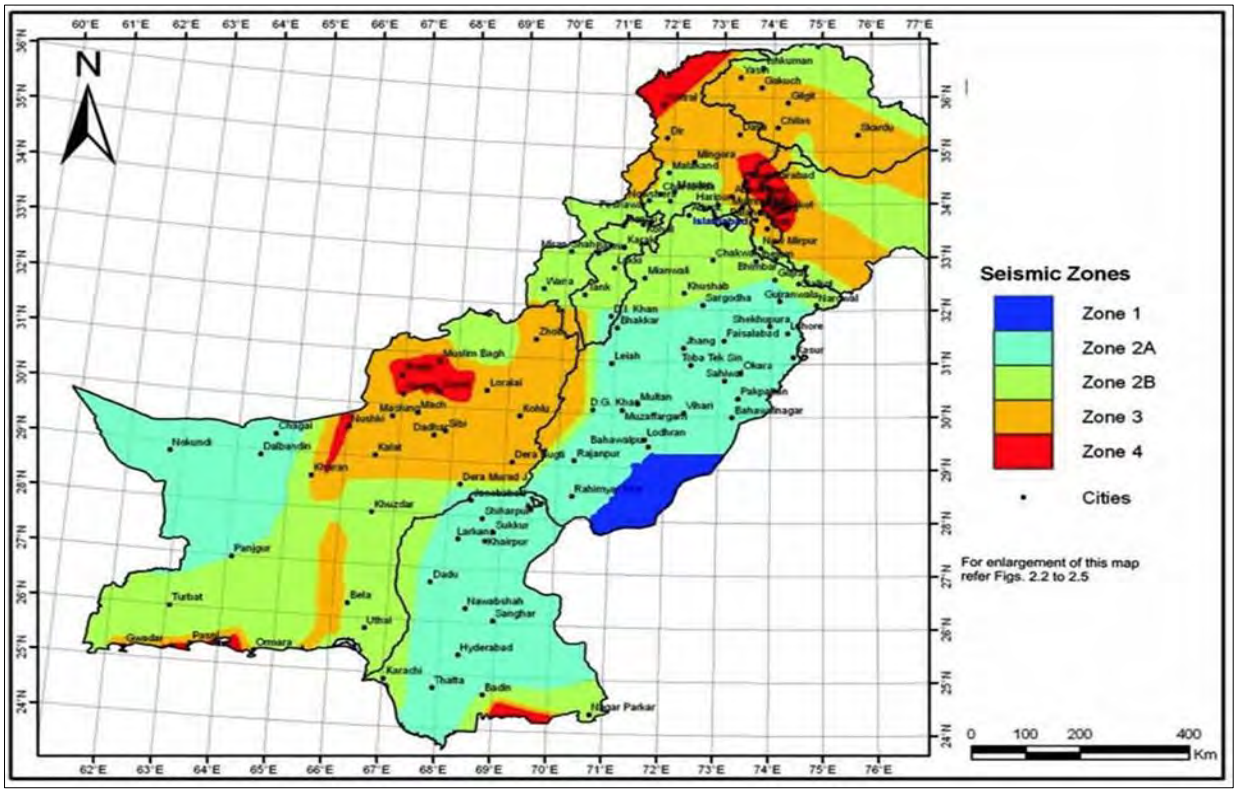

Figure 4.5: Seismic Zoning of Pakistan

4.10 Ecological Resources

District Sheikhupura is not rich with biological and ecological resources. However, the flora and fauna of the District includes; shrubs, herbs, mammals, birds, reptiles, amphibians and insects are found. They are discussed in detail below:

4.10.1 Aquatic Flora and Fauna

There is canal present in the study area which is being used for the irrigation purpose is Upper Chanab Canal. No aquatic life is reported in Upper Chanab Canal that can be at the verge of demage and disturbance. Moreover, no aquatic ecosystem (i.e., steam, river or pond) observed within or around the study area, which omits the possibility of any kind of aquatic species that may be harmed due to the establishment of steel manufacturing unit.

4.10.2 Flora

The project is located in sparsely populated rural area which has a variety of the trees. For the construction of this project few trees of different species will be removed. The dominant tree species on project area include; Eucalyptus, Neem, and Kikar. The nomenclature including common, English, local and botanical names of the flora found in the study area are presented in Table 8:

Table 8: Inventory of the Trees Present in Sheikhupura District

S#	Common Name	Scientific Name
1	Neem	*Azadirachtaindica*
2	Kikar	*Vachellianilotica*
3	Safeda	*Eucalyptus globulus*

4.10.3 Fauna

For study of fauna in the project area, field guides and books were consulted. On the other hand field observations were conducted along with the interviews of local community members about the fauna of the area.

The equipment used in field included cameras, binoculars and GPS device (wherever required). It is important to note that there is a number of factors which can change the findings of such survey. It may be pointed out that the pattern of seasonal migration of small birds varies depending upon each specie. no fresh water aquatic body is located near proposed project site. During the construction activity in project area, no important biological feature will be damaged or disturbed.

The fauna commonly found in District Sheikhupura includes; Hares, Falcon, Eagle, Quail, Starling, Jungle Pigeon, Russian Sparrow, Doves, King Fisher, Parrot, Crow and Local Sparrow. Commonly found mammals in the area include; dogs, cats, horses, house-rats, squirrels, porcupines and bats. However, Small Indian Mongoose and Indian Palm Squirrel are also found in the District Sheikhupura.

Table 9: Mammals in the Study Area

S#	Common Name	Scientific Name
1	Rat	*Rattus*
2	Bat	*Chiroptera*
3	Small Indian Mongoose	*Herpestesjavanicus*

4	Indian Palm Squirrel	*Funambuluspalmarum*
5	Porcupines	*Erethizondorsatum*
6	Squirrels	*Sciuridae*

The commonly found birds species include; House Sparrow, Crow and some of them are mentioned below with scientific names:

Table 9: Birds in the Study Area

S#	Common Name	Scientific Name
1	House Sparrow	*Passer domesticus*
2	House Crow	*Corvus splenders*
3	Pigeon	*Columbidae*
4	Bulbul	*Pycnonotidae*
5	Teetar	*Francolinusfrancolinus*
6	Parrot	*Psittaci forms*
7	Titodi	*Vanellusindicus*

In District Sheikhupura reptiles such as Snakes (Cobra and Kraits), Spiny Tailed Lizard and Fringed Toed Lizard are common in the tract, but cases of snake bites are very rare, as these reptiles have been either killed by expanding urbanization or they have moved away.

Table 10: Reptiles in the Study Area

S#	Common Name	Scientific Name
1	Snake	*Serpentes*
2	Spiny Tailed Lizard	*Uromastix hardwickii*
3	Fingered Toed Lizard	*Acanthodactyluscantoris*
4	Earthworm	*Lumbricina*

The amphibians commonly seen around the project area, especially during the rainy season includes;

Table 11: Amphibians in the Study Area

S#	Common Name	Scientific Name
1	Common Frog	*Ranatemporaria*
2	Indus Valley Toad	*Bufostomaticus*

A large number of insects are present due to open fields in the project site. Few of these insects are known to cause diseases in local population. Following is a list of commonly observed insects at the site:

Table 12: Insects in Study Area

S#	Common Name	Scientific Name
1	Black Ants	*Paratracheaiognicornis*
2	Dragon Fly	*Dragon Fly*
3	House Flies	*Muscadomestica*
4	Butter Flies	*Parnassiusbalucha*
5	Honey Bees	*Apismellifera*
6	Wasps	*Anagyruspseudococci*
7	Grasshopper	*Melanoplusdifferentialis*
8	Mosquito	*Anophlese sp.*

No endangered species are found at the site. The area has not been identified as ecologically sensitive area by wildlife department.

4.11 Environmental Monitoring Through Laboratory

Laboratory analysis for environmental monitoring establishment steel processing unit is done in order to check the baseline conditions and pollution load. In this connection M/s SEAL Lab which is EPA certified laboratory, was engaged to carry out environmental monitoring of wind speed, air quality, drinking water quality, noise level and particulate matter concentration in the project area.

Detail laboratory report of ambient air quality, ambient noise and surface water analysis results is annexed at Annexure-IV of this EIA Report and the detail information related to the testing is given below:

1.11.1. Sampling Sites

Following localities were identified to collect samples of water, noise and air for testing according to the testing guidelines of Punjab-EPA. It also defines number of samples as well as the number of sites from where samples were collected.

Table 13: Sampling Sites Details

Sr#	Particulars	Details

1	Number of Samples	Three (03)
2	Kind of Monitoring	Ambient Noise, Ambient Air and Ground Water
3	Sampling Sites	One (01)

1.11.2. Ambient Air Quality

The primary source of air pollution at the project sites is the vehicular emissions, industries and the key pollutants likely to be found at project proposed locations are Carbon Monoxide (CO), Oxides of Nitrogen (NOx), Sulphur Dioxide (SO_x), and Particulate Matter (PM). In order to determine the air quality of the area, Laboratory had the requisite air sampling device and expertise for collection of samples. Ambient air quality of the project area was monitored within the project area and results of the monitoring are given below:

Table 14: Ambient Air Quality

Sr. No.	Time (Hours)	CO (mg/m3)	NOx (µg/m3)	SO2 (µg/m3)	PM10 (µg/m3)	PM 2.5 (µg/m3)
1.	01:00 PM	7.86	18.7	06	66.5	12.5
2.	12:00 PM	6.14	18.4	08	70.6	13.6
3.	03:00 PM	6.245	19.5	16	72.2	14.8
4.	04:00 PM	7.258	16.7	15	71.8	16.9
5.	05:00 PM	5.825	15.6	16	68.5	12.5
6.	06:00 PM	5.694	21.8	17	70.7	14.6
7.	07:00 PM	7.386	17.4	13	72.7	15.2
8.	08:00 PM	5.472	19.5	08	73.6	16.8
9.	09:00 PM	4.816	18.2	07	72.5	13.7
10.	10:00 PM	4.648	16.5	09	74.8	15.4
11.	11:00 PM	5.474	18.0	06	72.4	13.6
12.	12:00 AM	4.388	19.4	06	72.1	12.9
13.	01:00 AM	4.572	17.6	07	69.6	10.4
14.	02:00 AM	4.230	16.8	06	66.2	19.8
15.	03:00 AM	5.986	19.9	07	65.5	17.7
16.	04:00 AM	4.495	16.2	03	63.8	15.6
17.	05:00 AM	5.542	18.5	05	62.4	19.8
18.	06:00 AM	4.645	15.7	04	58.6	16.2
19.	07:00 AM	3.992	17.1	05	56.4	15.9
20.	08:00 AM	3.886	19.3	04	55.7	16.3
21.	09:00 AM	5.345	16.6	03	54.3	14.5

1.11.3. Noise

Noise level of the project area was monitored at project site using digital sound meter and results of the same are given below:

Table 15: Noise Level Monitoring

Sr. No.	Time	Noise dB(A)		PEQS
1	04:00 PM	51.5	Day Time	55
2	05:00 PM	56.5		
3	06:00 PM	54.3		
4	07:00 PM	56.2		
5	08:00 PM	59.1		
6	09:00 PM	51.7		
7	10:00 PM	55.5		
8	11:00 PM	47.0	Night Time	45
9	12:00 AM	46.4		
10	01:00 AM	45.5		
11	02:00 AM	42.4		
12	03:00 AM	47.0		
13	04:00 AM	43.2		

1.11.4. Water Resource

The main source of the water consumption is the ground water which is being pumped from 150 ft and its being used in the study area for domestic purposes. To check the quality of the water in the area, ground water was collected and analyzed. The ground water was collected from bore hole adjacent to the project area. The detail of the water quality of the project area is given below:

Table 16: Water Quality Results

Sr. No	Parameter	Method	Unit	Result	PEQS
1	pH	APHA 4500-H^+ B	--	7.80	6.5-8.5
2	Total Dissolved Solids	APHA 2540 C	m	323	1000
3	Chlorid	4500- APHA Cl^- B	m	22.34	250

4	Fluorid	APHA 4500-F^- D	m	0.04	1.5
5	Taste	APHA 2120 B	Object.	Unobject.	Unobject.
6	Odour	APHA 2120 B	Object.	Unobject.	Unobject.
7	Colour	APHA 2120 B	TCU	0.22	15
8	Nitrate (as NO_3^-)	APHA 4500-NO^{3-} E	m	0.1	50
9	Nitrite (as NO_2^-)	APHA 4500-NO^{2-} B	m	0.001	3
10	Lead	APHA-Pb B	m	BDL	0.05
11	Total Hardness as $CaCO_3$	APHA 2340 C	m	23.76	500
12	Turbidity	APHA 2130 B	NTU	0.005	5
13	Zinc	APHA 3500-Zn B	m	0.0	5
14	Aluminum	APHA 3111 D	m	0.011	0.2
15	Chromium	APHA 3500-Cr B	m	0.0	0.050
16	Cadmium	APHA 3500-Cd D	m	BDL	0.01
17	Copper	APHA 3500-Cu C	m	0.0	2
18	Boron	APHA 4500-B C	m	0.026	0.300
19	Barium	APHA 3111 B	m	0.038	0.700
20	Antimony	APHA 3114 C	m	0.0	0.020
21	Arsenic	APHA 3114 C	m	0.0014	0.050
22	Cyanide	APHA 4500-CN^- D	m	0.0035	0.05
23	Mercury	APHA 3112	m	BDL	0.001
24	Nick	APHA 3111 B	m	0.0	0.020
25	Residual Chlorine	APHA 4500-Cl_2	m	0.266	0.2 – 0.5
26	Total Coliform	APHA 9222 B	Number/100	0	0/100 ml
27	Thermo Coliform	APHA 9222 B	Number/100	0	0/100 ml
28	E. Coli	APHA 9222 C	Number/100	0	0/100 ml

It was observed that the value of baseline environmental testing, analysis and monitoring are in compliance with PEQS and helped the management to decide the baseline value to further plan the project. Original reports are being provided with this EIA report and copies of monitoring reports from EPA certified lab along with validation forms are also attached as annexure.

Figure 4.6 Baseline Environmental Monitoring at Site

4.12 Socio-Economic Resources

This section provides collective information about the existing socio-economic and environmental condition of the project area within the Area of Influence (AOI). The different types of socio-economic aspects were covered such as demographic profile, occupation, education and health facilities. This data helped in identifying major interventions for the development of Environmental Management Plan (EMP). The study also helped to assess the positive or adverse impacts on local community.

This topic provides an overview of the baseline information relating to the socio-economic environment of the project area and the AOI. The socio-economic study gives information about the demographic profile, occupation, education and health facilities in the project area.

4.12.1 Demographic Information of Study Area

The demographic features include the information on population, family system and size, occupation, income and other social amnities available, etc. During the survey of project area, socioenvironmental team of Asif Ali And Associates (Pvt) Ltd. visited nearby residential area.

4.12.2 Village Profile

The village profile reflects the basic socio-economic conditions of local people. These parameters indicate the needs of society while planning the the aforesaid project. The village profile has been obtained by meeting with community representatives who are well aware about their surroundings. The consultant, with his team, visited project area and study area in order to idenitfy the socio-economic and environmental aspects of project. The following information about the Chak 39 Village is obtained by surveying the community.

Table 17: Study Area

S#	Socio-Economic Indicators	Chak No 39
1	Language Spoken	Punjabi, Urdu
2	Distance from Project Area	500 m
3	Accessibility of Road	Carpeted Road
4	Transport	Public and Private Transport
6	Population	2520
7	Livelihood	Agricultural, Livestock and Labor
8	Houses	245

9	Educational Facilities	Primary School, Secondary School and Govt. & Private College
10	Institutional Facilities	Mosque
11	Civil Facilities Available	Electricity, Water Supply and Graveyard
12	Source of Water	Groundwater
13	Common Diseases	Fever, Hepatitis, Common Cold, TB, Typhoid, Diarrhea and Malaria
14	Historical Place	NIL
15	Grain and Livestock Markets	NIL
16	Cottage Industry	NIL
17	Types of Trees	Neem, Kikkar and Eucalyptus
18	Disaster Management	NIL
19	Major problems of the Study Area	Safe Drinking Water, Sanitation and Sewerage System, Roads Access, Educational and Medical Problems

4.12.3 Residential Areas

The nearest residential area is offcourse Lahore Smart City along with that there are several other housing societies and small villages are present.

Figure 4.7: Nearby Residential Areas

4.12.4 Industries

Proposed project site is located on main Lahore Eastern Bypass. There are no industries present within the safe distance from the project.

4.12.5 Social and Public Amenities Available

The social and public amenities present in the area are given below:

a. Physical structures

The people in the study area are deprived of basic facilities like health, proper sewerage and sanitation facility, medical facilities, provision of safe drinking water, etc.

b. Religious Structure

There a mosque located at 0.9km from the project area. There is no shrine, structure or any other religious infrastructure present in the proposed project site that could be damaged and dislocated due to the proposed project establishment.

c. Protected Structures

There is no protected site, structure or any other social infrastructure present in the proposed project site.

d. Cultural Heritage and Community Structure

As stated earlier that the project area has no population and physical structure that may be damaged due to the establishment scrap melting unit. Consultant team also visited the study area but did not find any cultural heritage and community structure within the study area that could be impacted due to the proposed project.

4.13 Quality of Life Values

Socio-Economic Questionnaire and Environmental Checklist were used as survey tools by the Consultant survey team to collect desired information. Graphical representation of results of Socio-Economic Survey is given below:

4.13.1 Occupation of Respondents

Majority of the respondents (38%) attached with agriculture, 20% belongs to the labor class, 15% have their own business, 13% daily wagers, 7% shopkeepers and remaining 7% are private employees. During survey, efforts were made to interact with people representing all walks of life. The detailed graphic representation of occupational status is given below:

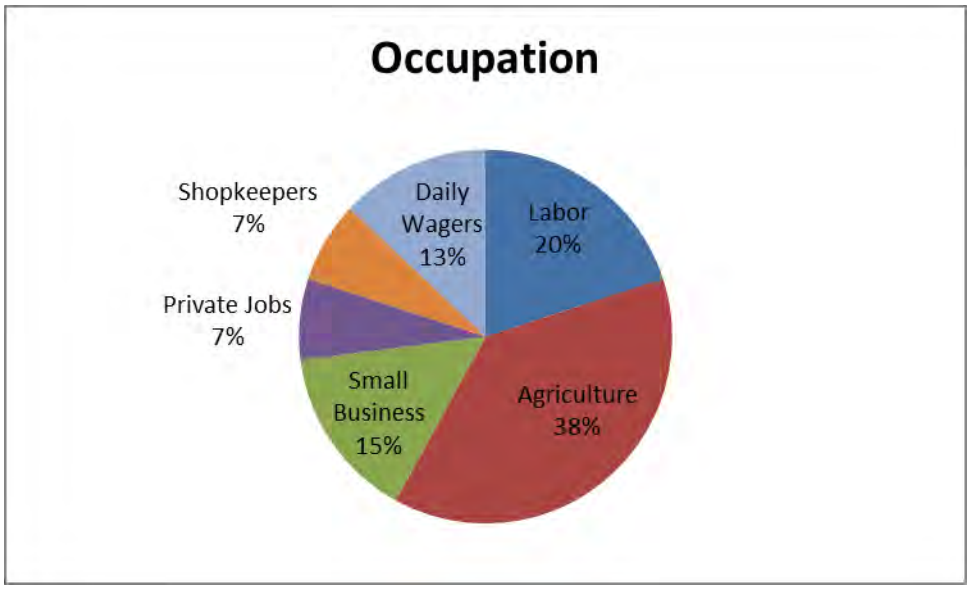

Figure 4.8: Occupation of Respondents

4.13.2 Personal Income

Based on the sample survey results, as the figure shows that nobody was earning less than 20,000 rupees, 69% of respondents fall within the income range of 20,000 – 25,000, 23% respondents earn 30,001 – 40,000 while only 8% of the respondents earn within the range of 40,001 – 45,000.

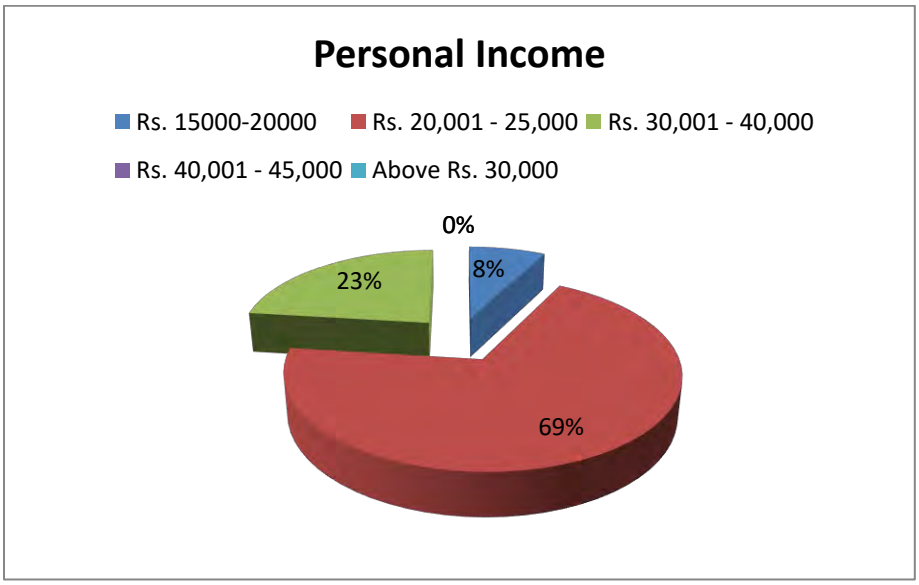

Figure 4.9: Personal Income

4.13.3 Educational Institutes

There is are many government and private educational institutions and colleges are present in the project vicinity.

4.13.4 Facilities Available

Facilities available at the houses, shops and factories are depicted here. It shows that electricity, water supply, telecommunication, sewerage, gas supply and every other routine facility is available in study area.

4.13.5 Literacy Rate

From survey results, it was found that 14% of the studied population was illiterate, 36% was up to primary level, 43% studied up to middle level and only 7% of the respondents studied up to higher secondary level.

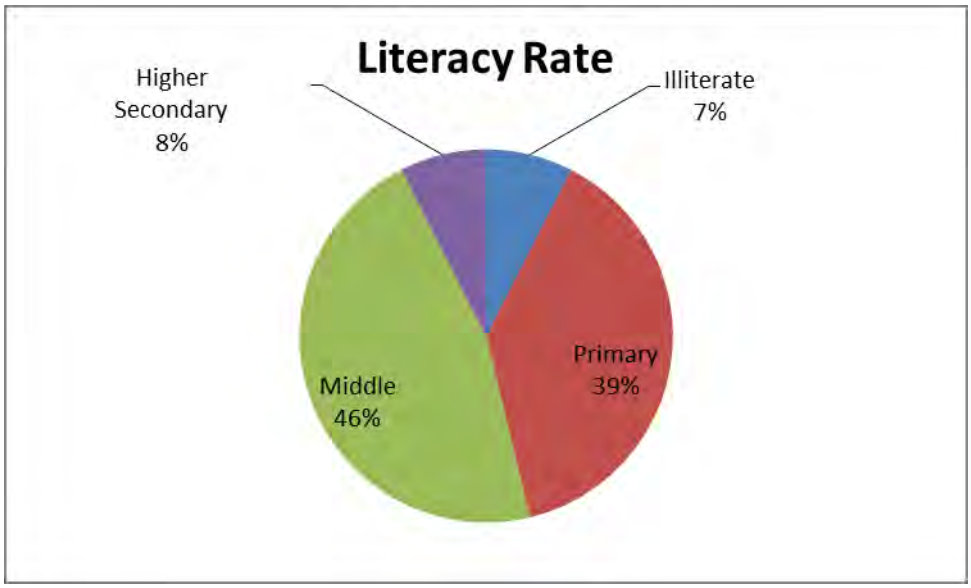

Figure 4.10: Literacy Rate

4.13.6 Common Diseases

According to the survey the common diseases recorded in the project area were, Diabetes, Fever, Hepatitis, Hypertension, stomach problems, Malaria, Typhoid, Nephritis and Diarrhea[2].

4.13.7 Cultivated Crops

The main crops that are being cultivated in the study area include; Rice, Wheat, Sugarcane, Onion, Tomato and Potatoes as well as fodder crops. The area is famous for best Basmati rice production in the world.

[2]Source: Climate Change Working Papers No. 9, 2015.

4.13.8 **Livestock**

People in the study area have common livestock which include; Cows, Buffalos, Sheep, Goats and Hens. However, there is no proper cattle or poultry farm observed within the study area.

CHAPTER 5

STAKEHOLDER CONSULTATION

CHAPTER 5: STAKEHOLDER CONSULTATION

5.1 GENERAL

Public consultation refers to the process by which the concerns of local affected persons and others who have plausible stake in the environmental impacts of the project or activity are ascertained with a view to taking into account all the material concerns in the project or activity design as appropriate. According to the IEE and EIA Review Regulations, public consultation is mandatory for any socio-environmental study.

Impact assessment survey and public consultation sessions held with different stakeholder groups that may be impacted by the said project development. The consultation process was carried out in accordance with the guidelines laid by EPA. The objectives of this process were to:

- Share information with stakeholders on said project installation and operation
- To access the impacts on the physical, biological, and socio-economic environment
- Understand stakeholder concerns regarding various aspects of the project
- Understand the perceptions, assessment of social impacts and concerns of the communities of the project area
- Find out the awareness level and situation of acceptability to identify any issues for the implementation of the said project
- To invite people to express their views about the positive/negative impacts on their life styles and environment

This report includes all the comments, which were taken into account in preparing the definitive development concept for the establishment of said project. Public consultation performa is attached as Annexure of this EIA Report.

5.2 OBJECTIVES OF CONSULTATION

Public consultation plays a vital role in studying the impacts said project on stakeholders in its successful implementation and execution. It provides an opportunity to exchange knowledge with theall stakeholders. Referring particularly to a project related to environmental assessment, involvement of public is all the more essential, as it leads to better and more acceptable decision-making. The overall objective of the consultation with the stakeholders is to help verify the environmental and social issues, besides technical ones, that have been presumed to arise and to

identify those which are not known or are specific to the project. In fact, discourse with many who have thoroughly observed the site conditions in the pre-developmental phase, goes a long way in updating the knowledge and understanding.

5.3 IDENTIFICATION OF STAKEHOLDERS

All the people who are directly or indirectly affected or concerned with the project are the stakeholder. Besides the living population of the surrounding areas, some other stakeholders were identified and contacted. They are the key players including; shops owners, vendors, public offices, school, university, hospitals,. Not only published material (Both brief and comprehensive literature were obtained on request) but also noted their views and the concerns. Following stakeholders are identified for this project:

Project stakeholders include the settled families, either property owners or the tenants, businessmen (land owners, traders, shopkeepers, vandors, transporters, restuarent owners etc.), employees of the commerical entities. PAPs are of two types, for instance:

5.3.1 Direct

In this case, the PAPs are those who will be benefited directly by project. No disturbance on the local community is being foreseen due to the installation of the said plant.

5.3.2 Indirect

Indirect impact will occur on those who are living or doing business within project area of influence. Indirect respondents include;

- ✓ Government agencies responsible to deal with the project related activities
- ✓ Government Agencies directly, indirectly or widely involved in the execution and monitoring of the said project
- ✓ Workers of political, cultural, religious or social scientific bodies, directly or indirectly related

5.4 PUBLIC DISCLOSURE

Public disclosure is the outcome of all such activities where public is involved at least in the information sharing process. This is an integral part of that process so before the proponent applies for NOC to the EPA, this disclosure will be distributed properly among all stakeholder. It is the

responsibility of the proponent and the consultants to display public disclosure document at prominent places where community has easy access.

5.5 CONSULTATION PROCESS

Information disclosure, public consultation and discussion regarding the various aspects of the project with the people of the area are necessary. This process is intensified during the EIA Studies, and separate rounds of public consultations were held. Surveys were carried out in order to investigate physical, biological and socio-economic resources falling within the immediate area of influence of the project. Primary data collection included:

- Data collection regarding the socio-economic condition of the study area
- Pretesting of socio-economic survey tools in the field
- To consult the locals for collection of information on biological environment

Various meeting with the stakeholders were held the following objectives:

- Share information with stakeholders on the said project and expected impacts on community in the vicinity of the project
- Understand stakeholders' concerns regarding various aspects of the project, including the existing condition of the upgrading requirements, and the likely impact of construction and operation activities
- Provide an opportunity to the public to influence the project design in a positive manner
- Obtain local and traditional knowledge, before decision making
- Increase public confidence about the proponent, reviewers and decision makers
- Reduce conflict through the early identification of controversial issues, and work through them to find acceptable solutions
- Dissemination of information through discussions, education and liaison
- Documentation of information narrated by the stakeholders and mitigation measures proposed by the stakeholders
- Incorporation of public concerns and their address in the EIA; and eliciting their comments and feedback

5.5.1 Consultation Methodology

The methodology adopted for consultations is summarized below.

5.5.1.1 Consultation Material

The main document for distribution to stakeholders during the consultations was Social Impact Assessment Interview. The filled Survey forms of stakeholders are annexed

5.5.1.2 Consultation Mechanism

Primary stakeholders were consulted during informal and formal meetings held in the project area. The consultation process was carried out in the Urdu language. During these meetings a simple, non-technical, description of the project was given, with an overview of the project's likely human and environmental impact. This was followed by an open discussion allowing participants to voice their concerns and opinions. In addition to providing communities with information on the said project, their feedback was documented during the primary stakeholder consultation. The issues and suggestions raised were recorded in field notes for analysis, and interpretation.

By reaching out to a wider segment of the population and using various communication tools such as participatory needs assessment, community consultation meetings, focus group discussions, in-depth interviews, and participatory rural appraisal EIA involved the community in active decision-making. This process will continue even after this EIA has been submitted, as well as during future EIA in which similar tools will be used to create consensus among stakeholders on specific environmental and social issues.

Secondary stakeholder consultations were more formal as they involved government representatives and local organizations, consulted during face-to-face meetings. They were briefed on the EIA process, the project design, and the potential negative and positive impact of the project on the area's environment and communities. It was important not to raise community expectations unnecessarily or unrealistically during the stakeholder consultation meetings in order to avoid undue conflict with community's leaders or local administrators. The issues recorded in the consultation process were examined, validated, and addressed in the EIA report.

5.5.2 Primary Stakeholders Consultation

Stakeholders are groups or individuals that can affect or take affect from a project's outcome.

Affected Communities include population that is likely to be affected by the Project activities. Potential impacts of the Project on the local environment include disturbances and changes to the physical and biological environment, such as, land transformation, noise disturbances, and air and water quality issues. These disturbances can result in indirect socioeconomic impacts, such as, physical or economic displacement. These impacts are expected to reduce with the increased distance from the Project facilities. In addition to the Potentially Affected Communities, nomad communities frequenting the area, local government and local Non-Government Organization (NGO) officials were also consulted.

The contacted stakeholders belonging to different categories are shown in **table.**

Table 18 Stakeholder Category in the project area

Sr. No.	Stakeholder Category
1	Residents
2	Business'/Shop owners
3	Pedestrians
4	Farmers
5	Schools/Colleges/Students
6	Daily Wages Laborer's
7	Locals

5.5.2.1 Institutional Stakeholders

The institutional stakeholders consulted for the Project include relevant government agencies, NGOs and private sector organizations. Following is the list of institutional stakeholders.

Table 19 Government Departments of project area

Sr. No.	Departments
1	Environment Protection Department
2	Proponent
3	Rescue 1122
4	Forest Department
5	Agriculture Department
6	Tehsil Council
7	NGO
8	Environment Expert
9	NHA

Sr#	Participant	CNIC/Designation	Concerns/Remarks	How the concerns are addressed
EPA				
1	Mr. Tayyab	Inspector (Environment, Sheikhupura) 0334-4373146	• Take proper measures to control dust pollution during construction work by using water bousers for water sprinklings • Save the Flora along road • Provide alternate passage to travelers during construction • Complete the construction work in minimum short period so that the people may be relieved early for travelling	• Monitoring will be done through EPA certified Lab during construction phase to meet the NEQS Standards. Water sprinkling will be done on daily bases to suppress the dust particles • Alternate passage will be provided to travelers. • Trees cutting will be prohibited to save the flora. 3x plantation of indigenous plants will be done incase of any loss
Proponent Team (Lahore Smart City)				
3	Mazhar Iqbal	Proponent	Residents will face temporary issue in movement	The project will follow approved plan of NHA. Alternate routes will be provided to the residents
Forest Department				
4	Naeem Rahim	SDO Forest, Sheikhupura	• Conservation of existing flora & fauna should be kept in mind while	• Proper landscaping plan has been done

		0300-7538766	excluding the subject project • New plantation along the subject project with local indigenous and fruity plants should be raised to minimize the effect on the environment • Green man recruitment should be promoted in the area for proper and continuous look after of plantation & nurseries	• The site has a diverse flora and fauna which is being sustained in an effective manner. • As the Road will be constructed in already existing facility, no natural resource will be disturbed.
Agriculture Department				
5	Muhammad Fahad	Asst. Director (Agriculture, Sheikhupura) 0306-5354036	• Underground water is getting decline day by day due to over pumping by tube wells. Making adverse effect on ground water quality and quantity. • There should be policy to precise quantity of water using drip irrigation system • Latest techniques should be adopted to avoid underground water contamination	• Water will be used only for sprinkling which will be collected from surface water resources • Spillage and leakage will be done without any immediate effect
Rescue 1122				

6	Ayesha Sohail	Rescue & Safety Officer 0333-6971022	• In case of emergency, emergency number must be available displayed at roadside	• Acknowledged and will be ensured
NGO				
7	Sana Khan	Project Assistant 0333-6871950	• Labor rights and empowerment should be ensured • Regular monitoring of air and water should be done • Solid waste should be managed properly to ensure the cleanliness • Safety of the workers should be ensured.	• Labor Rights policy will be implemented properly. • Safety of workers will be kept on top priority. • Solid waste will be managed properly.

5.5.3 Stakeholders Concerns and Priorities

For implementation of SEP, identified stakeholders were consulted and their concerns were documented with pictures and minutes of meetings held with project interested parties including project staff, government officials, and local communities to predict the nature and scale of risks, challenges and impacts of project perceived by them. Following describes the details of general / public meetings and series of focused group discussions held with different categories of the stakeholders at various locations along with their concerns & priorities raised about proposed project.

5.5.3.1 STAKEHOLDER CONCERNS AND RECOMMENDATIONS

The finding of the community consultation has been addressed in various sections of EIA. Mitigation plan has been incorporated into EMP. The summary of consultation with various stakeholders is given below. Participants have been categorized into students, shopkeepers, farmers, labors and other residents. Out of total respondents of, 86% knew about the project whereas 14% were not aware of the project planning and implementation. All people were then briefed about the project.

96% commented their views about the project and 04% didn't respond.

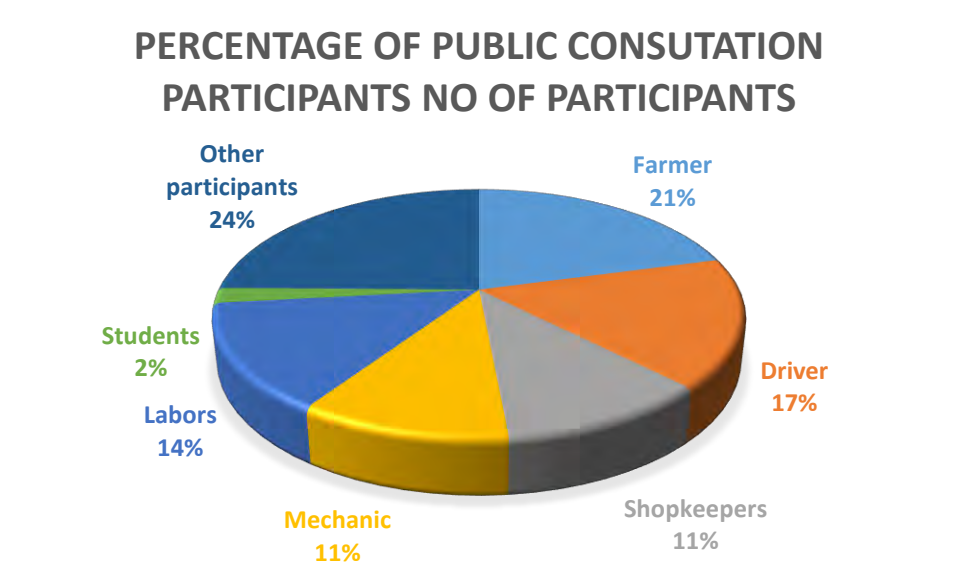

Figure 5.1: Percentage of public consultation Participants

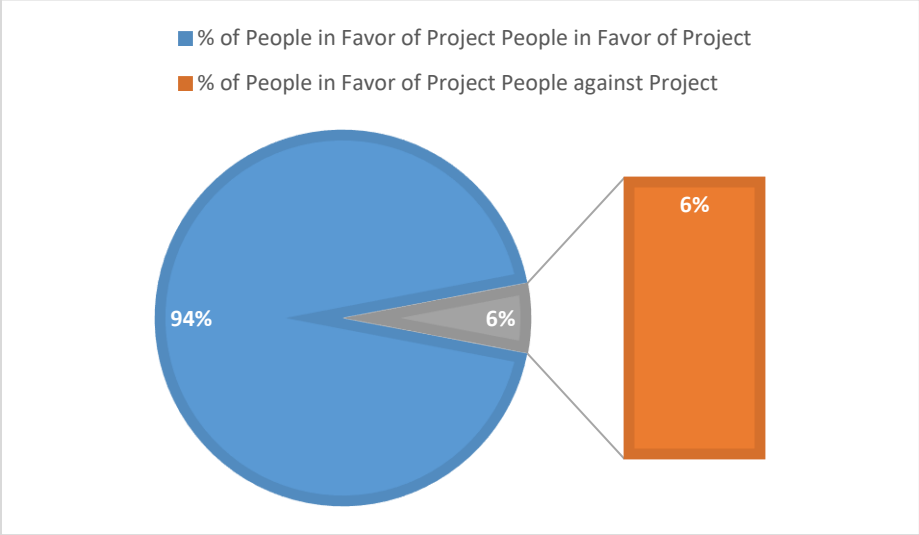

Figure 5.2: Percentage of People who showed Interest

Out of 96%, majority of the people (about 94%) favored the construction of the project keeping in view its importance and 6% people showed pessimistic views in general but mitigation measures and solutions to their concerns were provided.

Majority of people were in Favor of project. They said that project will result not only in direct jobs opportunities for locals but also will enhance subsidiary business, trade, education, and agriculture and community development. The people were of the view that project might also elevate education standards, struggle for career enhancement besides improvement in standard and quality of living in area. People were also of the view that project may also be instrumental in connecting the local people with major cities and will result in increase in GDP. Very few near to 6 % only shows concerns over power house emissions, noise, wastewater and health impacts. Majority of the concerns were changed in the Favor of installation after communicating the participants proper solutions and mitigation measures.

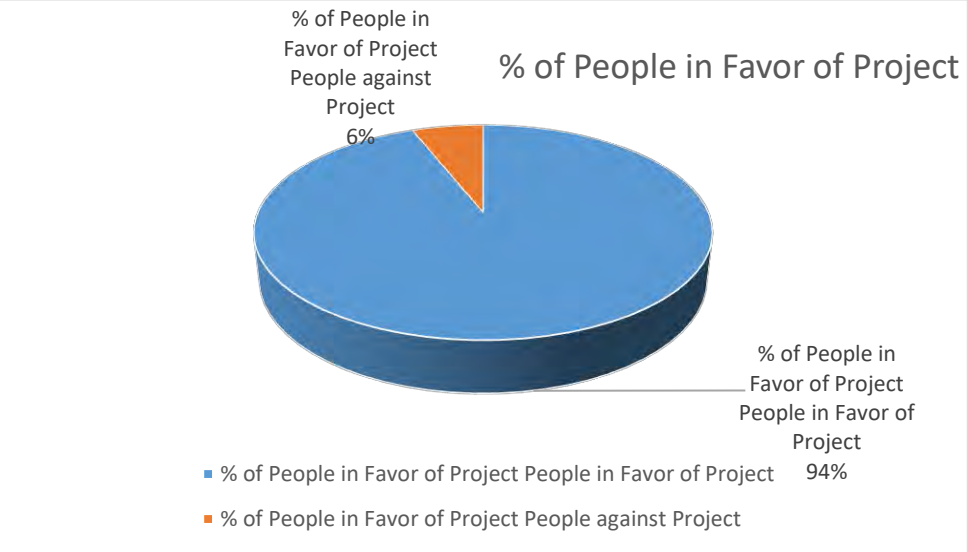

Figure 5.1 Percentage of people in favor of project

5.5.4 Stakeholder Consulted

Names of consulted stakeholders are given in table below:

Sr. No.	Stakeholder Name	Category
1.	Mushtaq	Labor (Daily Wages)
2.	Sajjad Ali	Shop Keeper
3.	Shabbir Khan	Hotel Owner
4.	Jahangir	Mechanic
5.	Kaleem Ullah	Mechanic
6.	Numan Majid	Mechanic
7.	Muhammad Sadiq	Waiter
8.	Muhammad Azam	Farmer
9.	Abdul Hameed	Shop Keeper
10.	Zaka Ullah	Driver
11.	Ghulam Rasool	Shopkeeper
12.	Muhammad Ibrahim	Shop Keeper
13.	Mujahid Akhtar	Driver
14.	Muhammad Akbar	Labor (Daily Wages)
15.	Muhammad Ismaiel	Shop Keeper
16.	Wazir Ahmad	Farmer

17.	Safdar Munir	Mechanic
18.	Mazhar Elahi	Labor (Waiter)
19.	Rehmat Ullah	Retired Govt Servant
20.	Muhammad Zahoor	Security Guard
21.	Karamat Sher	Labor

Figure 5.2 Consultation with Govt Departments

Figure 5.3 Public Consultation in nearby project area

5.5.5 Concerns / Apprehensions of the Stakeholders

Respondents were consulted during interview survey and their comments about project recorded on prescribed questionnaire. Following are the outcomes of consultation;

Sr. No	Concerns Shown by Stakeholders	How they will be addressed
01.	**Disturbance to Ambient Air**	
	Air, noise & soil pollution will increase not only during construction activities.	Regular water sprinkling will be done by the contractor Monitoring of ambient air, ambient noise and ground water analysis will be conducted as per SMART Rules
02.	**Clearance of land**	
	Tree cutting will be involved during road construction	No significant trees cutting is involved during project construction
03.	**Protection of local population and business**	
	Any business or land if is in the selected area should be paid compensation.	The compensation will be paid as per Government suggested value if any land or business is disturbed
04.	**Timely Construction of Interchange**	
	Interchange should be completed within the planning and as per implementation plan.	The Interchange will be completed as per implementation plan suggested in EIA chapter 3rd.
05.	**Transportation and Storage of Raw Materials**	
	The raw materials including construction material will create problem for local residents	Raw material will be stored at designated areas. The material will be transported during night times. Safety signage will be placed at construction sites.
06.	**Adverse Impacts on Local community**	
	The representative from AC Office	Lahore Smart City management will take

Sr. No	Concerns Shown by Stakeholders	How they will be addressed
	stated that a commitment should be made to provide locals with as many jobs related to the Project as possible. These include technical jobs for which training should be started as soon as possible	responsibility of addressing these concerns as per finalized GRM
	The presence of a colony and camps for workers and laborers will present challenges.	The contractor will provide all basic facilities to the labors.
	The maximum benefit of the Project should be to the locals. The resettled people, in particular, should be wealthier with an improved quality of life.	The contract will prefer local labors for in direct operation.
	Under social assessments, the EIA should include analysis on human rights, community benefit sharing, conflicts and security, etc.	The EIA will cover these aspects
07.	**Impacts on Terrestrial Ecology & Species of Conservation Importance**	
	Construction phase disturbances area concern for terrestrial wildlife more so than operational phase disturbances. Air and noise pollution, in particular are important to address.	Landscaping plan will be presented along with EIA report to handle this concern
08.	**Safe alternate route for travelling**	
	Alternate routes and traffic will be disturbed during construction times.	All necessary measures will be taken to ensure the safety of traffic during construction, including barricades (including signs, pavement markings). All such barricades will be set up to facilitate the local traffic.

CHAPTER 6

POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

CHAPTER6: POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

6.1 GENERAL

This chapter describes the potential environmental and social impacts of the proposed activities, predicts the magnitude of the impact and assesses the significance. The main intention of this section is to provide the mitigation measures that need to be adopted wherever necessary, to reduce, minimize, or compensate for the negative impacts.

6.2 IDENTIFICATION OF POTENTIAL IMPACTS

In the first step, potential impacts of the project are identified by desktop screening exercise, using checklists during field visits for collection of baseline data, professional judgment, published literature on environmental impacts of similar projects and standard environmental guidelines. Potential impacts are also identified through discussion with project proponent, consultation with stakeholder and community to identify their concerns. The main aspects associated with potential impacts are as follows:

- Water resources
- Ambient Air Quality
- Waste discharges
- Noise pollution
- Ecology of the area, including flora and fauna
- Vehicle movement
- Socio-economic conditions
- Archaeology

6.3 CLASSIFICATION OF IMPACTS

According to the type of potential receptors, the potential impacts are classified. The following receptor categories were used.

Category of Receptor	**Description**
Community	People their social and cultural values, aspirations and archaeological sensitivity
Land and Soil	Land resources, soil resources
Air Quality	Ambient air quality
Water Resources	Ground and surface water resources
Ecosystem	Vegetation, wildlife and biodiversity

6.4 SCOPING CRITERIA FOR IMPACTS

The identified potential impacts of the project are evaluated on the basis of following criteria;

- The present baseline condition, the change in environmental parameters likely to be affected by the project related activities;
- Is there any impact that environmental standards or environmental guidelines applicable to the project will be breached?
- Is there a high risk of permanent, irreversible, and significant change to environmental condition due to particular project activity?
- Did the community express any concern about this aspect?

6.5 METHODOLOGY FOR IMPACT ASSESSMENT

The impact assessment methodology defines three levels of consequences (or severity) and likelihood (chance of occurrence) i.e. Low, Moderate/Medium or High. The significance of an impact is determined on the basis of the level of consequence and likelihood of the impact.

Table 20 Definitions of severity and likelihood of impacts

Level	Severity of Impact (Consequence)	Likelihood
High	Serious / catastrophic damage to local and regional environment Serious threat to corporate reputation/ profitability / ability to do business	High likelihood of occurrence during lifetime of operation Regular / continuous part of operations
Moderate	Measurable damage to the environment Potential to affect reputation / cost Reduced efficiency	Moderate possibility of occurrence during lifetime of operation Periodic / occasional part of operations
Low	Negligible damage to the environment No risk to business	Unlikely to occur during lifetime of operation

Table 21 impact significance matrix

		Likelihood (Probability of occurrence)		
Impact (Consequence)		**High**	**Medium**	**Low**
	High	High	High	Medium
	Medium	High	Medium	Low
	Low	Medium	Low	Low

The prediction of impacts also includes the duration of impacts in terms of short-term or long-term, nature of impact, geographical location of the impact, reversibility of the impact. The criterion for impact assessment is illustrated in the Table

Table 6-22: Impact Assessment Criteria

Impact Characteristics	Categories
Nature of the Impact	**Direct:** The environmental parameters that are directly affecting by this project.

	-Indirect: The environmental parameters change due to the combinational effect by project and environmental impacts
Duration of the Impact	**Short term:** Lasting only till the duration of the project **Medium term:** Lasting from a few months to a year **Long term:** Lasting for a period much greater than medium term impacts
Geographical Location of the impact	**Local:** Within the area of project i.e. operation site and access roads **Regional:** Within the boundaries of the project area **National:** Within the boundaries of the country
Reversibility of the impact	**Reversible:** When a receptor resumes its pre-project condition **Irreversible:** When a receptor cannot resume its pre-project condition

6.5.1 What is the problem?

The project is about construction of interchange at Lahore Eastern Bypass by Lahore Smart City. The major impact associated with the construction of project includes solid waste management, wastewater management, noise emissions, tree plantation and traffic management, batching plant.

6.5.2 When problem will occur and when it should be addressed?

The impacts from the said industry mainly occur during the construction phase of the project. These issues include; noise generation, traffic congestion, fugitive dust emissions, solid waste management, wastewater disposal, top-soil removal, Health and Safety issues and change in the geographic features of the area. These all problems should be addressed on-site where they are being generated, to avoid the residual or adverse impacts. The tell the description and impacts to Government and public by reports and public hearing.

6.5.3 Where problem should be addressed?

The problem will be generated from AOI development. So, it should be addressed on source, i.e. at site within the same timeframe.

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6.5.5 How the problem should be addressed?

Problem should be addressed with its full detail i.e. its magnitude, possible impacts and problem, long time effect, environmental impacts, and proper mitigation measures will be provided according to the nature of the impacts/problems.

6.5.6 Ways of Achieving Mitigation Measures:

Following ways will be adopted to reduce the impacts of the said project:

6.5.6.1 Changing in Planning Design

The design is developed considering environmental risk and hazards. There is no endangered and threatened species present in the project area. No human settlement or infrastructure was not dislocated or dismantled due to the project development. The project is fare away from urban development. Not impact will affect the urbanization. Hence, there is no need to change the design of the project.

6.5.6.2 Improved Management and Monitoring Practices

The anticipated impacts will be reduced significantly by adopting better management activities, as it will be carried out for the betterment of the society. While environmental monitoring will be conducted on the regular basis to keep the sources of the air pollution, wastewater generation, noise and public nuisances in-check. All the migration measures and advance technology will be implanted to mitigate the impact. All the practices will meet the PEQS and international standards like OSHA and AEPA.

6.6 Delineation of Project Corridor of Impact (COI)

Before proceeding to the environmental analysis of the proposed project, it is imperative to delineate the COI. There are two (02) types of Project corridors which have been used for the environmental baseline information, impacts assessment and mitigation purposes and is described briefly as under:

6.6.1 Corridor of Impact (COI)

COI is a limit which identifies the area where direct and indirect impacts of the project activities are envisaged like existence of forests, game reserves, wetlands, archaeological sites etc. COI also includes the ROW. The limit for COI for the proposed project was taken as 100 m on either side of the existing road for collection of baseline information, impacts assessment and mitigation measures of physical, ecological as well as social resources.

As the location of Construction/Contractor camps, vehicle, equipment yard, material quarry areas and access tracks have not been defined yet, so impacts evaluated due to these facilities in this section will be of generic nature.

6.6.1.1 Replacement/Relocation/Rehabilitation

The project site is owned by the proponent and reserved for the said project. No replacement, relocation and rehabilitation is required for the commencement of the aforesaid project.

6.7 Impact Summary

Environmental Parameters	Impact Assessment during Different Phases	
	Construction	Operational
A: Physical		
Land Resources		
Soil Erosion and Contamination	-1p	0
Transportation	-1t	+1 P
Solid Waste and By-Products	-1t	N/A
Land Use	+1p	+1p
Air Resources		
Noise Pollution	-1t	-1p
Air Emission	-2t	-1p
Dust	-1t	-1p
Water Resources		
Ground Water	-1t	N/A
Surface Water	NA	N/A

Wastewater	-1t	N/A
B : Ecological		
Flora		
Tree Cutting	-1t	+2p
Fauna		
Terrestrial Fauna	N/A	N/A
C: Socio-Economic		
Employment Opportunities	+1t	+1p
Land Value Appreciation	+1p	+1p
D: Hazards		
Physical Hazards	-1t	-1p
Health and Safety	-1t	N/A
Legends: 1= Low; 2= Medium; 3= High; 4= Extremely High; NA= Not Applicable; t= Temporary; p= Permanent; app= Applicable; 0= Negligible		

6.8 Anticipated Impacts during Pre-Construction/Design Phase

6.8.1 Pre-Construction/Design Phase

Impacts envisaged during Pre-construction/Design Phase and the recommended mitigation measures have been described as follows;

6.8.1.1 Topography

The topography in the project area will change due to the construction of the proposed project. Visual changes to the topography will be of permanent and moderate adverse in nature and have no mitigation measures except that the project design should consider aesthetic concerns.

Formation width in Built-up Areas

The formation width in built-up areas may result in creating hindrance of market opportunities, loading and vending activities for the local residents/business owners/workers. However, this impact will be temporary and moderate adverse in nature.

Mitigation

- Incorporate technical design features that allow flexible shoulder width(s) near built-up areas; and
- Explore the incorporation of additional pedestrian overheads.

6.8.1.2 Land Acquisition

One of the major project related impact will be the land acquisition. The land required for the proposed project is mostly agricultural land. This impact will be permanent and high adverse in nature.

Mitigation

- Careful alignment selection by the designer to minimize the impact;
- Also adequate budget should be allocated in the Project's budget for the compensation to the affectees as per Land Acquisition Act, 1894 and framing of a judicious and fair compensation package for provision of compensation on prevailing market rates.

6.8.1.3 Changes in Land Value

The proposed project is expected to increase the land values, especially in nearby villages/societies. Land owners will have an opportunity to sell their land on increased prices and start new businesses. This impact will be moderate beneficial in nature.

6.8.1.4 Flora

Due to the proposed project, about 1643 numbers of trees of various species will be affected. This impact will be permanent and moderate adverse in nature.

Mitigation

- Incorporate technical design measures to minimize removal of trees, if possible such as change in alignment;
- Plan for compensatory planting for four (4) trees against each fallen tree of similar floral function; and
- Disallow introduction of exotic species with known environmental setbacks (Eucalyptus, etc.).

6.8.1.5 Social Disturbance

Due to the proposed project, entry/exit problems for shop owners or industrialists and bifurcation of settlements, agricultural land/fields may occur for the residents. This will result in causing inconvenience and affecting daily activities and business. This impact is permanent and moderate adverse in nature.

Mitigation

- Provision of pedestrian overhead bridges (after every 2 to 3 kilometers) in the design to minimize the impact.

6.8.1.6 Public Utilities

Due to the proposed project, public utilities affected may create disruption of public services and economics. This impact is however temporary and moderate adverse in nature.

Mitigation

- Incorporate technical design features to minimize effect on public utilities; and
- All public utilities (e.g. sewage, drainage/water pipes, power transmission lines, underground telephone lines, etc.) likely to be affected by the proposed project, need to be relocated well before the commencement of construction work.

6.8.1.7 Loss of Business

Petrol pumps, factories, shops and hotels will be affected by the execution of the proposed project. This impact is temporary and moderate adverse in nature.

Mitigation

- Incorporate technical design features to minimize the project construction activities to avoid the loss of private property if possible; and
- In case of unavoidable interference prior notification and consultation needs to be made to reach consensus on procedures and options or any other form of agreed judicious compensation with the concerned stakeholders/affectees.

6.8.1.8 Surface/ Wastewater Resources

One (1) surface water body (canal) is intersecting the project road which is River Ravi. The

wastewater may generate from canteens and toilets which needs to be disposed of properly. If disposed of improperly this wastewater will contaminate the surface water body and increase the contamination of the River Ravi. The impact is moderate adverse and permanent in nature.

Mitigation

- Provision of septic tanks in the design to treat the wastewater;
- Provision of adequate drainage network to reduce infiltration; and
- Provision of storm water drainage system with adequate capacity.

6.8.1.9 Traffic Management

During the construction phase of the project, improper traffic management may result in traffic jams and cause inconvenience to the people passing through the project area. The main reasons are the movement of vehicles carrying construction materials, different construction activities and the presence of terminals of freight services along the proposed route. This impact is temporary and minor adverse in nature.

Mitigation

- Proper traffic management plan should be formulated and announced before the construction to avoid traffic jams/public inconvenience.

6.8.1.10 Solid Waste

Solid waste will be generated from construction camps and different construction activities. Moreover, construction waste will also be generated during construction phase. The waste if not collected and disposed of properly will affect the aesthetics of area. It will lead to generation of odor, attracting disease vectors and clogging of canal and drain. The impact is considered to be temporary and minor adverse in nature.

Mitigation

- Waste management plan shall be devised including provision of waste bins, defining collection frequencies, allocating personnel and defining safe disposal options.

6.8.1.11 Resource Conservation

The materials used in construction of proposed project would include coarse aggregates (crush), fine aggregates (sand), steel, water, asphalt, reinforcement and cement etc.

Almost all the materials to be used in the construction of proposed project are non-renewable or derived from non-renewable sources and therefore their sustainable use is necessary for the future use. The impact is considered to be permanent and high adverse in nature.

Mitigation

- Proper planning for reduction of wastage of water should be done;
- Provision of adequate insulation to reduce heat loss through batching plants; and
- Planning for regular monitoring of CO and CO2 content of the flue gases to verify that combustion systems are using practical excess air volumes.

6.8.2 Construction Phase

Following is the brief description of impacts and their mitigation envisaged during the construction phase.

6.8.2.1 Topography

The main impact during the construction will be the clearing of ROW, cutting and filling of borrow pits including erosion of topsoil cover. This impact is temporary and Moderate adverse in nature.

Mitigation

- Where the use of agricultural land is unavoidable, the top 30 cm of the plough layer will be stripped of and stockpiled for redressing the land after the required borrow material has been removed;
- Where deep ditching is to be carried out, the top lm layer of the ditching area will be stripped and stockpiled. The ditch will initially be filled up with scrap material from construction and then leveled with the stockpiled topsoil;
- Ditches or borrow pits that cannot be fully rehabilitated will be landscaped to minimize erosion and to avoid creating hazards for people; and
- Landowners will be compensated according to the terms of lease agreements negotiated with them and the restoration actions agreed upon by the Contractor will be duly carried out.

6.8.2.2 Soil

Due to the proposed construction activities, soil erosion and contamination may occur. Soil erosion

may occur on roadside, at contractors' camps and at embankment works as a result of uncontrolled run-off from equipment washing yards, excavation of earth cutting operations and clearing of vegetation whereas contamination of soil may be caused by oil and chemical spills at asphalt plant sites, workshop areas and equipment washing yards. Also due to unauthorized use of borrow areas and quarries, soil erosion may occur including degradation of landscape. This may limit the future use of land for agricultural purposes. This impact is, however, of temporary and moderate adverse in nature.

Mitigation

- Low embankments will be protected by planting Vetiver grass that can flourish in relatively dry conditions;
- Soil contamination by asphalt will be minimized by placing all containers in caissons;
- All spoils will be disposed off as desired and the site will be restored back to its original conditions before handing over;
- Non-bituminous wastes from construction activities will be dumped in approved sites, in line with the legal prescriptions for dumpsites, and covered;
- Productive land or land adjacent to agricultural land may not be preferred for excavation; and
- Non-productive, barren lands in broken terrain, nullahs and publicly recognized waste lands should be given preference for borrowing materials.

6.8.2.3 Land Acquisition

One of the major impact during construction of the proposed project will be the land acquisition. About 44 kanals of land would be acquired for construction of the proposed project.

Mitigation

- Provide judicious compensation to the affectees by providing sufficient budget in the project cost. The process of land acquisition and compensation should be followed in a transparent manner to minimize the impacts.

According to Land Acquisition Act 1894, the following points are to be considered while determining compensation to the project affectees:

- While determining the amount of compensation to be awarded for land acquisition under this Act, the court (the land acquisition collector) shall take into consideration the following:

- *The market value of land at the date of publication of notification under section 4 sub section (1);*
- *The damage sustained by the person interested, by reason of the taking of any standing crops, or trees which may be on the land at the time of the collector's taking possession thereof;*
- *The damage if any sustained by the person interested at the time of the collector's taking possession of the land by reason of acquisition injuriously affecting his other property, moveable, or immoveable, in any other manner, or his earning;*
- *As a consequence of the acquisition of the land by the collector, the person affected is compelled to change his residence or place of business, the reasonable expenses incidental to such change.*

6.8.2.4 Religious/Cultural Resources

Since no physical cultural resources are falling within the ROW of the proposed project area, so there is no need for relocation of such resources. Hence, no mitigation is required for this impact.

6.8.2.5 Construction Camps/Camp Sites

Due to the proposed camp sites, loss of vegetation and dissatisfaction of rehabilitation measures during and after completion of construction phase may occur. However, the impact will be temporary and moderate adverse in nature. For these impacts, mitigation measures have been developed to minimize the likelihood, extent or duration of their occurrence and any associated adverse effects. **Table** summarizes potential impacts and proposed mitigation measures associated with construction camps.

Table 23 Summary of worker camp impacts & mitigation measures

Potential Impact	Proposed Avoidance and Mitigation Measures
Environmental ▪ Temporary habitat loss or disturbance ▪ Temporary visual intrusion ▪ Noise emissions at a single location ▪ Waste generation ▪ Discharge of sanitary effluents and rainwater run-off to nearby water bodies	***Environmental*** ▪ Reinstate any temporary facilities to pre-existing conditions in ecologically sensitive areas. ▪ Implement landscaping plan for all facilities in areas where high landscape value and visual vulnerability to the proposed activities warrants site-specific landscape restoration measures. ▪ Operate equipment in a manner sympathetic to the

Potential Impact	Proposed Avoidance and Mitigation Measures
	ambient noise environment. Do not leave equipment idling unnecessary. ▪ Provide adequate warnings of impeding works to all potential receptors within a1 km corridor surrounding the RoW via public notices and local news
Social ▪ Worker camp site: consultation surrounding potential construction camp sites revealed concerns regarding the location of proposed sites for Worker Camps.	***Social*** State land will be a second preference for worker camp locations, followed by land where there is a willing lessee. Employment policies which aim to maximize job opportunities for local people will help to minimize tensions caused by different socio-cultural values Training will be provided to all staff on camp management rules and overall discipline and cultural awareness. This will include, in appropriate languages: ▪ A briefing on camp rules ▪ A community relations orientation to increase awareness about the local area, cultural sensitivities and the project Code of Conduct ▪ Awareness-raising on health considerations, including sexually transmitted diseases (STDs). The construction contractor is required to develop a Construction Camp Management Plan to address: ▪ Discipline; ▪ Community liaison; ▪ Ethnic tensions and; ▪ Communicable diseases; A Code of Conduct and Camp Rules will be required within the Construction Camp Management Plan, which

Potential Impact	Proposed Avoidance and Mitigation Measures
	provides policies and a disciplinary framework with respect to worker behavior
Camp Location Existing Camp locations of Lahore Smart City	***Camp Location*** The construction contractor will be required to assess the environmental/social sensitivity of any additional or alternative sites prior to their approval for adoption.

Some additional mitigation measures will include:

- The contractor(s) should provide plan for removal & rehabilitation of site upon completion;
- Photographical and botanical inventory of vegetation before clearing the site; and
- Compensatory plantation to be scheduled when construction works near end.

6.8.2.6 Health and Safety

a) Occupational Health and Safety

Health risks and work safety problems may result at the workplace if the working conditions provide unsafe and/or unfavorable working environment and due to storage, handling and transport of hazardous construction material. Workers should be provided with safe and healthy working environment taking into account risks inherent to the particular sector and specific classes of hazards in the project area. This is a temporary and moderate adverse in nature.

Mitigation

- Obligatory insurance against accidents for labourers/workers;
- Provide basic medical training to specified work staff and 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 material, first aid, security, fencing, and contingency measures in case of accidents;
- Work safety measures and good workmanship practices are to be followed by the contractor to ensure no health risks for labourers;
- Protection devices (ear muffs) should be provided to the workers doing job in the high noise areas;
- Provision of adequate sanitation, washing, cooking and dormitory facilities;

- Proper maintenance of facilities for workers will be monitored;
- Provision of protective clothing i.e. helmet, adequate footwear for bituminous pavement works, protective goggles, gloves etc. for labourers handling hazardous materials;
- Ensure strict use of wearing these protective clothing during work activities;
- Instruct foremen to strictly enforce the keeping out of non-working persons particularly children, off work sites; and Adequate signage, lightning devices, barriers, yellow tape and persons with flags during construction to manage traffic on Multan Road, haulage and access roads.

b) Community Health and Safety

Quality of ground water and surface water resources available in the nearby local communities may get contaminated due to the construction activities, oil spillage and leakage. The labourers work with different transmittable diseases may spread out those diseases in the local residents. The impact is permanent and high adverse in nature.

Mitigation

- There should be proper control on construction activities and oil spillage/ leakage from construction vehicles/ machinery.
- The labour works with different transmittable diseases should be restricted within the construction site;
- Timely public notification on planned construction works;
- Close consultation with local communities to identify optimal solutions to maintain community integrity & social links;
- Fencing around the camps should be strong enough so that it cannot be broken easily by local people for making passages; and
- Use of water should not disturb public water availability and source of water should be selected carefully.

6.8.2.7 Borrow/ Open Pits

Borrow/ open pits and its excavation activities may result in land disputes, soil erosion, and loss of potential cropland, loss of vegetation, landscape degradation, and damage to road embankments.

Borrow/ Open pits may also result in potential sources of mosquito breeding and may prove

hazardous to human beings, livestock and wildlife. This will also degrade hygienic condition of the project area. This impact is permanent and moderate adverse in nature.

Mitigation

- Borrow pits will be restored with the consent of owners and one possible option provided will be conversion of pits to fish farms;
- Necessary permits to be obtained for borrow pits
- Care must be taken in selection of borrow area so that it is not posing any threat /danger to road construction, stability and safety;
- In borrow pits the depth of the pit will be regulated so that the sides of the excavation will have a slope not steeper than 1:4;
- Soil erosion along the borrow pit shall be regularly checked to prevent / mitigate impacts on adjacent lands; and
- In case borrow pits fill with water, measures have to be taken to prevent the creation of mosquito-breeding sites.

6.8.2.8 Air Quality

Air quality will be affected by fugitive dust emissions from construction machinery, asphalt plants and vehicular traffic. Emissions may be carried over longer distances depending upon the wind speed, direction, temperature of surrounding air and atmospheric stability.

The critical sources of air pollution during the construction phase will be:

- Asphalt plants that generate toxic emissions which contain unburnt carbon particles, sulphur compounds and dust from batch preparation;
- Quarry areas that generate fugitive dust during crushing;
- Traffic diversion routes marked along dirt tracks that generate fugitive dust when in use by vehicular traffic; and
- Transportation of materials and other construction activities that create dust emissions.

During construction, the continuous operation of machinery and movement of heavy trucks and vehicles may generate gaseous emissions and have a temporary and moderate adverse impact on the surrounding environment.

The overall impact on the quality of air during the construction phase will, however, be limited to the project's implementation phase only.

Mitigation

- All vehicles, machinery, equipment and generators used during construction activities should be kept in good working condition and be properly tuned and maintained in order to minimize exhaust emissions; -
- Open burning of solid waste from the Contractor's camps should be strictly banned;
- Preventive measures against dust should be adopted for on-site mixing and unloading operations. Regular sprinkling of the site by water should be carried out to suppress excessive dust emission(s);
- Emissions from power generators and construction machinery are important point sources at the construction sites. Proper maintenance and repair is needed to minimize the hazardous emissions;
- Quarry areas and asphalt plants should be located at least 500m downwind from populated areas, wildlife habitats and contractor's camps to minimize the impact of dust emissions;
- Asphalt, hot mix and batching plants should be equipped with dust control equipment such as fabric filters or wet scrubbers to reduce level of dust emissions;
- PEQS applicable to gaseous emissions generated by construction vehicles, equipment and machinery should be enforced during construction works;
- Ensure precautions to reduce the level of dust emissions from hot mix plants, crushers and batching plants should be taken up; e.g. providing them as applicable, with protection canvasses and dust extraction units. Mixing equipment should be well sealed and equipped as per existing standards;
- Regular sprinkling to avoid dust; and
- Regular monitoring of air quality in accordance with PEQS.

6.8.2.9 SMOG CONTROL PROGRAM

The project baseline data already at edge at peak due to traffic congestion. All the impacts has been discussed in the report however SMOG / Air Pollution has been added accordingly.

SMOG is provincial issue, and EPA has already delegated the powers to district office in light of SMOG Prevention Rules, 2023 which is directly implemented to project development and industrial sector. In current scenario, the client will abide by the rules of PEQS, OSHA standards

and SMOG Prevention Rules so that local community might not be affected.

1. Burning of waste will be avoided and waste will be removed periodically.
2. Training on SMOG awareness will be provided to workers so that the rules might be implemented.
3. Road construction will lead to air pollution, sprinkling of water will be done.
4. The machinery used during process will be regularly maintained.
5. High quality fuel will be used in plant machinery.
6. Air emission equipments will be equipped with emission control technologies i-e catalytic converters etc and it will be the responsibility of contractor to regularly check and report the fitness certificates of equipments
7. As tree plantation plan has been proposed in this project, tree plantation will not only be done alongside the road instead with consultation of EPA district officer, plantation will be done at different locations of citry area.
8. Plantation alongside canal will be done.
9. Plantation drives at Schools and Colleges will be done as per directions of Assistant Commissioner
10. Maintenance of these tree will also be the responsibility of client
11. Designing highways to reduce congestion and therefore reduce vehicle emissions will eventually reduce the air pollution.

6.8.2.10 Noise

Noise is most pervasive environmental problems in the urban areas especially on the road side. Main sources are heavy machinery such as bulldozers, excavators, stabilizers, concrete mixing plant, pneumatic drills, stone crushers asphalt plants and other equipment's. Noise generated by construction machinery is likely to affect workers working on the site. This impact is temporary and minor adverse in nature.

The likely impacts due to noise are:

- Psychological effects of distraction of attention, irritation and short temperedness in the exposed persons due to persistently higher noise levels;
- Noisy settings and higher background levels can cause temporary threshold shift and consequent habit of speaking loud, which may cause damage to vocal cords in the persons exposed; and

- Noise produced from moving construction vehicles and blowing of pressure horns, at times, could be intolerable particularly during quite hours of night.

Mitigation

- Selection of up-to-date and well maintained plant or equipment with reduced noise levels ensured by suitable in-built damping techniques or appropriate muffling devices;
- Confine excessively noisy work to normal working hours in the day, as far as possible;
- Provide the construction workers with suitable hearing protection like ear cap or earmuffs and train them in their use;
- Preferably, restrict construction vehicles movement during nighttime;
- Heavy machinery like percussion hammers and pneumatic drills should not be used during the night;
- Vehicles and equipment used should be fitted, as applicable, with silencers and properly maintained;
- Use of low noise machinery, or machinery with noise shielding and absorption;
- Contractors should comply with submitted work schedule, keeping noisy operations away from sensitive points; implement regular maintenance and repairs; and employ strict implementation of operation procedures; Noise barriers in sensitive areas in the form of high boundary walls (concrete or wood), earth berms, etc. in front of schools, hospitals/ clinics and mosques; and
- Public hearings to discuss appropriate solutions and materials to control noise (e.g. mud or brick walls, bushes, etc.)

6.8.2.11 Surface and Groundwater

Surface water might get contaminated due to the disposal of construction waste generated during the project activities and earth and stone work activities. This contamination will not only endanger the aquatic life but may also result in jeopardizing the health of natives that use this water for meeting domestic requirement.

In addition to that, construction waste, if left unattended will result in forming leachate that will percolate through the soil strata and will reach underground water table and hence, will end up contaminating it. Also the water for construction and consumption may come in conflict with local water demand.

There is a probability that various materials like fuel, lubricant oil and other oily products, which are used during the construction phase may contaminate groundwater, if they are not handled properly. During the construction phase, the sanitary wastewater will be generated at the workers' camp(s). If this wastewater is allowed to stagnate in water ponds on the site, it can percolate into the soil, thereby, contaminating groundwater. This impact is temporary and moderate adverse in nature.

Mitigation

- Protection of surface and groundwater reserves from any source of contamination such as the construction and oily waste that will degrade its potable quality;
- The solid waste should be disposed of in designated landfill sites to sustain the water quality for domestic requirements;
- Water required for construction should be obtained in such a way that the water availability and supply to nearby communities remain unaffected;
- Conduct regular water quality monitoring according to Drinking Water Quality Standards (DWQS) and determined sampling schedule;
- The contractor should ensure that construction debris do not find their way into the drainage or irrigation canals which may get clogged;
- Work on canal areas should be kept to a minimum or protective walls should be constructed;
- Prohibit washing of machinery and vehicles in surface water, provide sealed washing basins and collect wastewater in sedimentation/retention pond; Construction work close to the water bodies should be avoided, especially during monsoon period; and
- Wastes must be collected, stored and taken to approve disposal site.

Spill control

- No refueling, storage, servicing or maintenance of equipment should take place within 150 feet of drainages or other sensitive environmental resources; and
- Any fluids drained from the machinery during servicing will be collected in leak proof container and taken to an appropriate disposal or recycling facility.

6.8.2.12 Flora

Trees are vital ecosystem, which perform variety of functions for the improvement of environment such as reduction in air pollution, noise abatement, cooling effect on earth, supply of oxygen etc. Due to the proposed project, about 1643 numbers of trees of different species will need to be cut

due to the execution of the proposed project.

The trees coming in the ROW are mostly of Kikar (Acacia Nilotica), Sufaida (Eucalyptus) Borh (Ficus bengalensis), Sheesham (Dalbergia sisso), Willow (Salix babylonica), Simbal (Salmalica malabarica) and Jand (Prosopis spicigera). Tree Plantation Plan for the proposed project is shown in Section-7.

Following impacts are expected on the flora of the project area:

- Trees act as a binding force as their roots are spread in the soil, which helps to keep the soil intact. With the removal of trees, however less, this binding force will be vanished and the soil will be liable to increased erosion;
- During the entire construction period dust laden polluted air will form a dust film on leaves thus blocking the stomata consequently hindering photosynthesis processes causing detrimental effect on the plant health;
- Exhaust of noxious gases from movement of heavy machinery will further pollute air which will adversely affect health of plants;
- Establishment of Contractors camps and warehouses for storage of equipment, material etc. will involve clearing of vegetation from the area, causing an adverse impact; and
- During construction activities the Contractor's workers may damage the vegetation and trees (for use as fire-wood to fulfill the camps requirements).
  This impact will be permanent and high moderate negative in nature.

Mitigation

- The indigenous trees most suited to the tract should be re-planted;
- Flowering and fruiting shrubs should be planted along the road to beautify the landscape. Planting would however be done keeping in view the principles of landscape designing;
- An awareness campaign targeted on the neighborhood farmers should be run to popularize the planting of trees;
- The contractor's staff and labour should be strictly directed not to damage any vegetation such as trees or bushes. They should use the paths and tracks for movement and should not be allowed to trespass through farmlands;
- Construction vehicles, equipment's and machinery should remain confined within their designated areas of movement;

- Contractor should supply gas cylinders at the camps for cooking purposes and cutting of trees/bushes for fuel should not be allowed; and
- Camp sites and asphalt plants should be established on waste/barren land rather than on forested or agriculturally productive land. However if such type of land is not available, it should be ensured that minimum clearing of the vegetation is carried out and minimum damage is caused to trees.

6.8.2.13 Fauna

The usual fauna found in the project area have already been mentioned earlier in Section-4. Due to the implementation of the proposed project, the free movement of fauna would be disturbed. Another impact on the fauna of the project area will be the probable dislocation of the birds/animals (rodents) from their nests and burrows. Birds who have nests on the trees located in the ROW or who frequently visit the project area in search of food may receive an adverse impact and shall have to move to adjoining areas.

Also, due to the leakages/spills from the construction equipment/machinery the local ponds/water storages and canal water from where the animals/birds drink water may get contaminated; thus, endangering the fauna of the project area. The impact may be considered permanent & moderate adverse in nature

Mitigation

- Plantation of large number of trees along the proposed project to regain the ecological habitat;
- New and good condition machinery with minimum noise should be used in construction;
- Noisy work should not be carried out in night time so that there should be no disturbance to local birds and animals;
- Contractor should ensure that the no hunting, trapping of animals should be carried out during construction;
- Borrow pits should be fenced so that no animal can fell into these;
- The camps should be properly fenced and gated to check the entry of wild animals in search of eatable goods. Similarly waste of the camps should be properly disposed off to prevent the chances of eating by wild animals, which may prove hazardous to them; and
- Special measures should be adopted to minimize impacts on birds such as avoiding noise generating activities during the critical period of breeding.

6.8.2.14 Disposal of Mucking Material

Inevitable cut and fill earthwork operations will open up scars on the land around the project area. This impact is temporary and minor adverse in nature.

Mitigation

- The excavated materials that are unsuitable for use will need to be stored, transported and disposed of appropriately at designated sites.

6.8.2.15 Disruption of Existing Public Utilities/ Infrastructure

There may be some disruption to the already existing utilities like electricity poles, underground telephone lines, power transmission lines etc. in the project area during the construction phase. This impact is, however, temporary and moderate adverse in nature.

Mitigation

- Rehabilitation of existing utilities before construction to avoid any inconvenience to the residents of the project area or provide them with alternate arrangement during the construction period.

6.8.2.16 Traffic Management

Due to the proposed construction activities, traffic management may pose a challenge in the project area. Movement of vehicles carrying construction materials may result in traffic jams and time delays and cause inconvenience to the people passing through the Project Area particularly from Lahore to Southern Punjab (vise-versa). It will also increase the traffic load on the existing road network, thus deteriorating the existing condition of the road. Also, the movement of vehicles along the haulage routes may cause soil compaction, vegetation pattern and damage to properties and utilities. This impact is temporary and moderate adverse in nature.

Mitigation

- Proper traffic management plan should be implemented to avoid traffic jams/public inconvenience;
- Movement of vehicles carrying construction materials should be restricted during the daytime to reduce traffic load and inconvenience to the local residents/ business owners;
- Coordinate planning of traffic diversions with the traffic police and the Transport Department in accordance with the construction program with advance warnings to the affected residents and

road users;

- Availability of continuous services of the traffic police in the diversion and control of traffic; and
- The executing agency is required to maintain liaison between the Highway/ Traffic Police, local residents/ travelers and the contractor to facilitate traffic movement during construction stage.

6.8.2.17 Impact of Heavy Vehicles on Existing Road Network

The plying of heavy vehicles on existing road network may result in air pollution (if unpaved roads), noise pollution especially near sensitive receptors (residential areas, school, health facilities etc.), and damage to roads and traffic congestion. However, the impacts would be temporary and moderate adverse in nature for which the following mitigation measures are proposed.

Mitigation

- Vehicle with the open load carrying area used for transportation of materials should have properly fitted side and tail boards;
- Materials having potential to produce dust should not be loaded to a level higher than the side and tail boards and should be covered with clean tarpaulin in good condition. The tarpaulin should be properly secured and extended to at least 300 mm over the edges of the side and tail board; and
- The contractor should not use any vehicle either on or off road with excessive noise pollution. Noise mufflers should be installed and maintained in good condition on all motorized equipment's.

6.8.2.18 Solid & Liquid Waste (Municipal, Construction and Hazardous Waste)

Different types of waste are likely to be generated during the construction phase of the proposed project. The municipal waste will be in the form of food, cans, paper and wastewater from construction camps toilets and washing yards. Construction waste will include excavated soil, sand, gravel, wood, metal pieces and electrical wires. Whereas hazardous waste can be comprise paints and construction chemicals. Due to construction activities waste will also be generated at construction and contractors camp site which may include wastewater, oil spillage from machinery and solid waste etc. Handling and storage of oil, asphalt/bitumen may be a source of environmental pollution as a hazardous waste. This will result in unhygienic conditions, health risk to work force at the camp site.

All these, if left unintended, can become a source of nuisance and environmental pollution in the project area. The impact is considered to be temporary and moderate adverse in nature.

Mitigation

- Wastewater effluent from contractor's workshop and equipment washing yards should be passed through gravel/ sand beds to remove oil/ grease contaminants before discharge;
- Training of work force should be conducted in the storage and handling of materials and chemicals that can potentially cause soil contamination;
- Solid waste generated during construction and camp sites should be safely disposed in demarcated waste disposal sites and the contractor should provide a proper waste management plan;
- Reusable/recyclable (iron bars, aluminum) waste should be sold to waste vendors and those which cannot be sold out may be used as a filling material for leveling the depressions, subject to technical feasibility;
- Debris generated by dismantling of existing pavement structures should be re-used subject to the suitability of the material;
- Ensure proper labelling of containers, including the identification and quantity of the contents, hazard contact information etc.;
- Conduct training of employees involved in the transportation of hazardous material regarding emergency procedures;
- Provide the necessary means for emergency response on call 24 hours/day;
- The sewage system for camps should be properly designed (pit latrines or, as required, septic tanks) to receive all sanitary wastewaters;
- Lined wash areas should be constructed within the camp site or at site, for the receipt of wash waters from construction machinery; and
- Construction workers and supervisory staff should be encouraged and educated to practice waste minimization, reuse and recycling to reduce quantity of waste.

6.8.2.19 Disturbance to People

Approach/ hindrance problems for the residents/ business owners and movement of the people to the mosque/ shrines will be disturbed during construction activities. This impact is temporary and minor adverse in nature.

Mitigation

- Timely completion of the construction works and provides alternate routes for the areas where the construction is being carried out.

6.8.2.20 Economic Activity

Due to the construction of the proposed project, economic activity will be generated in the project area as the labourers and semi-skilled staff will have an opportunity to work for the construction of the proposed project. This will help in developing their skills and capacities. This is a moderate beneficial impact.

6.8.2.21 Maintenance of Construction Equipment

Improper maintenance of construction equipment may lead to safety and environmental hazards like groundwater and soil contamination or injury to workers. This impact is temporary and moderate negative in nature.

Mitigations:

- Place substantial blocking under any chain-hoist-suspended or jack supported equipment under which people must work. (The operator of trenching equipment should never leave the controls while shovels are suspended without blocking);
- No work should occur in areas where passing automobiles or moving machinery result in a hazardous condition;
- All work areas should be provided with proper ventilation. Employees shall not work in areas where they are exposed to excessive carbon monoxide gas from exhausts of running engines;
- Gasoline should not be kept in open containers or pits;
- Use a reasonably nontoxic solvent with a high flash point for cleaning parts and never use gasoline;
- Keep wrenches or tools clean and in safe working condition;
- Secure unbolted heavy parts or engines if necessary to leave the work;
- Always keep a suitable fire extinguisher ready. Inspect fire extinguishers regularly, and keep them in good operating order;
- Ground electric appliances, keep them in good working condition, and ensure that sparking will not ignite gases or vapors. Do not permit live cords to touch workers;
- Put oily rags in closed metal containers for disposal after use; and

- The maintenance workshop must be equipped with washing yards for cleaning of heavy equipment and septic tanks/soakage pits for the treatment of waste water.

6.8.3 Anticipated Impacts during Operational Phase

The anticipated impacts related to the proposed project have been studied for the operational phase and discussed hereunder.

6.8.3.1 Flora

No negative impacts are envisaged on the flora of the area during the operational phase. However, improper maintenance of the saplings planted against the trees cut for the proposed project may adversely affect the growth of those saplings which were planted to improve the environmental aesthetics of the project area. Raising of new trees in four rows on either side of the proposed project, will render a positive impact on the flora of the area and will also cause a beneficial impact on the landscape of the area, which will be of permanent in nature.

Presence of adequate flora will absorb noxious hydro-carbon gases, through photosynthesis, emitted from an expected large number of cars, vehicles and public transport, thus purifying air of hazardous particles.

Mitigation

- The saplings planted in the project area against the trees affected should be properly maintained throughout their initial growth period in terms of water requirement and necessary nutrients;
- An awareness campaign targeted on the neighborhood farmers should be run to popularize the planting of trees; and
- Organic farming will be encouraged to minimize the use of chemical fertilizers and pesticides.

6.8.3.2 Fauna

The project activities will bring some adverse impacts on the fauna of the project area such as the uneasiness of movement and increased probability of accidents, if the animals/livestock approach the proposed project. This impact is permanent and high adverse in nature. Noise and air pollution caused due to heavy and fast traffic will be the source of disturbance to the fauna of the project area and especially to the avifauna of the area, which is an another high adverse impact.

Raising of dense plantation of shady trees on both sides of the proposed project will provide

resting, nestling and roosting habitat to the avifauna which is a high beneficial impact

Mitigation

- Provision of animal/ livestock crossings after every some distances to facilitate their movement; and
- Installation of sign boards indicating the sensitive areas for the road users to avoid accidents.

6.8.3.3 Surface and Groundwater

No major adverse impact on surface and groundwater is anticipated during the operational phase with the exception of some occasional oil spills, which may be restricted up to the road surface.

6.8.3.4 Air Quality

The existing dust pollution will be reduced drastically by operation of the project due to improvement in road condition but it will be short termed. However, in the longer run, increased traffic levels and congestion will lead to PM10 pollution levels above the national standards, which may result in causing public health risks, nuisance and other impacts on bio-physical environment. These conditions will result in the rise of vehicular emissions (CO, NOx, SOx, PM10) associated with the adverse effects on the environment and humans. This impact is permanent and moderate beneficial during operational phase of the proposed project.

6.8.3.5 Noise

During the operational phase, the noise levels are anticipated to increase due to traffic related noise pollution; vibrations from movement of heavy vehicles and mainly use of pressure horns. This impact is permanent and minor adverse in nature.

Mitigation

- Noise measurements should be carried out at locations and schedule specified in the Environmental Management Plan (EMP) to ensure the effectiveness of mitigation measures;
- Signs for sensitive zones (health centers/ educational institutions etc.) to disallow the use of pressure horns; and
- Enforcement and penalties against traffic rules violators.

6.8.3.6 Road Safety

Enhanced vehicular movement and speed in the long run may result in road safety issues like traffic accidents. This impact is permanent but moderately adverse in nature, since the frequency of accidents may be lowered, but their intensity may be quite severe due to enhanced speeds at which vehicles will move. The impact may be considered permanent and high adverse in nature.

Mitigation

- Strict enforcement of speed limits, installation of speed guns and channelization of traffic with respect to categories (heavy vehicle traffic and light vehicle traffic) and enforcement of penalties for the violators.

6.8.3.7 Landscape

At present, the landscape of the project area is dominated by commercial area with small cluster of trees. However, after the construction of the proposed project, the landscape of the project area will be changed in terms of road infrastructure and planned plantation of trees along the road. This will permanently change the landscape of the project area and at the same time will have a beneficial impact in terms of socio-economic development of the project area.

6.8.3.8 Drainage

During the operational phase, poor maintenance of the road drainage system, particularly during the monsoon season can cause nuisance to the travelers and public due to flooding of the drainage. In case of chocking of road drainage, the increased surface runoff due to heavy rains will accumulate on the project road and can cause traffic jams. The impact may consider to be moderate adverse in nature.

Mitigation

- The impact can be controlled/ reduced by timely and continuous maintenance/ cleaning of the drainage system; and

  Placement of sign boards instructing not to dispose of solid waste to avoid chocking of drain

CHAPTER 7

ENVIRONMENTAL MANAGEMENT PLAN

LAHORE SMART CITY INTERCHANGE

CHAPTER 7: ENVIRONMENTAL MANGEMENT AND MONITORING PLANS

7.1 GENERAL

This EIA provides the Environmental Management Plan (EMP) of the project to keep it environment benign as well as the monitoring plan to ensure the compliance of the established EMP.

Outline and key features of the EMP for construction and operations phase is presented in sub-sections below. As per the environmental legislation in Pakistan, the EMP for the operations phase, along with other documents, is to be submitted to the environmental protection agency to obtain confirmation for compliance and Environmental Approval for project operation. Even after implementation of the suggested mitigation measures, the impact may remain significant, and require regular monitoring. This section also underlies the monitoring framework for both construction and operation phases to check compliance of the EMP and to take timely actions for correction in case any accidence of significant criteria, requirements or goals are found.

7.2 OBJECTIVES OF ENVIRONMENTAL MANAGEMENT PLAN

The primary objectives of the EMP are to:

- Facilitate the implementation of the mitigation measures identified
- Define the responsibilities of the project proponent and contractor and provide a means of effective communication of environmental issues between them.
- Identify monitoring parameters in order to 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.
- To apply the rules and regulation of the Punjab Environmental laws and international standards
- Making of environmental managemental polices
- Reviewing, regulating and improving of environmental policies on regular basis.

7.3 MANAGEMENT APPROACH

The organizational roles and responsibilities of the key players are summarized below:

Proponent*:* The project proponent will undertake overall responsibility for compliance with the EMP. Concerned Departments will carry out verification checks to ensure that the contractors are effectively implementing their environmental and social requirements.

Contractors*:* The contractors will implement the majority of environmental and social mitigation measures. The contractors will carry out field activities as part of the project. The contractors are subject to certain liabilities under the environmental laws of the country, and under its contract with proponent.

7.4 COMPONENTS OF THE EMP

THE EMP CONSISTS OF THE FOLLOWING:

- Management plan
- Monitoring Plan
- Communication and documentation
- Institutional capacity
- Environmental training

7.5 ENVIRONMENT MANAGEMENT PLAN

It lists all the mitigation measures identified in the EIA and the associated environmental or social aspect in line during operational phase with the administrative framework involving all the responsible implementing authorities who are required to take the planned actions/measures. It enhances project benefits by reducing its impacts and making it environmental friendly.

Table 24 Environmental Management Plan

Sr. No.	Project Component or Impact	Target	Mitigation	Responsibility	
				Design Consultant	Concerned Department
A. PRE-CONSTRUCTION/ DESIGN PHASE					
1	Topography	To ensure minimum changes in the topography of the project area	• Project design should consider aesthetic concerns.	Prepare topographic survey plans with tentative alignment	Management of project shall ensure the preservation of the original topographical configuration without alteration.
2	Formation width in built-up areas	To minimize the hindrance for the local people; and To lessen the density of traffic.	• Incorporate technical design features that allow flexible shoulder width in villages; and • Explore the incorporations of additional underpasses	Prepare Geometric Design with plan and profile drawings	Management of project is mandated to ensure strict adherence to the design parameters as sanctioned by the design consultant.
3	Land Acquisition	To minimize land	• Careful alignment selection by the	Details of land	Management as

		acquisition	designer to minimize the impact; and • Also adequate budget will be provided in the Project cost for the compensation to the affected people as per Land Acquisition Act, 1894	acquisition is prepared	per SOP of Government of Pakistan should acquire land
4	Flora	To avoid/minimize tree cutting	• Incorporate technical design measures to minimize removal of trees, if possible, such as change in alignment; • Plan for compensatory planting for four (4) trees against each fallen tree of similar floral function; and • Disallow introduction of exotic species with known environmental setbacks (Eucalyptus)	An estimated number of removal of trees has been included in BOQ	Management should plant as per SOP of Govt of Pakistan
5	Social Disturbance	To minimize the entry/exit problems of the locals in the Project Area	• Mitigation measures will include provision of pedestrian overhead bridges (after every 2 to 3 kilometers) in the design to minimize the impact.	In current design considerations, there is no immediate requirement for the implementation of overhead bridges. However, such structures would	Management shall oversee any site-related social disturbances in accordance with the (SOP) established by the Govt of Pakistan

				be provided in future, if need arise	
6	Public Utilities	To avoid disturbance to the public	• Incorporate technical design features to minimize effect on public utilities; and • All public utilities (e.g., sewage, drainage/water pipes, power transmission lines, underground telephone lines, etc.) likely to be affected by the proposed project, need to be relocated well before the commencement of construction work.	List of public utilities prepared has been prepared	Management shall relocate utilities as per SOP of Govt of Pakistan
8	Surface/ Water Resources	To avoid/ minimize the contamination of surface water body and drain.	• Provision of septic tanks in the design to treat the wastewater; • Provision of adequate drainage network to reduce infiltration; and • Provision of storm water drainage system with adequate capacity.	Total water requirement and wastewater generation calculations has been mentioned	Management shall ensure the proper disposal and avoidance of contamination.
10	Traffic Management	To minimize traffic problems in the Project Area.	• Proper traffic management plan should be formulated and announced before the construction to avoid traffic jams/public inconvenience.	Proper Traffic management plan prepared has been attached in annexure of EIA	To be implemented by management

				report	
11	Solid waste	To minimize odour, spreading of diseases and clogging of canal and drain.	• Waste management plan shall be devised including provision of waste bins, defining collection frequencies, allocating personnel and defining safe disposal options.	Proper Waste management plan prepared has been attached in Annexure of EIA report	To be implemented by management
12	Resource Conservation	To reduce the use of non-renewable resources.	• Proper planning for reduction of wastage of water should be done; • Provision of adequate insulation to reduce heat loss through batching plants; and using practical excess air volumes • Planning for regular monitoring of CO and CO2 content of the flue gases to verify that combustion systems are using practical excess air volumes	Total water requirement and wastewater generation calculations has been mentioned in EIA report	Management to ensure that proper disposal should be made
B. CONSTRUCTION STAGE					
Sr. No	Project Component or Impact	Target	Mitigation	Responsibility	
1	Topography	To minimize adverse impact to topography of the Project	• Where the use of agricultural land is unavoidable, the top 30 cm of the plough layer will be stripped of and stockpiled	Lahore Smart City	

		Area	for redressing the land after the required borrow material has been removed; • Where deep ditching is to be carried out, the top 1m layer of the ditching area will be stripped and stockpiled. The ditch will initially be filled up with scrap material from construction and then leveled with the stockpiled topsoil; • Ditches or borrow pits that cannot be fully rehabilitated will be landscaped to minimize erosion and to avoid creating hazards for people; and • Landowners will be compensated according to the terms of lease agreements negotiated with them and the restoration actions agreed upon by the Contractor will be duly carried out.	
2	Soil	To minimize soil erosion and contamination	• Low embankments will be protected by planting Vetiver grass that can flourish in relatively dry conditions; • Soil contamination by asphalt will be minimized by placing all containers in caissons;	Lahore Smart City

			• All spoils will be disposed off as desired and the site will be restored back to its original conditions before handing over; • Non- bituminous wastes from construction activities will be dumped in approved sites, in line with the legal prescriptions for the dumpsites, and covered; • Productive land or land adjacent to agricultural land may not be preferred for excavation; and • Non-productive, barren lands in broken terrain, nullahs and publicly recognized waste lands should be given preference for borrowing materials.	
3	Land Acquisition	To provide compensation to the affectees.	• Provide judicious compensation to the affectees by providing sufficient budget in the project cost. The process of land acquisition and compensation should be followed in a transparent manner to minimize the impacts.	Lahore Smart City
4	Construction Camps/	To minimize loss of assets and vegetation/ tees due to	• The contractor(s) should provide plan for removal & rehabilitation of site upon	Lahore Smart City

	Camp Sites	construction of construction camps.	completion; • Photographical and botanical inventory of vegetation before clearing the site; and • Compensatory plantation to be scheduled when construction works near end.	
5	Health and safety of workers and communities	To minimize health risks	*Health & Safety of workers:* • Obligatory insurance against accidents for labourers/workers; • Provide basic medical training to specified work staff and 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 material, first aid, security, fencing, and contingency measures in case of accidents; • Work safety measures and good workmanship practices are to be followed by the contractor to ensure no health risks for labourers;	Lahore Smart City

			• Protection devices (ear muffs) should be provided to the workers doing job in the high noise areas; • Provision of adequate sanitation, washing, cooking and dormitory facilities; • Proper maintenance of facilities for workers will be monitored; • Provision of protective clothing i.e. helmet, adequate footwear for bituminous pavement works, protective goggles, gloves etc. for labourers handling hazardous materials; • Ensure strict use of wearing these protective clothing during work activities; • Instruct foremen to strictly enforce the keeping out of non-working persons, particularly children, off work sites; and • Adequate signage, lightning devices, barriers, yellow tape and persons with flags during construction to manage traffic in Lundianwala Area and other	

			access roads. *Community Health & Safety:* • There should be proper control on construction activities and oil spillage/ leakage from construction vehicles/ machinery. • The labour works with different transmittable diseases should be restricted within the construction site; • Timely public notification on planned construction works; • Close consultation with local communities to identify optimal solutions to maintain community integrity & social links; • Fencing around the camps should be strong enough so that it cannot be broken easily by local people for making passages; and • Use of water should not disturb public water availability and source of water should be selected carefully.	

6	Borrow/Open Pits	To avoid land disputes and to minimize soil erosion	• Borrow pits will be restored with the consent of owners and one possible option provided will be conversion of pits to fish farms; • Necessary permits must be obtain for any borrow pits from the competent authorities; • Care must be taken in selection of borrow area so that it is not posing any threat /danger to road construction, stability and safety; • In borrow pits the depth of the pit will be regulated so that the sides of the excavation will have a slope not steeper than 1:4; • Soil erosion along the borrow pit shall be regularly checked to prevent / mitigate impacts on adjacent lands; and • In case borrow pits fill with water, measures have to be taken to prevent the creation of mosquito-breeding sites	Lahore Smart City
7	Air Quality	To minimize air pollution	• All vehicles, machinery, equipment and generators used during construction	Lahore Smart City

			activities should be kept in good working condition and be properly tuned and maintained in order to minimize the exhaust emissions; • Open burning of solid waste from the Contractor's camps should be strictly banned; • Preventive measures against dust should be adopted for on-site mixing and unloading operations. Regular sprinkling of the site by water should be carried out to suppress excessive dust emission(s); • Emissions from power generators and construction machinery are important point sources at the construction sites. Proper maintenance and repair is needed to minimize the hazardous emissions; • Quarry areas and asphalt plants should be located at least 500m downwind from populated areas, wildlife habitats and contractor's camps to minimize the	

			impact of dust emissions; • Asphalt, hot mix and batching plants should be equipped with dust control equipment such as fabric filters or wet scrubbers to reduce level of dust emissions; • NEQS applicable to gaseous emissions generated by construction vehicles, equipment and machinery should be enforced during construction works; • Ensure precautions to reduce the level of dust emissions from hot mix plants, crushers and batching plants should be taken up; e.g. providing them as applicable, with protection canvasses and dust extraction units. Mixing equipment should be well sealed and equipped as per existing standards; • Regular sprinkling to avoid dust; and • Regular monitoring of air quality in accordance with NEQS	
8	Noise	To minimize noise pollution	• Selection of up-to-date and well-maintained plant or equipment with	Lahore Smart City

			reduced noise levels ensured by suitable in-built damping techniques or appropriate muffling devices; • Confine excessively noisy work to normal working hours in the day, as far as possible; • Provide the construction workers with suitable hearing protection like ear cap or earmuffs and train them in their use; • Preferably, restrict construction vehicles movement during nighttime; • Heavy machinery like percussion hammers and pneumatic drills should not be used during the night; • Vehicles and equipment used should be fitted, as applicable, with silencers and properly maintained; • Use of low noise machinery, or machinery with noise shielding and absorption; • Contractors should comply with submitted work schedule, keeping noisy operations away from sensitive	

			points; implement regular maintenance and repairs; and employ strict implementation of operation procedures; • Noise barriers in sensitive areas in the form of high boundary walls (concrete or wood), earth berms, etc. in front of schools, hospitals/ clinics and mosques; and • Public hearings to discuss appropriate solutions and materials to control noise (e.g., mud or brick walls, bushes, etc.); and	
9	Surface & Groundwater	To avoid contamination of surface and groundwater and to avoid use of canal water in construction work.	• Protection of surface and groundwater reserves from any source of contamination such as the construction and oily waste that will degrade its potable quality; • The solid waste should be disposed of in designated landfill sites to sustain the water quality for domestic requirements; • Water required for construction should be obtained in such a way that the water	Lahore Smart City

			availability and supply to nearby communities remain unaffected; • Conduct regular water quality monitoring according to Drinking Water Quality Standards and determined sampling schedule; • The contractor should ensure that construction debris do not find their way into the drainage or irrigation canals which may get clogged; • Work on canal areas should be kept to a minimum or protective walls should be constructed; • Prohibit washing of machinery and vehicles in surface water provide sealed washing basins and collect wastewater in sedimentation/retention pond • Construction work close to the water bodies should be avoided, especially during monsoon period; and • Wastes must be collected, stored and taken to approve disposal site. *Spill Control*	

			• No refueling, storage, servicing or maintenance of equipment's should take place within 150 feet of drainages or other sensitive environmental resources; and • Any fluids drained from the machinery during servicing will be collected in leak proof container and taken to an appropriate disposal or recycling facility.	
10	Flora	To minimize the impact on flora	• The indigenous trees most suited to the tract should be re-planted; • Flowering and fruiting shrubs should be planted along the road to beautify the landscape. Planting would however be done keeping in view the principles of landscape designing; • An awareness campaign targeted on the neighborhood farmers should be run to popularize the planting of trees; • The contractor's staff and labour should be strictly directed not to damage any vegetation such as trees or bushes. They	Lahore Smart City

			should use the paths and tracks for movement and should not be allowed to trespass through farmlands; • Construction vehicles, equipment's and machinery should remain confined within their designated areas of movement; • Contractor should supply gas cylinders at the camps for cooking purposes and cutting of trees/bushes for fuel should not be allowed; and • Camp sites and asphalt plants should be established on waste/barren land rather than on forested or agriculturally productive land. However, if such type of land is not available, it should be ensured that minimum clearing of the vegetation is carried out and minimum damage is caused to the trees	
11	Fauna	To minimize the impact on fauna and avi- fauna and their dislocation	• Plantation of large number of trees along the proposed project to regain the ecological habitat; • New and good condition machinery with	Lahore Smart City

			minimum noise should be used in construction; • Noisy work should not be carried out in night time so that there should be no disturbance to local birds and animals; • Contractor should ensure that the no hunting, trapping of animals should be carried out during construction; Borrow pits should be fenced so that no animal can fell into these; • The camps should be properly fenced and gated to check the entry of wild animals in search of eatable goods. Similarly waste of the camps should be properly disposed off to prevent the chances of eating by wild animals, which may prove hazardous to them; and • Special measures should be adopted to minimize impacts on birds such as avoiding noise generating activities during the critical period of breeding.	
12	Disposal of mucking material	To minimize the scars on the land in the project area	• The excavated materials that are unsuitable for use will need to be stored,	Lahore Smart City

			transported and disposed of appropriately at designated sites.	
13	Disruption of existing public utilities and infrastructure	To minimize the disturbance to public utilities and infrastructure	• Rehabilitation of existing utilities before construction to avoid any inconvenience to the residents of the project area or provide them with alternate arrangement during the construction period.	Lahore Smart City
14	Traffic Management	To minimize traffic problems in the project area	• Proper traffic management plan should be implemented to avoid traffic jams/public inconvenience • Movement of vehicles carrying construction materials should be restricted during the daytime to reduce traffic load and inconvenience to the local residents/ business owners; • Coordinate planning of traffic diversions with the traffic police and the Transport Department in accordance with the construction program with advance warnings to the affected residents and road users; • Availability of continuous services of the traffic police in the diversion and control	Lahore Smart City

			of traffic; and • The executing agency is required to maintain liaison between the Highway/ Traffic Police, local residents/ travelers and the contractor to facilitate traffic movement during construction stage.	
15	Maintenance of Construction Equipment	Improper maintenance of construction equipment may lead to safety and environmental hazards like groundwater and soil contamination or injury to workers	• Place substantial blocking under any chain-hoist-suspended or jack supported equipment under which people must work. • All work areas should be provided with proper ventilation. • Always keep a suitable fire extinguisher ready. • Put oily rags in closed metal containers for disposal after use • Secure unbolted heavy parts or engines if necessary to leave the work	Lahore Smart City
16	Impact of heavy vehicles on existing roads network	To minimize air and noise pollution, traffic congestion and damage to roads	• Vehicle with the open load carrying area used for transportation of materials should have properly fitted side and tail boards; • Materials having potential to produce	CC, SC, EC

			dust should not be loaded to a level higher than the side and tail boards and should be covered with clean tarpaulin in good condition. The tarpaulin should be properly secured and extended to at least 300 mm over the edges of the side and tail board; and • The contractor should not use any vehicle either on or off road with excessive noise pollution. Noise mufflers should be installed and maintained in good condition on all motorized equipment's.	
17	Solid & liquid waste (municipal, construction and hazardous waste)	To minimize the impact on soil and water resources	• Wastewater effluent from contractor's workshop and equipment washing yards should be passed through gravel/ • sand beds to remove oil/ grease contaminants before discharge; • Training of work force should be conducted in the and handling of materials and chemicals that can potentially cause soil contamination; • Solid waste generated during construction and camp sites should be	Lahore Smart City

			safely disposed in demarcated waste disposal sites and the contractor should provide a proper waste management plan; • Reusable/recyclable (iron bars, aluminum) waste should be sold to waste vendors and those which cannot be sold out may be used as a filling material for leveling the depressions, subject to technical feasibility; • Debris generated by dismantling of existing pavement structures should be re-used subject to the suitability of the material; • Ensure proper labelling of containers, including the identification and quantity of the contents, hazard contact information etc.; • Conduct training of employees involved in the transportation of hazardous material regarding emergency procedures; • Provide the necessary means for	

			emergency response on call 24 hours/day; • The sewage system for camps should be properly designed (pit latrines or, as required, septic tanks) to receive all sanitary wastewaters; • Lined wash areas should be constructed within the camp site or at site, for the receipt of wash waters from construction machinery; and • Construction workers and supervisory staff should be encouraged and educated to practice waste minimization, reuse and recycling to reduce quantity of waste.	
18	Disturbance to people	To minimize the disturbance (hindrance in free movement) to people in the project area	• Timely completion of the construction work and provide alternate routes for the areas where the construction is being carried out.	CC, SC, EC
C. OPERATIONAL STAGE				
1	Flora	Proper maintenance of saplings planted	• The saplings planted in the project area against the trees affected should be properly maintained throughout their initial growth period in terms of water	Lahore Smart City

			requirement and necessary nutrients; • An awareness campaign targeted on the neighborhood farmers should be run to popularize the planting of trees; and • Organic farming will be encouraged to minimize the use of chemical fertilizers and pesticides.	
2	Fauna	To provide alternate crossings for animals and livestock	• Provision of animals/livestock crossings after every some distances to facilitate their movements; and • Installation of sign boards indicating the sensitive areas for the road users to avoid accidents	Lahore Smart City
3	Noise	To minimize noise pollution	• Noise measurements should be carried out at locations and schedule specified in the Environmental Management Plan (EMP) to ensure the effectiveness of mitigation measures; • Signs for sensitive zones (health centers/educational institutions etc.) to disallow the use of pressure horns and • Enforcement band penalties against traffic rules violators	Lahore Smart City

4	Road safety	To control speed violation	• Strict enforcement of speed limits, installation of speed guns and channelization of traffic with respect to categories (heavy vehicle traffic and light vehicle traffic) and enforcement of penalties for the violators.	Lahore Smart City
5	Drainage	To avoid chocking, flooding and nuisance to public.	• The impact can be controlled/ reduced by timely and continuous maintenance/ cleaning of the drainage system; and • Placement of sign boards instructing not to dispose of solid waste to avoid chocking of drain.	Lahore Smart City

7.6 ENVIRONMENTAL MONITORING PLAN

Environmental monitoring is a vital component of the Environmental Management Plan. It is the mechanism through which the effectiveness of the environmental management Plan in protecting the environment is measured. The feedback provided by the environmental monitoring is instrumental in identifying any problem or lapse in the system under implementation and planning corrective actions.

Table 7-25: Environmental Monitoring Plan

Env. Components	Project Stage	Parameters	Instrument	Standards	Monitoring			Institutional Responsibility
					Location	Frequency	Duration	
Air	Construction	PM_{10}, SO_2, NO_2, CO, SPM ,O_3	Air Quality Monitors/Gadgets	PEQS	Project site	Twice during construction	As per approved testing method	Contractor through approved monitoring lab
	Construction	Stack emissions	Air Quality Monitors/Gadgets	PEQs	stack	Quarterly	As per approved testing method	Through approved third party/monitoring lab

Noise Levels	Construction	Noise levels on dB(A) scale	Digital Sound Meter	PEQs	Project site	Twice during construction	Reading to be taken at 15 seconds interval for 15 minutes every hour and then averaged	Contractor through approved monitoring lab
	Construction	Noise levels on dB(A) scale	Digital Sound Meter	PEQs	Project site	Quarterly	Reading to be taken at 15 seconds interval for 15 minutes every hour and then averaged	Through approved third party/monitoring lab
Wastewater	Construction	BOD, COD, TSS etc	Through approved equipments	PEQs	ETP	Quarterly	As per approved testing method	Through approved third party/monitoring lab

7.7 INSTITUTIONAL CAPACITY OF THE UNIT

The organizational structure for the Environment Management Plan is outlined below:

7.7.1 Primary Responsibilities

The primary responsibility for implementing different aspects of the EMP within the company lies with the concerned departments of Lahore Smart City

7.7.2 Operation Management & Control

Conducting the operational activities in environmentally sound manner will be the responsibility of the Manager concerned; for which he will be trained.

7.7.3 Supervision & Monitoring

Senior Supervisor will be responsible for all environmental issues and for the implementation of EMP.

7.7.4 Communications & Documentation

An effective mechanism to store and communicate environmental information during the project is an essential requirement of an EMP.

7.7.4.1 Meetings

As environment is multidisciplinary subject with environmentalist having a dynamic role therefore In-charge environment would be considered as integral part in both constructional and operational team. Participation of Environmental in-charge in daily morning meeting and any other special meeting is mandatory. Besides internal meeting HSE in-charge/Environment in-charge is also responsible to conduct meeting with local in keeping administration in liaison.

7.7.4.2 Changes-Record Register

A change-record register will be maintained at the site, in order to document any changes in project design. These changes will be handled through the change management mechanism.

7.8 ENVIRONMENTAL TRAINING

Environmental training will help to ensure that the requirements of the EIA and EMP are clearly understood and followed by all project personnel in the course of the project.

Table 26 Training Program

Target audience	Trainers	Contents	Schedule
Selected management staff	Contractors	Key finding of mitigation measure	After every five months
All personnel	HSE Officer	Mitigation measures	Monthly
Technical Staff	HSE Officer	Waste disposal or sale out status, vehicle movement restriction and other mitigation measures	After every three month
Other staff	HSE Officer	Waste disposal, resource conservation and other mitigation workers	Monthly

7.9 EQUIPMENT MAINTENANCE DETAILS

The project is about Construction of Interchange at Lahore Smart City. Machines in said unit will be maintained on the regular basis. Following is the maintenance details for the machines and equipments:

Task	**Weekly**	**Monthly**	**Semi-Annually**	**Annually**
Visual Inspection	✓			
Testing and Inspection		✓		
Maintenance of Machines				
Fire Mains and Nozzles				
Containers/Cylinders				

Control and Section Valves				

7.10 ENVIRONMENTAL BUDGET

Approximately PKR 150 million budget will be reserved for tree plantation, solid waste management, wastewater management and environmental monitoring. Monitoring tests for ambient air quality, noise and groundwater quality will also be conducted.

CHAPTER 8

CONCLUSION AND RECOMMENDATIONS

CHAPTER 8: CONCLUSION AND RECOMMENDATIONS

8.1 CONCLUSION

The report presents Environmental Impact Assessment (EIA) of the said unit. EIA of said Project is performed according to guidelines of EPA. It includes description of the project, description of the environmental baselines, potential environmental impacts and suggested mitigation measures. An implementation mechanism for mitigation measures in the form of an Environmental Management Plan is included in the study.

The performed EIA showed all anticipated impacts (both positive and negative), associated with the project. Appropriate mitigation measures as explained in the environmental study will strengthen the environment and promote sustainable development.

Based on overall assessment of the environmental impact of the project, it is concluded that the economic benefit from the project is not at the cost of environment. From the historical records and vast experience in sustainable development keeping environment as integral part of manufacturing system, Lahore Smart City is worthy of Environmental approval. Further the project is not likely to cause any significant adverse impact on the physical and biological environment but positive impact on social development and economic prosperity of the area, provided that suitable mitigation measures as identified in this study are implemented.

It is accordingly recommended that Environmental Approval for the project may be issued by the Punjab Environmental Protection Agency, subject to payment of the requisite scrutiny fee by the proponent of the project.

8.2 RECOMMENDATIONS

The Environmental Impact Assessment study and survey results are finally evaluated to recommend the following:

- Implementation of EMP must be given top priority.
- Proper PPEs including ear plugs, ear muffs, mufflers, goggles, gloves and shoes etc. should be provided to workers
- Train workers to use PPEs

- Advise workers to follow SOPs.
- Equipment maintenance and efficiency must be checked.
- No compromise on public health and environment should be allowed.
- A proper judicious compensation to the land and structure affectees must be given to the respective owners;
- A proper traffic diversion plan must be formulated and conveyed to the road users;
- Tree plantation plan must be followed during operational phase;
- Operation and maintenance of the drainage structures and road wear and tear must be done periodically;
- Health and safety plan for the workers must be followed during construction phase; and
- Environmental compliance during the construction phase of the project must be done for which EMP must be a part of the construction contract document
- At the same time, communication shall be made with hospitals, emergency services and police for urgent support.
- The proposed Environmental Management & Monitoring Plan should be implemented.
- The construction and installation should be completed in guidelines of accorded Environmental Approval.

ANNEXURE I

PROPONENT CNIC

PAKISTAN National Identity Card

ISLAMIC REPUBLIC OF PAKISTAN

Name
Mazhar Latif

Father Name
Abdul Latif

Gender | Country of Stay
M | Qatar

Identity Number	Date of Birth
32303-0682597-3	01.08.1971
Date of Issue	Date of Expiry
02.12.2020	02.12.2030

Holder's Signature

FOR EPA APPROVAL

Present Address :
Valanshia Housing Society, H.No. 27, Block H, Lahore, Lahore City, District Lahore Pakistan

32303-0682597-3

Permanent Address :
Valanshia Housing Society, H.No. 27, Block H, Lahore, Lahore City, District Lahore Pakistan

Registrar General of Pakistan

The Holder is entitled visa free entry into Pakistan

198461459308
317-89-101734

FOR EPA APPROVAL

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7108019M3012028PAKBRKELO<<<<<7
LATIF<<MAZHAR<<<<<<<<<<<<<<<<

ANNEXURE II

PROPERTY DOCUMENTS

LAHORE SMART CITY INTERCHANGE

فرد کی تصدیق کے لیے اپنے موبائل فون سے (QR) کوڈ سکین کریں۔

نقل رجسٹر حقداران زمین (مسل میعادی)

محال چک نمبر ۲۲یو سی ؁ طرف/پتی عدارد تحصیل فیروزوالہ ضلع شیخوپورہ سال 2019-20 کتاب نمبر ورق نمبر 23 / 1

۱	۲	۳ (الف)	۳ (ج)	۳ (د)	۳ (ہ)	۳ (و)	۴	۵	۶	۷	۸	۹	۱۰
نمبر کھیوٹ مالک	نمبر کھتونی کاشتکار	کوائف مالک: نام مالک معہ نام والد/خاوند قوم اور سکونت	نوعیت حقوق مالک یا رہن مرتہن	مشترکہ کھاتہ میں مخصوص حصہ	مخصوص رقبہ مطابق حصہ	زرعی پاس بک نمبر	نام کاشتکار معہ احوال	نمبر خسرہ معہ نام اگر کوئی ہو	رقبہ و قسم زمین کھیت دار اور میزان کھتونی کاشتکار و کھیوٹ مالک	وسائل آبپاشی معہ نام چاہ/راجباہ وغیرہ	لگان جو کاشتکار ادا کرتا ہے شرح اور مطالبہ	مطالبہ معہ تفصیلات مالیہ و حبوب	کیفیت معہ 1 - نام نمبردار (اگر کوئی ہو) 2 - شرح مالیہ زمین
5/3 5	26/2 تا 32/1	لاہور سمارٹ سٹی پرائیویٹ لمیٹڈ بذریعہ فضل عمر خان ولد سنجاب خان	مالک	80/7563	4-0-0		باقی بدستور	قطعات 51	سالم کھاتہ 378-3-0 تین سو اٹھتر کنال تین مرلہ				بحوالہ انتقال نمبر 3729 فک آزر ہن منفصلہ مورخہ 2010/02/11 کھاتہ ہذا رقبہ تعدادی 0-0-0 کا بقدر 0-3-12 منجانب فیصل بینک بحق رحمت علی ولد سارنگ، بلعوض مبلغ 660000 فک آزر ہن ہو چکا ہے
		(ب) قومی شناختی کارڈ نمبر 35201-1261560-3		حصہ منتقلہ 80/7563	رقبہ منتقلہ 4-0-0								
		لاہور سمارٹ سٹی پرائیویٹ لمیٹڈ بذریعہ فضل عمر خان ولد سنجاب خان ساکن مکھی نمبر5، عثمان، E/ن نمبر 960 سٹریٹ، محلہ منورہ آباد، غازی روڈ، لاہور کینٹ	مالک	40/7563	2-0-0								
		(ب) قومی شناختی کارڈ نمبر 35201-1261560-3		حصہ منتقلہ 40/7563	رقبہ منتقلہ 2-0-0								
		باقی بدستور میزان		2481/2521 40/2521	6-0-0								

Arazi Record Center • Service Center Official • Tehsil Ferozwala Distt. Sheikhupura

نقل مطابق اصل ہے نام درخواست کنندہ طارق مسیح ولد عاشق مسیح

فرد برائے ذاتی ریکارڈ قوم

شناختی کارڈ نمبر 3540124676555

نام اجراء کنندہ محمد قیصر رمضان ولد محمد رمضان

تاریخ فرد پرنٹنگ 22/07/2025 15:35:04

تاریخ فرد اجراء 22/07/2025 15:24:31

کمپیوٹرائزڈ نقل۔ دستخط کی ضرورت نہ ہے۔ فرد آئی ڈی 0-00-00-084-00-00-00-0025743936-00-00-0

اراضی ریکارڈ سنٹر فیروزوالہ

فرد فیس 1,100

ٹوکن نمبر 67 تاریخ ٹوکن اجراء 22/07/2025 14:04:51

CamScanner

فرد کی تصدیق کے لیے اپنے موبائل فون سے (QR) "" سکین کریں۔

نقل رجسٹر حقداران زمین (مسل میعادی)

محال چک نمبر ۲۳ یو سی طرف / پتی ۔۔۔ تحصیل فیروزوالہ ضلع شیخوپورہ سال 2019-20 کتاب نمبر ورق نمبر 23 / 15

۱	۲	۳ (الف)	۳ (ج)	۳ (د)	۳ (ہ)	۳ (و)	۴	۵	۶	۷	۸	۹	۱۰
نمبر کھیوٹ مالک	نمبر کھتونی کاشتکار	کوائف مالک: نام مالک معہ نام والد / خاوند قوم اور سکونت	نوعیت حقوق مالک راہن مرتہن	مشترکہ کھاتہ میں مخصوص حصہ	مخصوص رقبہ مطابق حصہ	زرعی پاس بک نمبر	نام کاشتکار معہ احوال	نمبر خسرہ معہ نام اگر کوئی ہو	رقبہ و قسم زمین کھیوٹ وار اور میزان کھتونی کاشتکار و کھیوٹ مالک	وسائل آبپاشی معہ نام چاہ / اجباہ وغیرہ	لگان جو کاشتکار ادا کرتا ہے شرح اور مطالبہ	مطالبہ معہ تفصیلات مالیہ وجوب	کیفیت معہ 1 - نام نمبردار (اگر کوئی ہو) 2 - شرح مالیہ زمین
7/2/2 7/2	42/2 تا 60/2	لاہور سمارٹ سٹی پرائیویٹ لمیٹڈ بذریعہ فضل عمر خان ولد سجاب خان ۳(ب) قومی شناختی کارڈ نمبر 35201-1261560-3	مالک	51/433 حصہ منتقلہ 51/433	38-5-0 رقبہ منتقلہ 38-5-0		باقی بدستور	قطعات 77	سالم کھاتہ 324-15-0 تین سو چوبیس کنال پندرہ مرلے				بحوالہ انتقال نمبر 4919 فک آڑ رہن منسوخ مورخہ 29/12/2018 کھاتہ بذار قبہ تعدادی 324-15-0 کا 109/2165 بقدر 16-7-0 منجانب اکبر علی ولد غلام محمد بحق فیصل بنک لمیٹڈ بلعوض مبلغ 17000000 فک آڑ رہن ہو چکا ہے
		باقی بدستور میزان		382/433 51/433	38-5-0								

0-00-00-084-00-00-00-0025743936 فرد آئی ڈی

کمپیوٹرائزڈ نقل۔ دستخط کی ضرورت نہ ہے۔

اراضی ریکارڈ سنٹر فیروزوالہ

نام اجراء کنندہ: محمد قیصر رمضان ولد محمد رمضان

تاریخ فرد پرنٹنگ: 22/07/2025 15:35:04

تاریخ فرد اجراء: 22/07/2025 15:24:31

فرد فیس: 1,100

ٹوکن نمبر: 67

تاریخ ٹوکن اجراء: 22/07/2025 14:04:51

تفصیل حاصل کنندہ: نام درخواست کنندہ: طارق سیح ولد عاشق سیح

قوم

شناختی کارڈ نمبر: 3540124676555

فرد برائے ذاتی ریکارڈ

فردی تصدیق کے لیے اپنے موبائل فون سے (QR) کوڈ سکین کریں۔

نقل رجسٹر حقداران زمین (مسل میعادی)

محال چک نمبر ۳۴ یو سی | طرف/پتی عارو | تحصیل فیروزوالہ | ضلع شیخوپورہ | سال 2019-20 | کتاب نمبر | ورق نمبر 23 / 22

۱	۲	۳ (الف)	۳ (ج)	۳ (د)	۳ (ہ)	۳ (و)	۴	۵	۶	۷	۸	۹	۱۰
نمبر کھیوٹ مالک	نمبر کھتونی کاشتکار	کوائف مالک					نام کاشتکار معہ احوال	نمبر خسرہ معہ نام اگر کوئی ہو	رقبہ و قسم زمین کھیت وار اور میزان کھتونی کاشتکار و کھیوٹ مالک	وسائل آبپاشی معہ نام چاہ/ اجباہ وغیرہ	لگان جو کاشتکار ادا کرتا ہے شرح اور مطالبہ	مطالبہ معہ تفصیلات مالیہ و حبوب	کیفیت معہ 1 - نام نمبردار (اگر کوئی ہو) 2 - شرح مالیہ زمین
		نام مالک معہ نام والد/ خاوند قوم اور سکونت	نوعیت حقوق مالک راہن مرتہن	مشترکہ کھاتہ میں مخصوص حصہ	مخصوص رقبہ مطابق حصہ	زرعی پاس بک نمبر							

نمبر کھیوٹ	مربع نمبر	خسرہ نمبران	خسرہ ویلیویشن	پیائش	جگہ
5/3	22	10سن, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 3, 4, 5, 6, 7, 8	0		
5/3	56	1, 10, 11, 12, 13, 15, 16, 19, 2, 20, 21, 22, 24, 25, 3, 5, 6, 8, 9	0		
5/3	58	12, 13, 19, 2, 26, 3/1سن, 4, 5, 7, 9	0		
7/2/2	10	1/1, 1/2, 10, 11/1, 11/2, 12/1, 12/2, 12/3, 13/1, 13/2, 14, 14/1, 14/2, 15, 16, 17/1, 17/2, 18/2, 19/1, 19/2, 2, 2/1, 2/2, 20/1, 20/2, 21/1, 22, 22/2, 23/1, 23/2, 24/1, 24/2, 24/3, 25/1, 25/2, 25/3, 3, 4, 4/2, 5, 5/1, 5/2/2, 6, 7, 8, 9	0		
7/2/2	57	12, 12/1, 13/1, 14/1, 14/2, 14/3, 15, 17/1, 17/3, 18/1, 18/2, 19/1, 19/2, 20سن, 22, 23/1, 24/1, 24/2, 24/3, 25, 3, 4/1, 4/2, 4/2سن, 5, 7/1, 7/2, 8/1, 8/2, 9/1, 9/2	0		

درخواست کنندہ: طارق مسیح ولد عاشق مسیح

قوم

3540124676555

نام اجراء کنندہ: محمد قیصر رمضان ولد محمد رمضان

تاریخ فرد پرنٹنگ: 22/07/2025 15:35:04

کمپیوٹرائزڈ نقل۔ دستخط کی ضرورت نہ ہے۔

اراضی ریکارڈ سنٹر فیروزوالہ

فرد آئی ڈی 0-00-00-084-00-00-00-0025743936

CamScanner

فرد کی تصدیق کے لیے اپنے موبائل فون سے (QR) کوڈ سکین کریں۔

نقل رجسٹر حقداران زمین (مسل میعادی)

محال چک نمبر ۲۳یوسی سی — طرف/پتی مدرد — تحصیل فیروزوالہ — ضلع شیخوپورہ — سال 2019-20 کتاب نمبر — ورق نمبر 23 / 23

۱	۲	۳ (الف)	۳ (ب)	۳ (ج)	۳ (د)	۳ (ہ)	۴	۵	٦	۷	۸	۹	۱۰
نمبر کھیوٹ بک	نمبر کھتونی کاشتکار	کوائف مالک					نام کاشتکار معہ احوال	نمبر خسرہ معہ نام اگر کوئی ہو	رقبہ و قسم زمین کھیت وار اور میزان کھتونی کاشتکار و کھیوٹ مالک	وسائل آبپاشی معہ نام چاہ و اجباہ وغیرہ	لگان جو کاشتکار ادا کرتا ہے شرح اور مطالبہ	مطالبہ معہ تفصیلات مالیہ و حبوب	کیفیت معہ 1 - نام نمبردار (اگر کوئی ہو) 2 - شرح مالیہ زمین
		نام مالک معہ نام والد/خاوند قوم اور سکونت	نوعیت حقوق مالک راہن مرتہن	مشترکہ کھاتہ میں مخصوص حصہ	مخصوص رقبہ مطابق حصہ	زرعی پاس بک نمبر							
								میزان کل رقبہ منتقلہ	44-5-0		چوالیس کنال پانچ مرلہ		
								کل کھیوٹ خسرہ ویلیویشن	0.00				

نقل مطابق اصل ہے ہم درخواست کنندہ — طارق بیگ ولد عاشق بیگ

شناختی کارڈ — قوم

نام اجراء کنندہ — محمد قیصر رمضان ولد محمد رمضان

تاریخ فرد پرنٹنگ — 22/07/2025 15:35:04

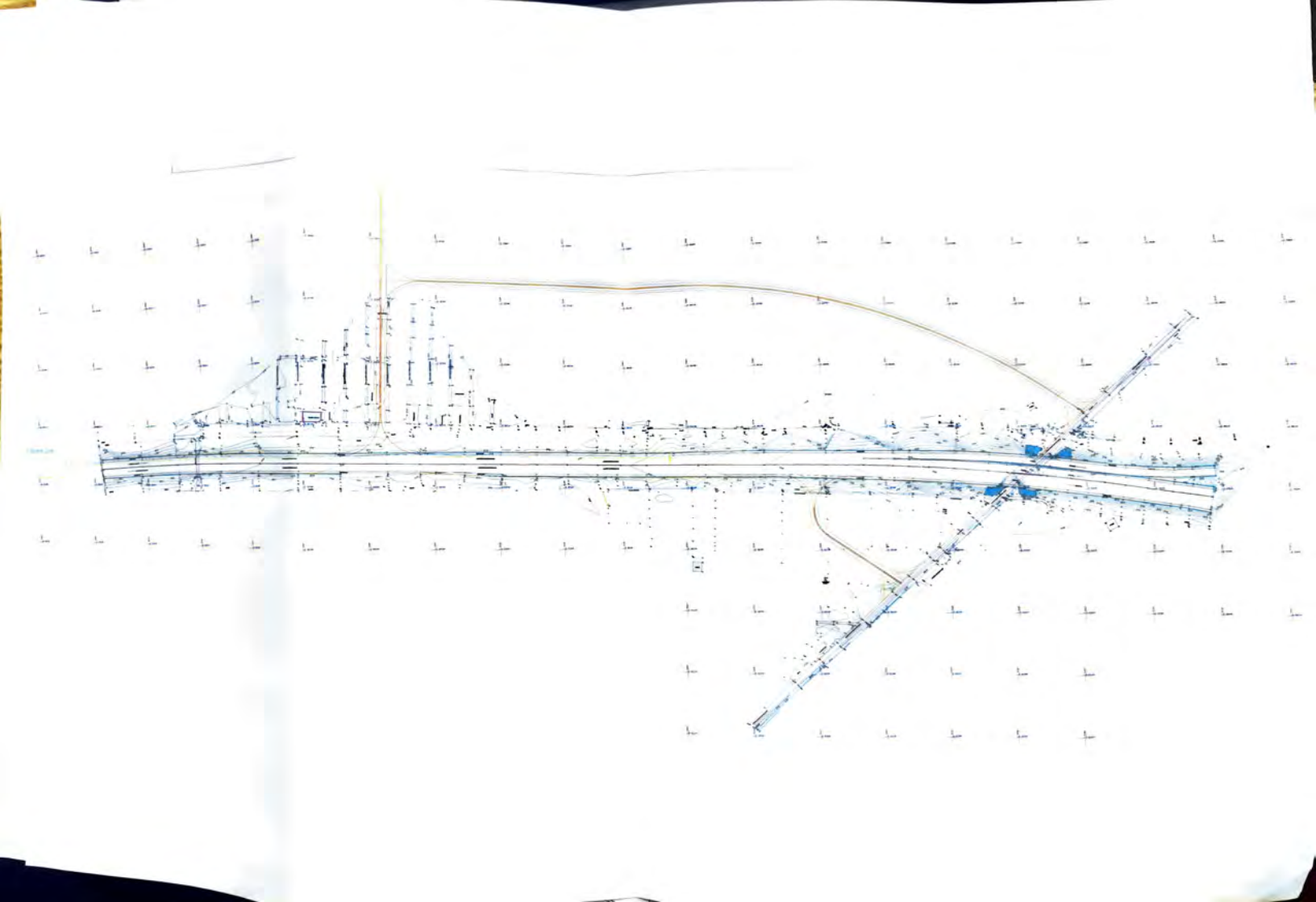
کمپیوٹرائزڈ نقل۔ دستخط کی ضرورت نہ ہے۔

اراضی ریکارڈ سنٹر فیروزوالہ

فرد آئی ڈی 0-00-00-084-00-00-00-0025743936

ANNEXURE III

LAYOUT MAPS



ANNEXURE IV

ENVIRONMENTAL MONITORING REPORTS

LAHORE SMART CITY INTERCHANGE

SOLUTION ENVIRONMENTAL & ANALYTICAL LABORATORY
EPA CERTIFIED

GROUND WATER ANALYSIS REPORT

Client Name: Construction of Interchange Lahore Smart City
Address: Lahore Smart City Kala Shah Kaku, Tehsil Ferozewala, District Sheikhupura

Sampling Point: Tap
Sampling Date: 25-07-2025
Sampling By: SEAL
Nature of Sample: Ground Water
Date of Completion: 31-07-2025
Temp. & Humidity: 23-30 C^0 & 50-70 %
Reference No.: SEAL/Lab/2025/GW/449

Results:

Sr. No.	Parameter	Method	Unit	Result	PEQS
1	pH	APHA 4500-H^+ B	--	7.80	6.5-8.5
2	Total Dissolved Solids (TDS)	APHA 2540 C	mg/l	323	1000
3	Chloride	4500- APHA Cl^- B	mg/l	22.34	250
4	Fluoride	APHA 4500-F^- D	mg/l	0.04	1.5
5	Taste	APHA 2120 B	Object. /unobj.	Unobject.	Unobject.
6	Odour	APHA 2120 B	Object. /unobj.	Unobject.	Unobject.
7	Colour	APHA 2120 B	TCU	0.22	15
8	Nitrate (as NO_3^-)	APHA 4500-NO^{3-} E	mg/l	0.1	50
9	Nitrite (as NO_2^-)	APHA 4500-NO^{2-} B	mg/l	0.001	3
10	Lead	APHA-Pb B	mg/l	BDL	0.05
11	Total Hardness as $CaCO_3$	APHA 2340 C	mg/l	23.76	500
12	Turbidity	APHA 2130 B	NTU	0.005	5
13	Zinc	APHA 3500-Zn B	mg/l	0.0	5
14	Aluminum	APHA 3111 D	mg/l	0.011	0.2
15	Chromium	APHA 3500-Cr B	mg/l	0.0	0.050
16	Cadmium	APHA 3500-Cd D	mg/l	BDL	0.01
17	Copper	APHA 3500-Cu C	mg/l	0.0	2
18	Boron	APHA 4500-B C	mg/l	0.026	0.300
19	Barium	APHA 3111 B	mg/l	0.038	0.700

HEAD OFFICE: Plot # 12, Water Avenue, Green View Society, Off Kacha Jail Road, Kot Lakhpat, Lahore, Pakistan. **PHONES:** +92-42-35922295-96, **FAX:** +92-42-35922296
EMAIL: info@seal.com.pk / nihalasghar@gmail.com / hr@seal.com.pk

KARACHI OFFICE: Office No, M06-07 In Fort Sultan Opp, Air Port Telephone Exchange, Shahrah-e-Faisal, Karachi, Pakistan.
PHONES: +92-300-9768799 **EMAIL:** karachi@seal.com.pk

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SOLUTION ENVIRONMENTAL & ANALYTICAL LABORATORY

EPA CERTIFIED

Client Name:	Construction of Interchange Lahore Smart City	**Address:**	Lahore Smart City Kala Shah Kaku, Tehsil Ferozewala, District Sheikhupura
Sampling Point:	Tap	**Nature of Sample:**	Ground Water
Sampling Date:	25-07-2025	**Date of Completion:**	31-07-2025
		Temp. & Humidity:	23-30 C^0 & 50-70 %
Sampling By:	SEAL	**Reference No.:**	SEAL/Lab/2025/GW/449

Results:

Sr. No.	Parameter	Method	Unit	Result	PEQS
20	Antimony	APHA 3114 C	mg/l	0.0	0.020
21	Arsenic	APHA 3114 C	mg/l	0.0014	0.050
22	Cyanide	APHA 4500-CN^- D	mg/l	0.0035	0.05
23	Mercury	APHA 3112	mg/l	BDL	0.001
24	Nickel	APHA 3111 B	mg/l	0.0	0.020
25	Residual Chlorine	APHA 4500-Cl_2	mg/l	0.266	0.2 – 0.5
26	Total Coliform	APHA 9222 B	Number/100ml	0	0/100 ml
27	Thermo Coliform	APHA 9222 B	Number/100ml	0	0/100 ml
28	E. coli	APHA 9222 C	Number/100ml	0	0/100 ml

PEQS = Punjab Environmental Quality Standards
BDL = Below Detection Limit
APHA = American Public Health Association

Note:

- This report should be reproduced as a whole and not in parts.
- The responsibility of the ethical use of the results reported in this report lies with the client.
- Consequently, the laboratory is absolved of its responsibility for any claim that may result through the use by the client or others of the results appearing in this report.
- The left-over samples (if so available) shall be retained for 10 days after the issuance of the report unless otherwise negotiated between the client and the laboratory.
- The report is not valid for any negotiation

ANALYZED BY	REVIEWED BY	APPROVED BY
Lab Analyst	Assistant Lab Manager	Lab Manager

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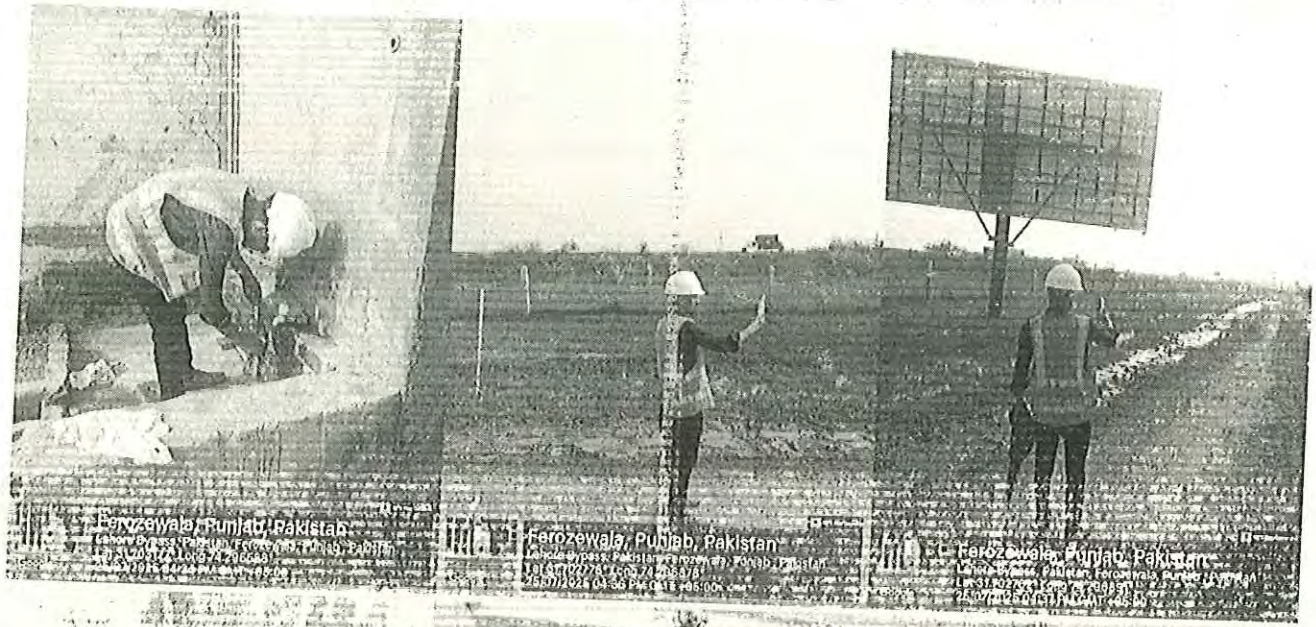
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AMBIENT AIR MONITORING REPORT

Client Name:	Construction of Interchange Lahore Smart City	**Address:**	Lahore Smart City Kala Shah Kaku, Tehsil Ferozewala, District Sheikhupura
Monitoring Point:	Mid of Site	**Time Duration of Monitoring:**	24 Hour
Monitoring Date:	25-07-2025 To 26-07-2025	**Reporting Date:**	31-07-2025
Monitoring By:	SEAL	**Reference No.:**	SEAL/LAB/2025/AA/001

Results:

Sr. No.	Time (Hours)	CO (mg/m3)	NOx (µg/m3)	SO2 (µg/m3)	PM10 (µg/m3)	PM 2.5 (µg/m3)
1.	01:00 PM	7.86	18.7	06	66.5	12.5
2.	12:00 PM	6.14	18.4	08	70.6	13.6
3.	03:00 PM	6.245	19.5	16	72.2	14.8
4.	04:00 PM	7.258	16.7	15	71.8	16.9
5.	05:00 PM	5.825	15.6	16	68.5	12.5
6.	06:00 PM	5.694	21.8	17	70.7	14.6
7.	07:00 PM	7.386	17.4	13	72.7	15.2
8.	08:00 PM	5.472	19.5	08	73.6	16.8
9.	09:00 PM	4.816	18.2	07	72.5	13.7
10.	10:00 PM	4.648	16.5	09	74.8	15.4
11.	11:00 PM	5.474	18.0	06	72.4	13.6
12.	12:00 AM	4.388	19.4	06	72.1	12.9
13.	01:00 AM	4.572	17.6	07	69.6	10.4
14.	02:00 AM	4.230	16.8	06	66.2	19.8
15.	03:00 AM	5.986	19.9	07	65.5	17.7
16.	04:00 AM	4.495	16.2	03	63.8	15.6
17.	05:00 AM	5.542	18.5	05	62.4	19.8
18.	06:00 AM	4.645	15.7	04	58.6	16.2
19.	07:00 AM	3.992	17.1	05	56.4	15.9
20.	08:00 AM	3.886	19.3	04	55.7	16.3
21.	09:00 AM	5.345	16.6	03	54.3	14.5


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22.	10:00 AM	4.542	15.8	05	57.2	16.6
23.	11:00 AM	3.872	18.6	07	58.5	16.7
24.	12:00 PM	4.795	17.7	09	52.6	15.5
Average		5.29	17.89	8.0	65.8	15.31
PEQS		10	80	120	150	35

PEQS: Punjab Environmental Quality Standards

Note:

- Quality was assured through self-calibration of the instrument.
- The measurements were carried out on client request.
- The client is responsible lawful usage of reported data in future.
- The report is not valid for any negotiations.

ANALYZED BY	REVIEWED BY	APPROVED BY
		for
Lab Analyst	Assistant Lab Manager	Lab Manager


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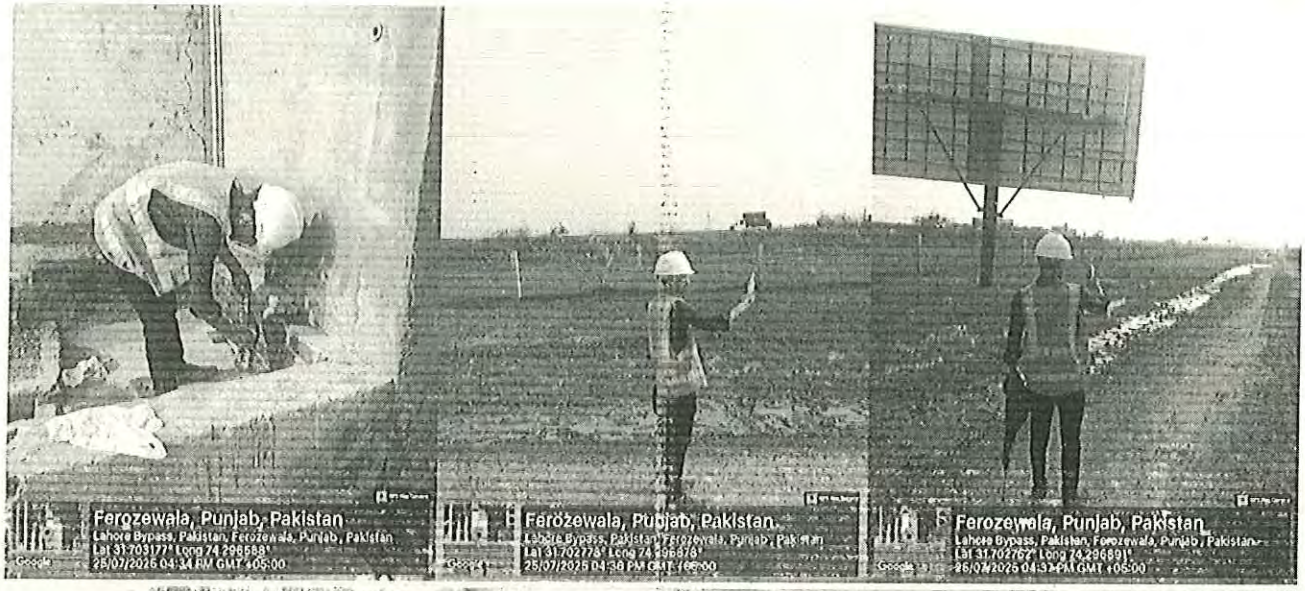
NOISE LEVEL MONITORING REPORT

Client Name:	Construction of Interchange Lahore Smart City	**Address:**	Lahore Smart City Kala Shah Kaku, Tehsil Ferozewala, District Sheikhupura
Monitoring Point:	Mid Of Project		
Monitoring Date	25-07-2025	**Instrument Used:**	Digital Sound Level Meter BSWA-308
Reporting Date:	31-07-2025	**Time of Monitoring:**	24 Hours
Monitoring By:	SEAL	**Reference No.:**	SEAL/LAB/2025/NM/001

Results:

Sr. No.	Time	Noise dB(A)		PEQS
1	04:00 PM	51.5	Day Time	55
2	05:00 PM	56.5		
3	06:00 PM	54.3		
4	07:00 PM	56.2		
5	08:00 PM	59.1		
6	09:00 PM	51.7		
7	10:00 PM	55.5		
8	11:00 PM	47.0	Night Time	45
9	12:00 AM	46.4		
10	01:00 AM	45.5		
11	02:00 AM	42.4		
12	03:00 AM	47.0		
13	04:00 AM	43.2		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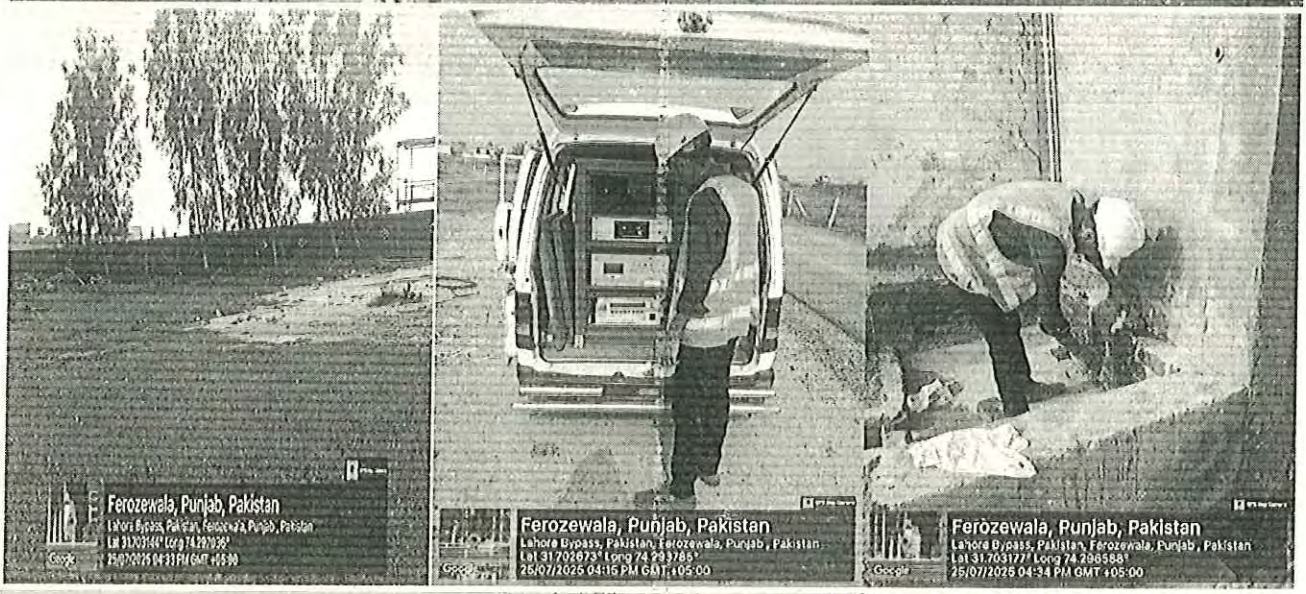
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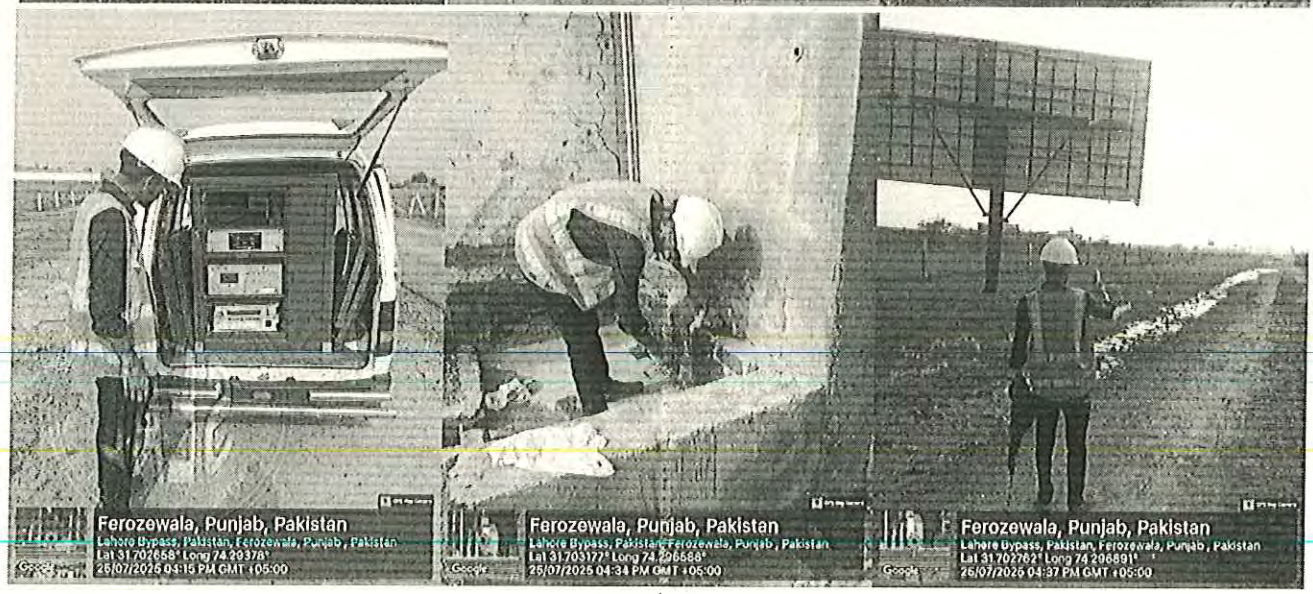
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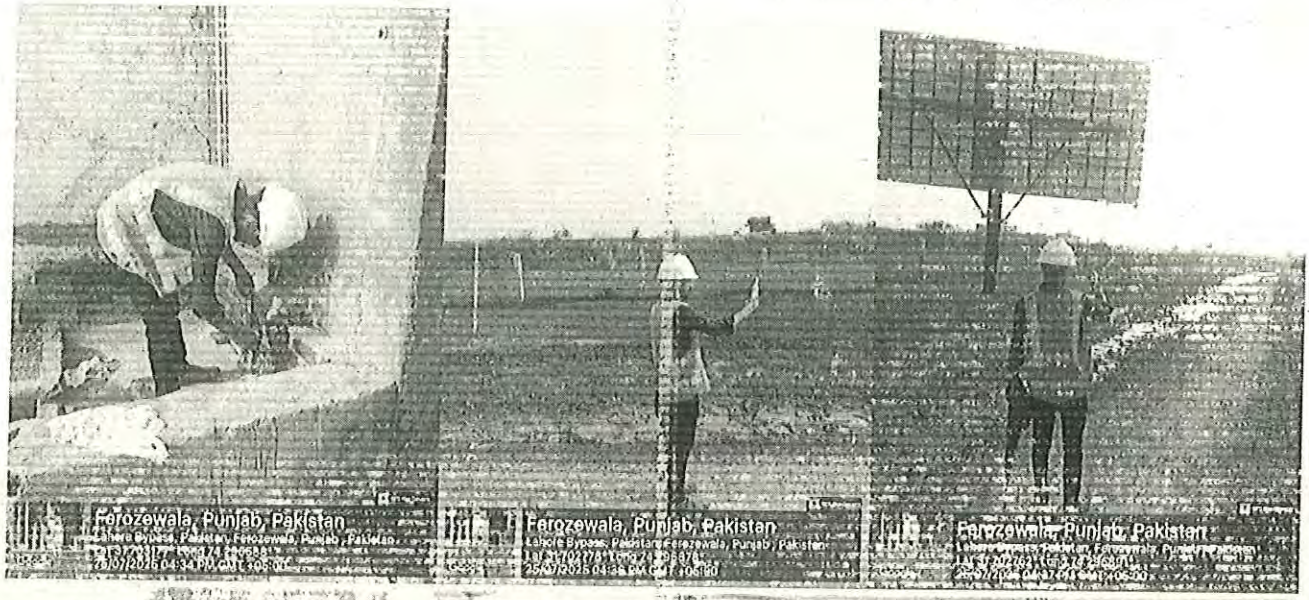
14	05:00 AM	43.6	Night Time	45
15	06:00 AM	44.6		
16	07:00 AM	52.3	Day Time	55
17	08:00 AM	54.1		
18	09:00 AM	51.2		
19	10:00 AM	57.7		
20	11:00 AM	46.0		
21	12:00 PM	54.5		
22	01:00 PM	57.3		
23	02:00 PM	58.1		
24	03:00 PM	51.3		
Average Noise Level		**49.0dB(A) Leq**		

PEQS: Punjab Environmental Quality Standards

Note:

- The average noise levels describe the overall ambient noise levels of the points.
- Selected measurement units were dB (A) Leq otherwise stated.
- Quality was assured through self calibration of the instrument.
- The measurements were carried out on client request.
- The client is responsible lawful usage of reported data in future.
- The report in not valid for any negotiation.

ANALYZED BY	REVIEWED BY	APPROVED BY
Lab Analyst	Assistant Lab Manager	Lab Manager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ENVIRONMENTAL PROTECTION AGENCY
GOVERNMENT OF THE PUNJAB
National Hockey Stadium, Gate No. 08
Gaddafi Stadium Complex, Lahore

EPA

Validation for Sampling of Wastewater & Drinking Water / Ground water

(Read conditions of certificate along with Regulation 9(1)(d) of CELR, 2000)

Nature Of Sample	Waste water		Drinking Water / Ground water		
Description of Sample source /Site			Lahore Smart City Kala Shah Kahu Tehsil Ferozewala District Sheikhupura		
Name and category of Project /Unit	Construction Of Interchange Lahore Smart City				
Standard Method used for Sampling	Accordind To US EPA				
Field Tested Parameters,	Field Tested parameter	PH ,Tem, Cl	Lab Tested Parameters (Not validated)		Compiled Result and Report

Waste Water Treatment facility	Primary	Secondary	Tertiary
Total WW collected Sample ...✓...		Total Collected Drinking water samples....11.....	

Sample Tag for testing parameter is assigned on sample container	Yes ✓	NO	NA
Sample is preserved properly for each testing parameter	Yes ✓	NO	NA
Sample size is adequate for testing the target parameters	Yes ✓	NO	NA
Wastewater Flow Measurement performed to ensure sample representativeness	Yes	NO	NA ✓

No. of Waste Water outlets	Waste Water Flow m³/hr from each outlet (Optional)	Water intake m³/hr(Optional)	Water Mass balance (Optional)		Sample Type	
					G.W	
			Yes	No	Grab	Composite

Parameter	Matrix W	Matrix WW	Container	Sample Size	Preservation	Yes	NO	NA
Coliform,TotalorFecal	✓		SterileContainer	100mL	Refrigerate6C	✓		
Coliform,TotalorFecal,ChlorinatedWater	✓		Sterile Container	100mL	0.008% Thiosulphate& cooled6C	/		
Color, Turbidity	✓		P,G	500mL	Cool6C	✓		
Hardness,Total	✓		P,G	500ml	HNO3 to pH<2			
Nitrogen,Nitrate+Nitrite , Phenolic Compounds, Oil & Grease, COD, NH3	✓		P,G	2000 mL	H2SO4 topH <2,Cool6C	/		
Metals,General	✓		P,G Rinsed1.1 HNO3	500mL	HNO3 topH < 2	/		
Cyanide,Total	✓		P,G	500mL	NaOHtopH> 12,Cool 6C			
Pesticides,General			Glass	1Liter	Cool6C	✓		

Field Parameters

Field parameter		pH meter; Model Make	Measurement Method	Calibrated in Field		Measured value
pH			APHA	Yes	NO	
Temp			/	Yes		
Cl				Yes		

Remarks / Caution: (1) The Validation is quality control check under Regulation 91(d) for sampling & monitoring. (2)The Sampling / monitoring performed under Regulation 3(a) by Technical & Scientific Staff of private Laboratory as allowed through Conditions of Certificate (3)The Scope of quality check of validation does not cover quality check of results declared with Report (4) The validated sampling / monitoring of the tests report is for non punitive actions such as baseline study EIA/IEE, Self monitoring, reporting under conditions of EIA/IEE, etc. (5) The tests Report cannot be used as evidence against any non compliance SMR /report issued by EPA official Laboratory (6) The EPA officer as well as certified laboratory should also comply directions issued vide letter No. 01-DD(Labs)/EPA dated 25.07.2022 while considering test

Mohammad Ahmad Akram
Research Officer
EPA (Labs) Lahore

Dated 25-7-25

SOLUTION ENVIRONMENTAL & ANALYTICAL LABORATORY LAHORE

ENVIRONMENTAL PROTECTION AGENCY
GOVERNMENT OF THE PUNJAB
National Hockey Stadium, Gate No. 08
Gaddafi Stadium Complex, Lahore

EPA

Validation for Monitoring / Sampling of Stack Emission, Noise, Ambient air, Vehicular emissions

(Read conditions of certificate along with Regulation 9(1)(d) of CELR, 2000)

Cautions Related to scope, use & legal foundation of Validation

1. The Validation is quality control check under Regulation 91(d) for sampling & monitoring.
2. The Sampling / monitoring performed under Regulation 3(a) by Technical & Scientific Staff of private Laboratory as allowed through Conditions of Certificate.
3. The Scope of quality check of validation does not cover quality check of results declared with Report.
4. "The validated sampling / monitoring of the tests report is for non punitive actions such as baseline study EIA/IEE, Self monitoring, reporting under conditions of EIA/IEE, etc. while the report is not valid for Court cases, EPO, compliance reporting for operational Phase approvals, punitive actions such as Smog prevention & control Rules, 2023, complaint cases, etc". The same shall be exhibit at top of Report during its issuance under Regulation 12.
5. The tests Report cannot be used as evidence against any non compliance SMR /report issued by EPA official Laboratory.
6. The EPA officer as well as certified Laboratory should also comply directions issued by authority vide letter No. 01-DD(Labs)/EPA dated 25.07.2022 while considering test report.

Nature Of Sample	Stack Emissions X	Ambient Air ✓	Vehicular Emission X	Ambient Noise ✓
Description of monitored source / Site	Lahore Smart City Kala Shah Kahu Tehsil Ferozewala District Sheikhupura			
Name and category of Unit	Construction Of Interchange Lahore Smart City			
Standard Method	Accordind To US EPA			
Equipment, Model,				
Field Tested Parameters ,	PH ,Tem, Cl	Lab Tested Parameters (Not Validated)	Compiled Result and Report	
Industrial Gaseous Emissions				
Values of tested Field Parameters: CO .....mg/nM3, NOx ...mg/nM3 , excess air (%age):				
(i) 5 min Ramp-Up phase (ii) flow rate & EC Temp. measured during calibration & testing (iii) Data recorded with 15 min interval (iv) complied all QA/QC checks			Yes	NO / NA
Stack Particulate Matter (PM) Monitoring / Sampling under USEPA Method 5 / 17				
(i) Sample train is complete (ii) Leak Test Performed (iii) data sheet filled (iv) "K" & "Y" calculated (v) QA/QC complied (vi) suitability of filter ensured			Yes	No / NA
Stack SOx sampling as per Method 8 (Thorin Indicator Method)				
(i)Absorbent solution available (ii) Flow rate as per method (iii) sampling as per Method			Yes	No / NA
Ambient Air Quality Monitoring by Automatic Monitors for CO, O3, SO2, NOx, PM2.5 & PM10				
Zero/span check is performed (ii) CE of NOx 96% - 104.1% , Compliance of Critical Criteria (iii) Compliance of operational Criteria (iv) Comply PEQS measuring technique			Yes	No / NA
Ambient Air Sampling of SPM, PM10, Pb by High Volume Sampler				
(i) The flow rate of sampler 1.1m3/min, (ii) Calibration performed			Yes	No / NA
Vehicular Emissions & Noise Measurement				
Vehicle emissions and noise measurement performed as per method			Yes	No / NA

Remarks:

Dated 25-7-25

Mohammad Ahmad Akram
Research Officer
EPA (Labs) Lahore

ENVIRONMENTAL SOLUTION ANALYTICAL LABORATORY LAHORE

ANNEXURE V

GLOSSARY

GLOSSARY

Alternatives	The evaluation of alternatives to project development in EIA (timing, location, technologies etc) including the no go, or no development action.
Ambient	Relating to the immediate surroundings of something
Contamination	Pollution
Conservation	The preservation of natural resources for use by future generations
Consultation	A process of communication with those potentially affected by a project, policy, plan or program.
Effluent	means any material in solid, liquid or gaseous form or combination thereof being discharged from industrial activity or any other source and includes a slurry, suspension or vapor
EMP	An EMP is a site specific or project specific plan developed to ensure that appropriate environmental management practices are followed during a project's construction and operation.
Environment budget	Monitory assets reserve for environmental activity
Environment	means air, water and land; all layers of the atmosphere; all organic and inorganic matter and living organisms; the ecosystem and ecological relationships; buildings, structures, roads, facilities and works; all social and economic conditions affecting community life; and the inter-relationships between any of the factors mentioned
Environmental Audits	An environmental management tool consisting of a periodic and objective evaluation of an organization and installations to assess compliance with regulatory and other requirements, as defined by audit criteria
Environmental	means an environmental study comprising collection of

Impact Assessment	data, prediction of qualitative and quantitative impacts, comparison of alternatives, evaluation of preventive, mitigatory and compensatory measures, formulation of environmental management and training plans and monitoring arrangements, and framing of recommendations and such other components as may be prescribed
Extent/ Magnitude	The size or degree of the predicted impact
Fauna	Animal life occurring in particular region or time
Flora	plant life occurring in particular region or time
Geological	Relating to the study of the earth's physical structure and substance.
Impact	The consequence of an action or activity on the human or natural environment. Impacts may be positive, negative or neutral
Issue	A question or concern regarding an environmental impact, consequence or effect
Mitigation	Prescribed actions taken to prevent, avoid, reduce or minimize the impacts or potential adverse effects of a project
Monitoring	A combination of observation and measurement to assess the environmental and social performance of a project and its compliance with EIA/ EMP, or other approvals and regulatory conditions
Particulate Matter	A complex mixture of extremely small particles and liquid droplets that get into the air
Proponent	the person who intends to carry-out a proposed project
Sustainable development	Economic development that is conducted without depletion of natural resources.
Waste	means any material, substance, or by-product eliminated or discarded as no longer useful or required after the completion of a process

ANNEXURE VI

PREVIOUS APPROVALS

LAHORE DEVELOPMENT AUTHORITY

LAHORE DEVELOPMENT AUTHORITY ORIGINAL COPY
METROPOLITAN PLANNING WING
NO.LDA/DMP-IV/700
DATED: 08-4-2021

M/s Lahore Smart City Pvt Ltd,
Through its Company Secretary,
Mr. Rana Muhammad Zafar,
S/o Ch. Abdul Aziz,
24-A, XX Commercial, Khayaban-e-Iqbal,
DHA Phase-III, Lahore.

Subject: **FINAL APPROVAL / SANCTION OF LAHORE SMARTCITY HOUSING SCHEME FOR AN AREA MEASURING 2153 KANAL FALLING IN MOUZA/CHAK NO.42, 43 & 44 HARDOSOHAL MUSLIM ROADTEHSIL FEROZEWALA DISTRICT SHEIKHUPURA.**

Reference the subject cited Housing Scheme.

2. The Housing Scheme Plan submitted by you for an area measuring 2153 Kanals falling in Mouza / Chak No.42, 43 & 44 Hardosohal Muslim RoadTehsil Ferozewala District Sheikhupura has been sanctioned by Lahore Development Authority. The copy of approved layout plan is enclosed herewith.

3. This sanction of the Housing Scheme is subject to the following conditions:

1. No change in land use of plots will be allowed at later stage in violation of any prevailing Laws for the time being enforced.
2. The development works in the housing scheme shall be completed in accordance with the approved designs and specifications under terms and conditions specified by concerned agencies/departments.
3. All development works shall be completed within a period of **05 (five)** years from the date of issuance of this letter.
4. Construction of buildings shall be undertaken after approval of building plans in accordance with prevailing Building and Zoning Regulations/Bye-Laws.
5. Proportionate cost for the provision of trunk services on proportionate area basis shall be paid by the plot owners as and when demanded by the concerned agency.
6. The operation and maintenance of the Housing Scheme after completion of development works shall be responsibility of the sponsor or plot owner's association.
7. In case of any litigation or objection regarding the land ownership, you will be responsible for the same and Lahore Development Authority shall not be a party in this issue. You will be responsible to settle any dispute about ownership of land if arises at any stage.
8. You or the plot owners shall pay any betterment charges as and when levied by the concerned agency.
9. In case of any complaint from the plot owners you or plot owner's association shall be responsible to settle the issue.

LDA LDA LDA LDA LDA LDA LDA LDA LDA LDA LDA LDA LDA LDA

No. 057012505

10. You will display a copy of approved Housing Scheme plan, a copy of sanction letter in your office.
11. You will abide by the terms and conditions of the Transfer Deed, Mortgage Deed/Performance Agreement and Bank Guarantee.
12. No revision in layout plan and design specification etc. to be done without the approval of concerned agency.
13. You will make arrangements to hand over the possession of the areas to Lahore Development Authority as per Transfer Deed.
14. Sale or commitment of plots over and above the total number of plots provided in the approved Housing Scheme is not allowed.
15. Full contents of this letter shall be given in the publicity brochure prepared for the sale of plots.
16. You will mark land reserved for public buildings etc., yet to be constructed/developed through sign boards on every site accordingly.
17. You will include all the general terms and conditions under the Lahore Development Authority Private Housing Schemes Rules-2014 in your application forms.
18. You will execute a registered agreement with the allottee at the time of booking of plot/constructed house which shall include in addition to any other Terms and Conditions and on full payment shall execute the Sale Deed in favour of the purchaser.
19. You will adhere all the conditions contained in ADC(R) No.DRA/1999 dated 28.12.2020 and No.DRA/84 dated 13.01.2021.
20. You will adhere all the conditions contained in WASA letterNo.D(PHS)/1833-35 dated 08.12.2020 and design approval letter No.D(PHS)/513-16 dated 20.03.2021.
21. You will adhere all the conditions contained in Director Engineering (PHS) vide letter No. D(ENGG)/PHS/LDA/2828 dated 15.03.2021.
22. You will adhere all the conditions contained in Irrigation letter No.1823/28-W dated 08.12.2020.
23. You will adhere all the conditions contained in RUDA NOC letterNo.chm(RUDA)23-1/2020 dated 15.10.2020&No.chm/SMBR-LA/001/2020 dated 26.11.2020.
24. You will submit NOC from Environmental Protection Agency (EPA), Government of Punjab within the period of six months after issuance of this letter as per affidavit submitted by you. In case of failure you will be liable to pay penalty as per Rules.

4. In case of failure to fulfil above mentioned conditions, this approval may be withdrawn by LDA without any intimation.

Director Metropolitan Planning-IV
MP Wing, LDA, Lahore

Cc:

1. The Chief Metropolitan Planner, LDA.
2. The Chief Town Planner, LDA.
3. The Director Estate Management (PHS), LDA.
4. The Director (Computer Services and IT), LDA
5. The Director PHS, WASA, LDA.
6. The Director Engineering PHS, LDA.
7. The Director Horticulture, PHA, Lahore.

GOVERNMENT OF THE PUNJAB
ENVIRONMENTAL PROTECTION AGENCY
National Hockey Stadium, Gate No. 10
Ferozepur Road, Lahore

No. AD(EIA)/EPA/F-91(IEE)/0107/2021/329
Dated: 11 / 11 /2021

To,

Mr. Raheel Majeed,
Proponent,
R/o House No. 75-C, Qazi Town, Kharak, Multan Road, Lahore.

Subject: **DECISION OF EPA PUNJAB REGARDING PROJECT "DEVELOPMENT OF HOUSING SCHEME NAMELY LAHORE SMART CITY HOUSING SCHEME" (DISTRICT SHEIKHUPURA).**

1.	Description of Project	Development of housing scheme namely Lahore Smart City. Area : 2153-Kanals.
2.	Location of Project	Chak No. 42/UCC, 44/UCC, Tehsil Ferozwala, District Sheikhupura
3.	Date of filing of EIA	04-03-2021

4. EPA Punjab has reviewed the Initial Environmental Examination (IEE) and considered Site Inspection Report received from Deputy Director (Environment), Sheikhupura vide letter No. 128/DDE/SKP/2021 dated 27-03-2021. EPA Punjab has also considered the recommendations of **Committee of Experts** (Meeting dated 01-07-2021) and committee notified by Director General, EPA dated 21-10-2021 **(M.O.M dated 21-10-2021)** and Technical approval granted by LDA dated 30-01-2021, approval for discharge of 3.5 Cusec into Lalla Drain R.D 45-46 by Irrigation Department dated 07-12-2020, Report of Revenue Department dated 28-12-2020 and other relevant record to take lawful decision.

5. **EPA Punjab accords Environmental Approval under Regulation 12 of IEE/EIA Regulations 2000 read with Section 12 of Punjab Environmental Protection Act 1997 for development of your aforesaid project subject to the following conditions:**

i. The Proponent shall ensure compliance with the Punjab Environmental Quality Standards (PEQS) notified for particulate matter, gaseous emissions, waste water and noise so as to protect the air, water bodies, soil and health of the people;
ii. Mitigation measures suggested in the IEE Report and Environmental Management Plan (EMP) shall be strictly adhered to minimize any negative impacts on soil, ground water, air and biological resources of the project area;
iii. Monitoring shall be carried out during the entire period of the project activities. Monitoring reports of the whole operation shall be submitted to EPA Field office on quarterly basis;
iv. The proponent shall provide a copy of IEE report and copy of this letter to the contractors for their information and compliance with conditions / measures suggested in these documents;
v. Effective arrangements shall be made for the proper disposal of solid waste. The solid waste shall be retained within the unit boundary/premises and will be disposed of in an environment friendly way at a suitable disposal facility;
vi. The proponent shall redress the grievances/objections / concerns of neighbours / stakeholders on priority basis (if arises at any stage);
vii. The proponent shall obtain NOCs/ Clearance of all other departments concerned if required under the laws in force;
viii. The Proponent shall plant 3000 trees of 6-7 feet height of indigenous species in the district in consultation with respective Field Office, within six months. The Proponent shall also take measures for protection and upkeep of these trees and shall maintain their proper record for verification by EPA;
ix. Majority of unskilled and, up to the extent possible, skilled jobs shall be given to the locals; and
x. The Proponent shall do landscaping and restore the environment after completion of the construction work.

xi. The proponent shall take measures to avoid ground water and land contamination.
xii. The proponent shall install wastewater treatment system to bring sewage within permissible limits/PEQS.
xiii. The proponent shall ensure Implementation of 3-R Model (Reduce, Reuse, Recycle) for solid waste management.

6. The proponent shall be liable for correctness and validity of information supplied to this department by the consultant.

7. This approval is accorded only for the construction phase of the project. The proponent shall obtain approval for operational phase of the project in accordance with Regulation 13(2) (b) and Regulation18 of the IEE/EIA Regulations, 2000.

8. Any change in the approved project shall be communicated to EPA, Punjab and shall be commenced after obtaining the approval.

9. This approval shall be treated as null and void if all or any of the conditions mentioned above, is/are not complied with. This approval does not absolve the proponent of the duty to obtain any other approval or consent that may be required under any law in force and is subjudice to legal proceedings in any legal for a / court.

10. This approval shall be valid (for commencement of construction) for a period of three years from the date of issue under Regulation 16 of IEE / EIA Regulations, 2000.

11. This approval can be withdrawn at any time without any prior notice if deemed necessary in the public / national interest.

ASSISTANT DIRECTOR (EIA)
for DIRECTOR GENERAL, EPA, PUNJAB

NO. & DATE EVEN.

A copy is forwarded to Deputy Director (Environment), Sheikhupura. He is requested to ensure compliance of the conditions contained in the Environmental Approval and maintain the file/record of correspondence with the project proponent properly.

- One Window Cell, EPA Punjab.

ASSISTANT DIRECTOR (EIA)

GOVERNMENT OF THE PUNJAB
Irrigation Department
OFFICE OF THE EXECUTIVE ENGINEER
RACHNA DRAINAGE DIVISION
Noor Muhammad Road, Sheikhupura
Ph: No. 056-9200250
Fax No. 056-3793896 E-mail: xenrddskp@yahoo.com

To,

The Director Metropolitan Planning-IV
Lahore Development Authority (LDA),
Lahore.

No. 1823 /28-W Dated. 8/12 /2020

Subject: - **FLOOD PRONE STATUS OF LAND FALLING IN CHAK NO. 38, 42, 43 AND 44 TEHSIL FEROZWALA, DISTRICT SHEIKHUPURA.**

Reference: - Your office letter No. LDA/DMP-IV/853.

The site in-question inspected by the Sub Divisional Officer, Rachna Outfall Drainage Sub Division, Sheikhupura along with concerned Sub Engineer and found that the area of "Chak No. 38, 42, 43 and 44 Tehsil Ferozwala, District Sheikhupura" situated in the vicinity of Laila Drain. Now the Laila Drain remodeled and its designed discharge also enhance hence said housing scheme does not fall in the Flood Zone at this stage.

Executive Engineer,
Rachna Drainage Division,
Sheikhupura

C.C.

Rana Muhammad Zafar Mehmood company secretary Lahore small city.

WATER AND SANITATION AGENCY (LDA)
PRIVATE HOUSING SCHEMES (PHS) DIRECTORATE
ZAHOOR ELAHI ROAD, LAHORE.
Phone No.042-35757425, 042-35754911 ext. 251

****

To,

The Director Metropolitan Planning, IV
Lahore Development Authority,
467- D/2, Main Boulevard,
M.A. Johar Town, Lahore

No.D(PHS)/1833-35
Dated: 8-12-2020

Subject: **REQUEST FOR ISSUACNE OF NO OBJECTION CERTIFICATE REGARDING ULTIMATE DISPOSAL OF SEWERAGE OF LAHORE SMART CITY HOUSING SCHEME LOCATED AT TEHSIL FEROZWALA, DISTRICT SHEIKHUPURA.**

Ref: No.LDA-APH-261120-000001 dated:26-11-2020.

The NOC regarding ultimate disposal of sewerage of subject housing scheme named as **"Lahore Smart City Housing Scheme"** measuring an area of **2351K-18-M,** falling in Tehsil Ferozwala, District Sheikhupura is hereby granted subject to the following conditions:-

1. The subject scheme doesnot fall under WASA services area. The sponsor will be responsible for the proper and environmentally safe disposal of sewage and storm water from the subject scheme up to the ultimate disposal point and to seek permission, if required, from concerned department in the area. Further, the sponsor will submit NOC from Punjab Irrigation Department at the time of submission of Services Design of Water Supply & Sewerage System for the Drain proposed as ultimate disposal point.
2. The sponsor will carry out detail design of Water Supply, Sewerage & Drainage System in accordance with WASA Design parameters and specifications. The sponsor will get the approval of services design from WASA and will develop infrastructure related to WASA component i.e. water supply, sewerage & drainage in accordance with the approved services design.
3. The sponsor will pay the Sewerage Trunk Infrastructure Charges and other charges to WASA in accordance with notification/demand notice.

8/12/2020

(Hafiz Muhammad Ijaz Rasul)
DIRECTOR (PHS),
WASA, LDA, LAHORE.

Cc:

1. DD(PHS, WASA, LDA.
2. Mr. Rana Muhammad Zafar Mehmood, Company Secretary, Lahore Smart City Housing Scheme, 24-A, XX Commercial, Khayaban-e-Iqbal, Ph-III DHA, Lahore.

Parks and Horticulture Authority Lahore

No. DHZ-VI/PHA/04-21/07
Dated: 01-04-2021

To,

Director (Metropolitan Planning-IV
LDA, Lahore.

Subject: **APPROVAL OF DESIGNS OF HORTICULTURE / LANDSCAPE PLAN OF LAHORE SMART CITY HOUSING SCHEME FALLING IN MOUZA CHAK NO. 42,43 & 44 AHDIAN ROAD (HARDOSOHAL MUSLIM ROAD) TEHSIL FEROZEWALA DISTRICT SHEIKHUPURA.**

Reference to LDA letter No.LDA/DMP-IV/591 dated 12-02-2021 on the subject noted above.

It is to informed you that the Competent Authority has been pleased to approve the proposed design of horticulture plan of Lahore Smart City Housing Scheme, as per PHA Regulartion Regarding Green Areas / on depositing of PHA fee. The entire area of the scheme consists of 2153 Kanals whereas, 160 Kanals which is 7% area reserved for green belts / horticulture development work.

The management of the housing scheme is strictly bond to fulfill the all codal formalities for maintenance of horticulture work as per standared policy of PHA Regulartion Regarding Green Areas on daily basis in future.

(Syed Farhat Abbas)
Director Horticulture Zone-VI
PHA, Lahore

PC:-

1. Director General, PHA (for information please)
2. Addl. Director General, PHA (for information please)
3. Mr. Rana Muhammad Zafar Mehmood, of Lahore Smart City Housing Scheme, Sheikhupura.
4. Master file.

LAHORE ELECTRIC SUPPLY COMPANY LIMITED
TECHNICAL DIRECTORATE
22-A QUEENS ROAD LAHORE
PBX: 99204820-30 (Ext. 200) Ph: 99204818 Fax: 99204819

Subject: **EXTERNAL ELECTRIFICATION OF SMART CITY HOUSING SCHEME CHAK NO. 42,43 & 44 TEHSIL FEROZEWALA DISTT. SHEIKHUPURA**

Reference: Your office letter No. LDA/DMP-IV/691 dated 5-4-2021.

As ultimate load demand of the said Housing Society is above 05 MW and Sponsors are liable to provide 32-kanals land for grid station free of cost, therefore the matter has been forwarded to LESCO Site Selection Committee / Board of Grid land.

It is further added that although the design of underground external electrification of the subjected Housing Scheme has been prepared by the Consultant as per LESCO criteria and as per approved layout plan issued by LDA but further action will be taken on receipt of report of LESCO Site Selection Committee / Board of grid land. However this office has no objection for further proceeding of the case by LDA.

Chief Engineer (P&D)
(Engr. Javed Iqbal Gill)

To: Director Metropolitan Planning-IV,
MP Wing PLDA, Lahore.

Info: Master file.

No. 14787 **/ DRW/1968/LESCO** **Dated** 06 **/4/2021**

TC-B-4

SUI NORTHERN GAS PIPELINES LIMITED

SARGODHA RD, NR PUNJAB COLLEGE, SHEIKHUPURA

REF: EO-BD/3441-2021

Date: 17-05-2021

ENGINEER ZAHID RAFIQUE,
DIRECTOR,
LAHORE SMART CITY,
24-A, XX COMMERCIAL, KHAYABN-E-IQBAL, PHASE –III DHA, LAHORE

APPLICATION FOR LAYING OF GAS NETWORK ON RLNG BASIS

Dear Sir,

This is with reference to your application vide Ref. LSC/047/04/21 dated 20.04.2021 regarding the subject cited above.

In this regard, we wish to inform that a joint site visit comprising executives of BD and Development department has been carried out at your housing society followed by meeting with Mr. Mazhar Latif, Project Director on 05.05.2021.

In this context, it has been observed that there is no clear demarcation of passages/main road for open access to your society. Moreover, no identification can be carried out for laying of gas mains and internal network owing to undeveloped/unmarked area. You are requested to intimate us after clear demarcation of the streets and passage ways at your housing society where laying of RLNG network is desired to be laid. The same was also thoroughly communicated to Mr. Mazhar Latif on site.

Upon receipt of above confirmation, we will proceed further as per Company's policy.

Meanwhile assuring you of our best services and cooperation.

Yours faithfully

SUI NORTHERN GAS PIPELINES LIMITED

(EHSAN ULLAH BHATTI)
GENERAL MANAGER
SHEIKHUPURA

17/5

Ravi Urban Development Authority
Government of the Punjab

No. chm/SMBR-LA/001/2020 Dated 26th November, 2020

To

The Senior Member,
Board of Revenue, Punjab
Lahore.

Subject: - **REQUEST FOR DENOTIFICATION OF EXCESSIVE KHASRAS U/S 4 OF LDA ACT 1894, BEYOND THE PROJECT BOUNDARY OF RAVI RIVER FRONT URBAN DEVELOPMENT PROJECT (RRUDP) FOR DEVELOPMENT OF LOW COST HOUSING IN LINE WITH THE VISION OF PRIME MINISTER OF PAKISTAN NEAR CHAK NO/ 38 TEHSIL FEROZEWALA, DISTRICT SHEIKHUPURA.**

Kindly refer to the subject noted above.

The Board of Revenue issued a notification under section 4 of Land Acquisition Act 1894 bearing No. 1395 dated 05.10.2020 published on the request of RUDA for the purpose of survey and further process of land acquisition. The Lahore Smart City applied to the RUDA that the area of Lahore Smart City has been notified under the above mentioned notification whereas it is outside the boundary limits of RUDA master plan. The same reference was referred to LDA for advice/comments. The LDA has informed vide its letter No. LDA/CMP/286 dated 20.11.2020 that LDA has denotified all the area including proposed site of Lahore Smart City under section 4 of Land Acquisition Act, 1894 and further clarified that as per the pre-feasibility study and master plan of RUDA the request of Lahore Smart City is true to the facts (copy enclosed).

Therefore, RUDA has no objection if the Board of Revenue denotifies the Lahore Smart City project area (Lahore Smart City application enclosed) under intimation to this office.

(RASHID AZIZ)
Chairman (RUDA)

CC:

1. The Director to Vice Chairman, LDA.
2. The Director (DGOHC), LDA.

90-Shahrah-e-Quaid-e-Azam, Lahore
Phone: +92-42-99203256, +92-42-99203262
Email: rrudpc@gmail.com

Scanned with CamScanner

Ph: 042-37930777
Email: acferozewala786@gmail.com

OFFICE OF THE
ASSISTANT COMMISSIONER
FEROZEWALA

No. AC/F/ 786 Dated 12/08/22

To,

The Addl: Deputy Commissioner (Rev.),
Sheikhupura.

SUBJECT: **NOC OF LAND UNDER HOUSING SCHEME NAMELY "LAHORE SMART CITY EXTENSION" MEASURING AN AREA OF 1824.95 KANALS MOUZA CHAK NO. 43 & 44 UCC TEHSIL FEROZEWALA DISTRICT SHEIKHUPURA.**

Kindly refer to your office letter No. HRC/ 1519 dated 06.07.2022 on the subject cited above.

2. It is submitted that on receipt of above mentioned reference, a detailed report regarding six queries has been sought from concerned Revenue Field Staff Tehsil Ferozewala, which is as under: -

i. As per received report, the land measuring 715-K, 03-M situated at Chak No. 43/UCC and land measuring 1109-K, 16-M situated at Chak No. 44/UCC (Total land measuring 1824-K, 19-M) is owned by the applicant.

ii. As per notification dated 08.06.2021 issued by the Government of the Punjab Law & Parliamentary Affairs Department, the subject land is beyond the boundary limits of RUDA.

iii. Detail attached.

iv. There is not any other matter related to Revenue Department.

v. The report regarding assessment of Condonation fee (chargeable) may be sought from Colony Branch, Sheikhupura.

vi. Fard Malkiat attached herewith.

3. The same in original is attached herewith for your kind perusal and further necessary action as per law / rules.

12/09/22

ASSISTANT COMMISSIONER
FEROZEWALA

CamScanner

ANNEXURE VII

GOOGLE EARTH MAP

Lahore Smart City Interchange

Location Map

Legend

- Lahore Smart City Interchange (31°42'8.60"N, 74°17'39.22"E)
- Lahore Toll Plaza West

Lahore Smart City Interchange (31°42'8.60"N, 74°17'39.22"E)

Chak 42

Hardosohal Muslim Rd

Lahore Bypass

M-11

Lahore Toll Plaza W

Chak 39

Hardosohal Muslim Rd

Lahore Bypass

ABID TOWN

Chak 40

Google Earth

Image © 2025 Airbus

N

3000 ft

ANNEXURE VIII

COMPOSITION OF RAW MATERIAL

LAHORE

CONCRETE MIX DESIGN
(A.C.I. Code 211.1)

ASIAN CONSULTING ENGINEERS

Doc #: [illegible]
Rev: 00
Page: [illegible]

Project : LAHORE SMART CITY

Project Code :

AGG SOURSE	SARGODHA	DATE	05.06.21
TRAIL NO	28	NO.OF CYLINDER CASTED	6
		TYPE OF CEMENT	OP
		CEMENT BRAND	Lucky

A, DESIGN REQUIREMENTS

CLASS OF CONCRETE PSI	4000	CEMENT FACTOR Kgs/M³	400
SLUMP ACHIEVED MM	180	FIELD STRENGTH 28 DAYS (PSI)	4000
SLUMP REQUIRED MM	150~200	TARGET STRENGTH 28 DAYS (PSI	4800
QTY OF ADMIXTURE L/M³	4.80	W/C RATIO	0.44
QTY OF ADMIXTURE KG/M³	5.54	ADMIXTURE: ULTRA SP 470(1.2% By wt of Cement	
MAX.SIZE OF AGG. MM	20MM	TEMP:28.1	

B, PRELIMINARY TEST DATA

MATERIAL	3/4" DOWN	3/8" DOWN	F.A
LOOSE DENSITY	1.403	1.399	1.469
RODDED DENSITY	1.598	1.586	1.649
SPECIFIC GRAVITY (SSD)	2.805	2.813	2.732
ABSORPTION %	0.41	0.44	1.33
% USED	40%	60%	
FINENESS MODULUS			2.65

C, DESIGN OF MIX PER M³

ABSOLUTE VOLUME OF CEMENT :	0.1270	ABSOLUTE VOLUME OF ENTRAPPED AIR :	0.0200
ABSOLUTE VOLUME OF WATER :	0.176	ABSOLUTE VOLUME OF FINE AGG. :	0.3099
ABSOLUTE VOLUME OF ADMIXTURE :	0.0048	ABSOLUTE VOLUME OF COARSE AGG.3/4"	0.14494
ABSOLUTE VOLUME OF PASTE :	0.3278	ABSOLUTE VOLUME OF COARSE AGG. 3/8"	0.21740

MATERIAL	ABSOL. VOL.CU.M³	SPECIFIC GRAVITY	UN-CORRECTED WEIGHT Kgs	CORRECTED WEIGHT Kgs	FOR M³ 0.05
CEMENT	0.1270	3.150	400.00	400.00	20.00
C.A 3/4"	0.1449	2.805	406.56	404.89	20.24
C.A 3/8"	0.2174	2.813	592.42	589.81	29.49
FINE AGG.	0.3099	2.732	846.59	835.33	41.77
WATER	0.176	1.000	176.00	191.53	9.58
ADMIXTURE ULTRA SP 470	0.0048	1.155	5.54	5.54	0.277

REMARKS:

Habib Rafiq Engineering(Pvt)LTD:	Checked By:	Approved By:
Tested By :		
Date :		

CONCRETE MIX DESIGN
(A.C.I. Code 211.1)

Project Code :

DATE
NO OF CYLINDER CASTED
TYPE OF CEMENT
CEMENT BRAND

A. DESIGN REQUIREMENTS

CLASS OF CONCRETE PSI	3000
SLUMP ACHIEVED MM	175
SLUMP REQUIRED MM	150-200
KG OF ADMIXTURE L/M³	3.60
KG OF ADMIXTURE KG/M³	4.32
MAX SIZE OF AGG MM	20MM

CEMENT FACTOR Kgs M³
FIELD STRENGTH 28 DAYS PSI
TARGET STRENGTH 28 DAYS PSI
W/C RATIO
ADMIXTURE ULTRA SP 470 0.2% By wt of Cement
TEMP 27 C

B. PRELIMINARY TEST DATA

MATERIAL	3/4" DOWN	3/8" DOWN	F.A
BULK DENSITY	1.403	1.399	1.466
RODDED DENSITY	1.598	1.586	1.649
SPECIFIC GRAVITY SSD	2.805	2.813	2.732
ABSORPTION %	0.41	0.44	1.33
USED	40%	60%	
FINENESS MODULUS			2.65

C, DESIGN OF MIX PER M³

ABSOLUTE VOLUME OF CEMENT	0.0952	ABSOLUTE VOLUME OF ENTRAPPED AIR	0.0200
ABSOLUTE VOLUME OF WATER	0.1740	ABSOLUTE VOLUME OF FINE AGG.	0.3447
ABSOLUTE VOLUME OF ADMIXTURE	0.0037	ABSOLUTE VOLUME OF COARSE AGG 3/4"	0.14464
ABSOLUTE VOLUME OF PASTE	0.2930	ABSOLUTE VOLUME OF COARSE AGG. 3/8"	0.21740

MATERIAL	ABSOL. VOL.CU.M³	SPECIFIC GRAVITY	UN-CORRECTED WEIGHT Kgs	CORRECTED WEIGHT Kgs	FOR M³ 0.05
CEMENT	0.0952	3.150	300.00	300.00	15.00
3/4"	0.1449	2.805	406.56	404.89	20.24
3/8"	0.2174	2.813	592.42	589.81	29.49
FINE AGG	0.3447	2.732	941.67	929.15	46.46
WATER	0.1740	1.000	174.00	190.80	9.54
ADMIXTURE ULTRA SP 470	0.0037	1.155	4.32	4.32	0.216

REMARKS:

Hab b Rafiq Engineering(Pvt)LTD:

Tested By

Date : 26/6/21

Checked By:

Approved By:

LAHORE

JOB MIX FORMULA ASPHALT
WEARING COARSE CLASS-B

ASIAN CONSULTING ENGINEERS

PROPORTION OF RECOMMENDED MATERIAL

A) Type of Aggregate	%Used By Wt. of Aggregate	%Used By Wt. of Mix.
1) Crushed Agg:10~20mm	28	26.88
2) Crushed Agg:5~10mm	38	38.4
3) Stone dust:0~5mm	34	30.72
4) Asphalt 60/70	4	4.16
Total	104	100

B) SPECIPIC GRAVITIES.	
Oven Dry Bulk Specific Gravity of Combined Aggregate (Gsb)	2.73
Effective Specific Gravity of Combined Aggregate (Gse)	2.841
Specific Gravity of 60/70 Asphalt)	1.03

C) DETERMINATION OF OPTIMUM ASPHALT CONTENT (%) BY WT.MIX.	
Optimum A.C % at max. stability	3.92
Optimum A.C % at max. Unit Wt.	4.08
Optimum A.C % at max. median air voids	4.00
Average Optimum A.C % by Wt. of mix.	4.00

D) PROPERTIES OF THE MIX. AT OPTIMUM ASPHALT CONTENT (%) BY WT. OF MIX.

Test Property	Obtained	Specified
Stability -Kg	1652	1000-min
Flow - 0.01 (inch)	12.4	8~14
Voids in mix (V.I.M %)	4.6	3.5~5.5
Voids in Mineral aggregate (V.M.A %)	15.2	
Voids in filled with asphalt (V.F.A %)	69.8	
Loss in stability (%)	14.6	20 - Max

E) JOB MIX. FORMULA

Sieve Size	% Passing	Tolerance	J.M.F Spec-	Specified
1"	100	±5	100	100
3/4"	96.2	±5	91~100	100
1/2"	79.7	±5	75~85	75~90
3/8"	73.8	±5	69~79	60~80
No. 4	45.1	±5	40~50	40~60
No. 8	30.9	±4	27~35	20~40
No. 50	12.3	±3	9~15	5~15
No. 200	4.4	±1	3~5	3~8

Contractor

Engr QA/QC :

Manager QA/QC :

Consultant

Checked By :

Approved By :

LAHORE

JOB MIX FORMULA ASPHALTIC
BASE COARSE CLASS - B

ASIAN CONSULTING ENGINEERS
www.asianpgp.com

PROPORTION OF RECOMMENDED MATERIAL

Date: 25-05-22

A) Type of Aggregate	%Used By Wt. of Aggregate	%Used By Wt. of Mix.
1) Crushed Agg:38~25mm	29	28.0
1) Crushed Agg:25~10mm	20	19.3
2) Crushed Agg:10~5mm	16	15.4
3) Stone dust:5~0mm	35	33.8
4) Asphalt 60/70	3.6	3.5
Total	103.6	100

B) SPECIPIC GRAVITIES.

Oven Dry Bulk Specific Gravity of Combined Aggregate (Gsb)	2.77
Effective Specific Gravity of Combined Aggregate (Gse)	2.886
Specific Gravity of 60/70 Asphalt)	1.028

C) DETERMINATION OF OPTIMUM ASPHALT CONTENT (%) BY WT.MIX.

Optimum A.C % at max. stability	3.5
Optimum A.C % at max. Unit Wt.	3.5
Optimum A.C % at max. median air voids	3.7
Average Optimum A.C % by Wt. of mix.	3.6

D) PROPERTIES OF THE MIX. AT OPTIMUM ASPHALT CONTENT (%) BY WT. OF MIX.

Test Property	Obtained	Specified
Stability -Kg	2918	2250 kg-min
Flow - 0.01 (inch)	18.5	12~21 mm
Voids in mix (V.I.M %)	5.7	4~8 %
Voids in Mineral aggregate (V.M.A %)	14.2	12 % min
Voids in filled with asphalt (V.F.A %)	60.3	55~65 %
Loss in stability (%)	17.9	25 % - Max

E) JOB MIX. FORMULA

Sieve Size	% Passing	Tolerance	J.M.F Spec-	Specified
1½"	100	±7	100	100
1"	89.8	±7	83~90	75~90
3/4"	74.8	±7	68-80	65~80
1/2"	56.0	±7	55-63	55~70
3/8"	52.4	±7	45-59	45~60
No. 4	44.1	±4	40-45	30~45
No. 8	24.4	±4	20-28	15~35
No. 50	8.8	±4	5-13	5~15
No. 200	4.1	±1	3-5	2~7

Lahore Smart City

Engr QA/QC : 25/05/22

Manager QA/QC :

Asian Consultant

Checked By : 25/5/022

Approved By :

SUMMARY OF UNDER REPAIR/ ROUTINE EQUIPMENTS

PROJECT : LAHORE SMART CITY. **DATE : 22/07/2025**

	EQUIPMET DESCRIPTION	CODE	MAKE/ MODEL	REPAIR FAULTS
1	MINI ROAD ROLLER	MRR-41	MIKASA	ENGINE
2	MOTOR GRADER	GRD-38	CAT	CONTROL VALVE
3	LOADING TRAILER	TRL-11	NISSAN	TYRE PROBLEM
4	CONCRETE TRANSIT MIXER	STM-23	ISUZU	ENGINE PROBLEM
5	DUMPER TRUCK	DPR-235	HINO	TYRE PROBLEM
6	MINI ROAD ROLLER	MRR-67		ENGINE PROBLEM
7	LIGHT POWER GEN	LPG-69		ELEC PROBLEM
8	POWER GENERATOR	PGN-95		FLY WHEEL BOLT+MAIN OIL SEAL
9	TRACTOR	TRC-64	MF-385	STEARING UNIT PROBLEM
10				
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43				

SUMMARY

EQUIPMENTS	TOTAL NO'S	LSC	OCP	U/R	OK
DUMPER TRUCK	32	23	9	1	31
CHAIN EXCAVATOR	3		3		3
TYRE EXCAVATOR	5	1	4		5
MOTOR GRADER	9	4	5	1	8
FORK LIFTER	3	3			3
CONCRETE BATCHING PLANT	2	2			2
WHEEL LOADER	5	3	2		5
CONCRETE MIXER MACHINE	1	1			1
CONCRETE TRANSIT MIXER	19	17	2	1	18
CONCRETE PUMP MOBILE	1		1		1
CONCRETE STATIC PUMP	2	2			2
DEWATERING PUMP PETROL	12	7	5		12
DEWATERING PUMP DIESEL	10	6	4		10
POWER GENERATOR	35	24	11	1	34
LIGHT POWER GEN	8	2	6	1	7
5KVA PORTABLE GEN	4	2	2		4
SKID LOADER	2		2		2
ASPHALT PLANT	1	1			1
PAVER MACHINE	1		1		1
TANDEM ROLLER	3	1	2		3
PENUMATIC TYRE ROLLER	3		3		3
BITUMEN DISTRIBUTER TRUCK	1		1		1
ASPHALT ROAD CUTTER	3	1	2		3
ROAD ROLLER PLAIN	9	4	5		9
ROAD ROLLER FOOTED	8	4	4		8
MINI ROAD ROLLER	10	5	5	2	8
TRACTOR	22	13	9	1	21
WATER BOWSER TRUCK	3	2	1		3
WATER BOWSER TRACTOR	4	1	3		4
TRACTOR TROLLY / TRAILER	3	2	1		3
SWEEPER BROOMER SUCTION	3	3			3
LOADING TRUCK / TRAILER	2	2		1	1
AIR COMPRESSOR	4	1	3		4
MOBILE CRANE / TOWER CRANE	2	1	1		2
WELDING PLANT DIESEL	2		2		2
PLATE COMPECTOR	12	6	6		12
CONCRETE VIBRATOR	12	6	6		12
DIESEL BOWSER TRUCK	2	1	1		2
ROAD WASHER TRUCK	1	1			1
MAN LIFT VEHICLE	1	1			1
BULL DOZER	2	1	1		2
MOBILE SERVICE TRUCK	1		1		1
WASTE TRUCK MACHINE	2	2			2
TOTAL	**270**	**156**	**114**	**9**	261

PREPARED BY: **DPM (ROADS)** **GM (LSC)**

CamScanner

ANNEXURE IX

SOCIO ECONOMIC PERFORMA

LAHORE SMART CITY INTERCHANGE

QUESTIONNAIRE FOR SOCIOECONOMIC SURVEY

Personal Information

1. Name_____ Contact #/ CNIC _____
2. Address_____

   _____
3. Age_____
4. Education_____
5. Marital Status
   - Married
   - Single
6. If married, No. of children_____
7. Religion_____
8. No. of earning members in family_____
9. Total income/ occupation_____
10. Is there any family member suffering from some disease?

    _____

Receptors Information

11. How many hospitals/ dispensaries are available in the area?

    _____
    _____
12. How many schools and colleges are present in the area?

    _____
    _____

Project Information

13. Do you know about this project? How were you informed?

    _____
14. What do you think about the Project? Do you think it should be applied? Why, why not?

    _____
15. What do you think would be the positive/ negative effects of the Project?

    _____
    _____
16. What will be the Health and Safety Issue due to this project in your point of view?

    _____
    _____
17. Would you like to add anything else?

    _____

Interviewed By: _____ Sign of Person (Interviewed)_____

ANNEXURE X

GEOMATRIC DESIGN

LAHORE SMART CITY INTERCHANGE

Government of Pakistan
Ministry of Communications
National Highway Authority

CONSTRUCTION OF INTERCHANGE TO CONNECT LAHORE SMART CITY WITH LAHORE EASTERN BYPASS NEAR HARDOSOHAL MUSLIM ROAD

GEOMETRIC DESIGN REPORT

(AUGUST 2025)

SUBMITTED BY

LAHORE SMART CITY

PREPARED BY:

ASIF ALI & ASSOCIATES (PVT) LTD

Table of Contents

CHAPTER 1: INTRODUCTION

1.1 GENERAL

Lahore Smart City depicts a model for sustainable development across the country. The concept of smart cities revolves around a comprehensive urban management model which encourages international standards of efficiency and control on the one hand and the best practices of inclusion and participation on the other. Lahore Smart City leverages and harnesses modern technology to enable the smart city to function more reliably while providing sustainable solutions to its residents. The area consists of different residential opportunities ranging from apartments to villas intermingling with nature.

Lahore Smart City comprises two major blocks i.e., Executive and Overseas. Further, it is divided into different districts such as Sports, Education, and Healthcare districts. Sports District is an international standard sports zone with multi-purpose facilities. It is a mixed land use with residential, leisure, sports, and entertainment facilities. It consists of major sports venues such as Cricket and Football stadiums. It also features an International standard sports academy and sports-themed retail pavilion.

Education District is primarily featuring educational institutions, research facilities, and training institutions. Healthcare District is the center for providing healthcare facilities including purpose-built labs, hospitals, and clinics. Lahore Smart City also includes Theme Park and Silicon Valley in its master plan. The theme park is a specified area dedicated to the activities of leisure and entertainment. Theme Park includes facilities such as holiday resorts and retail centers. Silicon Valley is designed to provide multiple land use facilities such as Technology Operational Offices, Corporate Offices, IT Campus, Retail Centers, and Residential Apartments.

1.2 PROBLEM STATEMENT

The planned 2-lane single carriageway Interchange will largely contribute to the economic and social development of the Lahore. It will serve the people visiting the Mughal Gateway project from Lahore Ring Road and G.T Road.

1.3 PROJECT OBJECTIVES

The Lahore Smart City Interchange will connect to GT Road and subsequently to M-2 through Kala Shah Kaku Interchange and will connect the Lahore Ring Road on the other end. It will facilitate the N-5 traffic destined to the Eastern Lahore and will reduce the load on existing Ravi Bridge and N-5 section after Kala Shah Kaku. The Lahore Smart City Interchange will be a 2-Lane single carriageway, with a 8- lane Bridge over River Ravi that will also cater to Lahore Sialkot Motorway in future.

1.4 SCOPE OF WORK

The purpose of the consulting services is to ensure that the Consultant's job is carried out to the highest professional standards and that the Detailed Design of the project is completed within the agreed upon time frame. The Consultants' duties will include, but are not limited to, those listed below. Work includes:

- Feasibility Study
- Detailed Design
- Environmental Impact Assessment
- Preparation of PC-1
- Preparation of Tender Documents and Drawings

The Detailed Scope of Work within the stipulated time for the contract is as below:

- Coordination with concerned departments regarding their ` development plans
- Collection of required data.
- Inception Report.
- Preparation of Conceptual plan With Recommendations along with presentation for approval concept design of interchange
- Traffic survey, Traffic mapping/ model and Capacity Analysis of junction
- Technical and Financial Feasibility Report
- Topographic Survey report along with Plans
- Hydrology & Hydraulic Study Report
- Soil & Material Investigation Report
- Geotechnical Investigation Report
- Environmental Impact Assessment (EIA) Report along with NOC
- Highway Safety Audit
- Design Reports encompassing i) overall design report, ii) Geometric Design Report iii) Structure Design report along with backup calculation, iv) Pavement Design Report

- Land Acquisition & Utilities Folders
- Construction Machinery Report
- Ground Validation & Alignment Stakeout
- Tender Documents, BOQ, Engineer's Estimate etc.
- PC-I
- Fixation of ROW on ground

1.5 PROJECT LOCATION

Lahore Smart City is located on Lahore Ring Road and M11 Lahore - Sialkot Motorway, near M2 Motorway. Location of Lahore Smart City is shown in figure 1.1. below,

Figure 1.1: Location of the Project Interchange

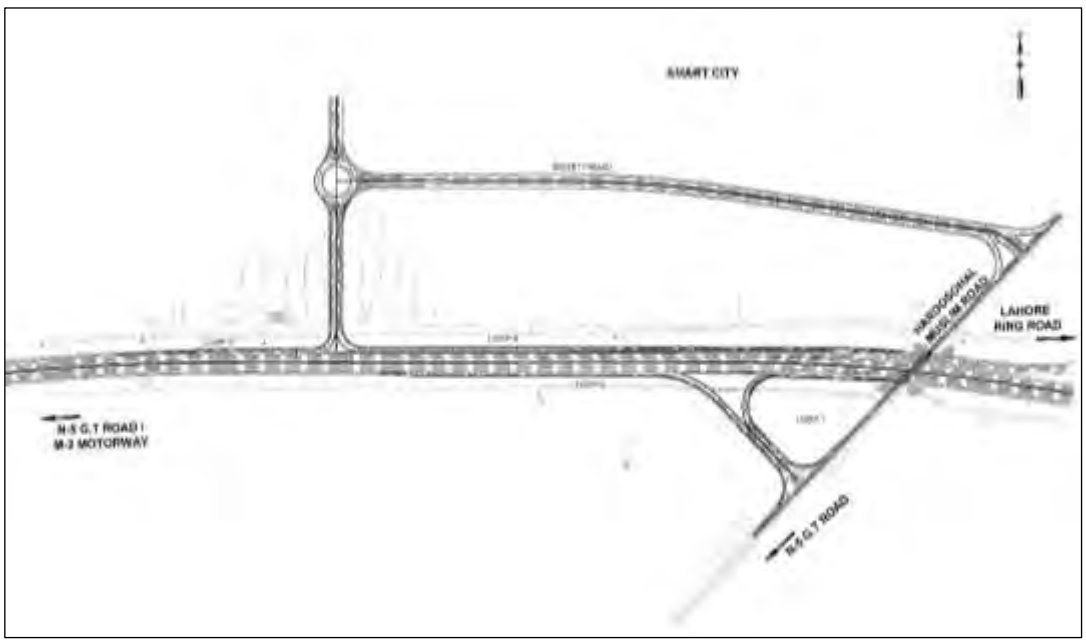


Figure 1.2: Plan of Access Roads to Lahore Smart City

Figure 1.3: Plan of Access Roads to Lahore Smart City on Google Map

1.6 LAHORE EASTERN BYPASS

It will start at Kala Shah Kaku interchange, will cross Kala Khatai – Narang Mandi Road, will give access to Lahore Gateway Project, and cross River Ravi and finally will meet Lahore Ring Road. Approximate length of this bypass will be about 13.5 Kms. The areas in the project length through which the alignment will pass mostly consist of plains.

The Project works comprise of Construction of 6-lane divided Motorway, with allied facilities. It will be a limited access Motorway, with a new 8-lane bridge over River Ravi. There will be River training works associated with the Bridge Construction, detail of which will be known after the River Model Study. Interchange at start of the Project will have to be modified to accommodate the new link. An Interchange is also envisaged at the end of the Project, besides at two other locations.

Our Proposed interchange is towards north side at Intersection of Hardoshal road with M-2 Link Road as marked in Figure 1.4. There is an existing KSK interchange on western side and GT Road N-5 on southern side from proposed interchange.

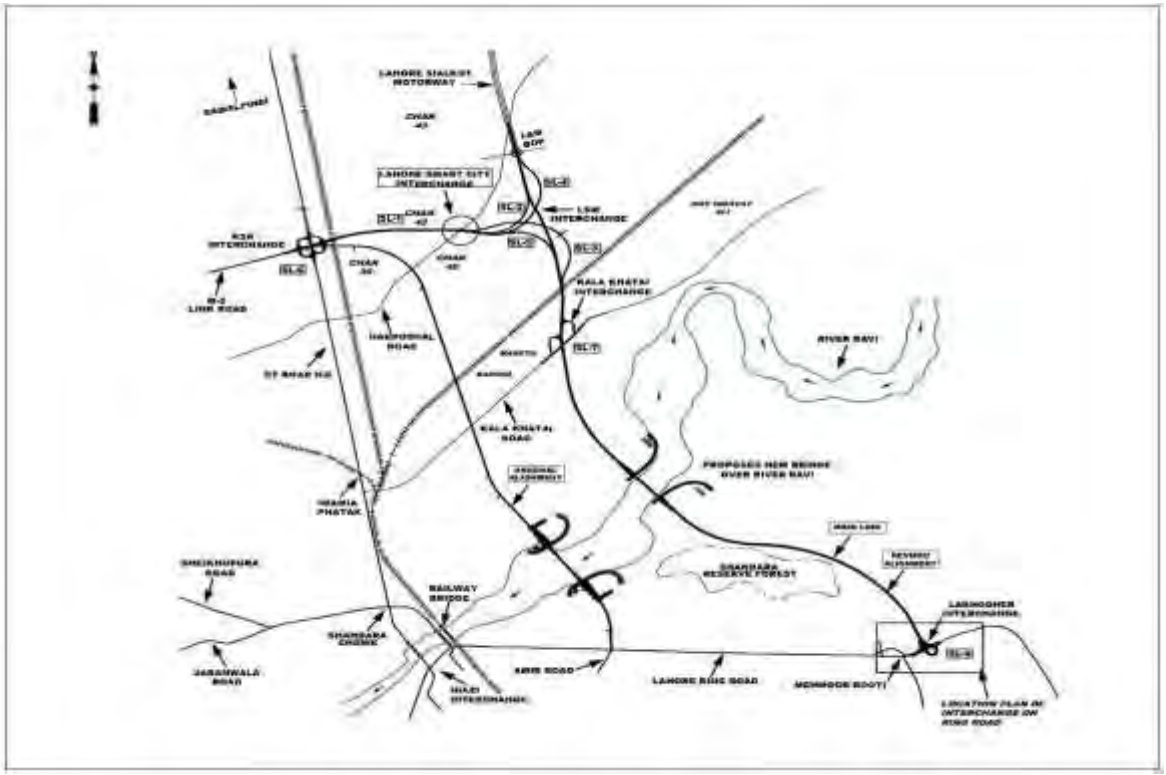


Figure 1.4: Proposed Interchange location

CHAPTER 2: PROJECT APPRECIATION

2.1 GENERAL

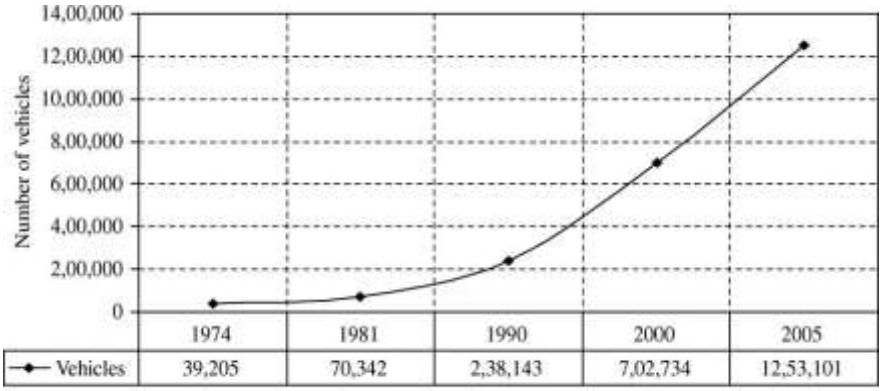
As a result of this project following benefits will accrue:

- It will facilitate the N-5 traffic destined to the Eastern & Southern Lahore and will reduce the load on existing N-5 between Ravi Bridge and Kala Shah Kaku.
- It will boost the tourism and will bring more population into the stream of benefits, which in turn will change to social complexion of people around this area. The Tourism Industry en-route will have direct benefit of competitive transportation system whereby resulting in uplift of economic condition of local community.
- It will serve the people visiting the Mughal Gateway project from Lahore Ring Road and G.T Road.
- It will also connect the Lahore - Sialkot Motorway.

2.2 BENEFITS OF PROJECT

Lahore, the provincial capital of Punjab, is the second largest city in Pakistan. The city's population of 10 million has been growing at a rate of about 3% per annum. While population and economy of Lahore are foreseen to grow steadily in the future, the increase of transport demand has been at much faster rate.

Rapid urbanization in Lahore has led to urban sprawl, with densities remaining low in most parts of Lahore. This has also led to increases in vehicle ownership, and greater vehicle miles travelled, but there has not been a commensurate increase in the length of roads and area under roads in Lahore.



	1974	1981	1990	2000	2005
Vehicles	39,205	70,342	2,38,143	7,02,734	12,53,101

Note: Figure is showing about 32 folds increase in urban transport during last 34 years

The result is high levels of congestion on the streets with consequent loss of man hours, high levels of air pollution, noise, smog and overall degradation of the environment.

Public Buse

Private Vehicles

Auto Rickshaws

The city's rapidly growing population coupled with increasing vehicles ownership has resulted insatiable travel demand. Development of transport infrastructure has not kept pace with this increase, and has caused transport related problems like traffic congestion and poor environment.

2.3 LAHORE'S ROAD NETWORK

Lahore's Road Network has primarily developed haphazardly along the old pre-partition routes without much planning. The partial Ring Road is the only project that have been planned and implemented over the past two decades to alleviate the traffic problems in the city.

Figure 2.1: Major Transportation Arteries

A complete list of major roads & streets is given in following Table while some major road arteries of the city are briefly described as follows:

a) Ferozepur Road

The 80 Kms long Ferozepur Road starts from Mozang Chungi in the northern part of Lahore and connects to the town of Firozpur in India. The Pakistani city of Kasur also lies on this road. In Lahore, the road passes along the localities of Ichra, Samanabd, Shadman, Shahjamal, Gulberg, Model Town and DHA. It passes through the towns of Kahna, Liliani and Kasur before entering India on Beas River.

b) Multan Road

It starts near Chauburji in northern Lahore and moves southwards along the localities of Samanabad, Gulshan Ravi, and Allama Iqbal Town etc before exiting the city at Thokar Niaz Beg. After exiting Lahore, it becomes part of the National Highway N-5 – the longest highway corridor in the country that starts in the north from Torkham on the Afghan border and ends in the south at the port city of Karachi.

c) Mall Road

The Mall Road in Lahore (also known as "Shahrah-e-Quaid-e-Azam"), is one of Lahore's primary and most famous road. It was constructed under the British Raj and was nostalgically named after The Mall in London. The Mall holds significant historical and cultural value, as most of the buildings lining the road are a collection of Mughal and colonial-era architecture, the majority of them built during the British Raj era. Prominent buildings along the Mall include the Governor House, the Punjab Assembly, the Islamic Summit Minar, the Civil Services Academy, Lahore Gymkhana, PC Hotel, Avari Hotel, Wapda House, GPO, Lahore High Court, Aitcheson College and the Lahore Museum. It starts near the Katcheri and moves southward to end in the Lahore Cantonment.

d) Canal Bank Road

Canal Bank Road is a major east-west link along the banks of the Bambawali-Ravi-Bedian (BRB) Canal. It starts at the village Khera near the Indian border and passes along the localities of Harbanspura, Mughalpura, Shadman, Gulberg, Muslin Town, Garden Town, University of the Punjab, Johar Town etc before exiting Lahore at ThokarNiaz Beg. The total length of the road is about 30 km but has been extended southwards over the past

two decades due to development of new housing societies like Bahria, EME, etc.

Street	From - Towards	Lane(s)	Length (km)
Mall Road	Chauburji - Fortress Stadium	3	9
Hall Road	Regal Chowk - McLeod Road	2	0.45
Main Boulevard Gulberg	Siddique Trade Center - Kalma Chowk	3	3.7
Main Boulevard Faisal	PU - Akbar Chowk	2	2.3
MM Alam road	Main Market - Firdous Market	2	1.5
Ferozepur Road	Qurtaba Chowk - Ferozpur	4	75
Jail road	Qurtaba Chowk - Cant	3	5
Queen's road	Qurtaba Chowk - Charing Cross	2	1.5
Lawrence road	Regal Chowk - China Chowk	2	1.9
Mozang road	MozangChungi adda - Lahore Zoo	2	1.3
Lytton road	Qurtaba Chowk - Babari Chowk	2	1.5
Canal Bank Road	ThokarNiaz Beg - Khera	2	29
Wahdat road	Ferozpur Road - Multan Road	3	6.5
Raiwind road	Canal Bank Road - Raiwind Town	2	27
Walton road	Qainchee bridge - R.A. bazaar	2	5.7
Lahore Ring Road	M2 Motorway - Kamahan road	3	42

Table 2.1: Key Roads & Streets of Lahore

e) Lahore Ring Road

The LRR circles Lahore over a circumference of 85 km. The route of the Lahore Ring Road is from BabuSabu to Saggian Interchange, Lahore, Niazi Chowk, and then stretching straight up to MehmoodBooti, passing through GT road, Canal Bank Road, Harbanspura Interchange, Barki Road, Abdullah Gul Interchange, Allama Iqbal International Airport, Ghazi Road, DHA Phase V & VII, Sui Gas Society, Ferozpur Road, to Hadiara Drain (South) to Halloki, Behria Town to NiazBiag. So far the northern loop of LRR has been completed.-

2.4 CURRENT TRANSPORTATION ISSUES

Traffic problem in Lahore has become a major issue and is getting worse with every passing day. Numerous reasons are there which are accelerating the intensity of this problem. With the mounting population of Lahore, the vehicles have also increased to an alarming level causing a state of traffic jam on the roads almost every hour of the day. The average travel time within the city has almost doubled over the past decade. The situation during morning and evening peak hours has become unbearable.

Some major factors that have contributed to this alarming situation are as follows:

2.4.1 Unplanned Urban Growth

While the city of Lahore has been growing rapidly over the past five decades, no master plan has been implemented to regulate its development and expansion in order to tackle the issues effectively. Therefore increase in population and its density has created serious problem which are becoming more intense day by day. Lack of planning also created more horizontal growth, instead a combination of both horizontal and vertical growths that should have been adopted like in all the major cities in the world.

2.4.2 Poor Public Transportation System

Due to lack of effective mass transportation system in the past, public trend towards private transport increased which caused rise in private vehicles at the rate of 12.2% per annum. Besides people's behavior on the roads, there are other multiple issues which are adding up and pointing towards a public policy failure.

The public transport network in Lahore has been under-developed, fragmented, inadequately managed and highly inefficient. There is a great gap between the demand and provision of an efficient and environment friendly public transport system. Public transport organizations have a long history of deficiency in professional, administrative, and financial capacity to manage public transport service planning.

There are currently many public transport vehicles operating without valid license and or even registration. About 25% of mini-buses operate without any valid documents. It has also been reported that many wagons are operating without any registration, and that many do not follow the authorized route.

The recent implementation of the Metro Bus Service and setting up of the Metro Bus Authority is a positive step in the direction of creating an effective and vibrant public transport system in the city.

2.4.3 Illegal Construction & Encroachments

Since independence, the Lahore Development Authority (as well as its predecessors) has failed miserably in preparing effective bylaws and implementing the same on site.

There has been a chronic disregard of any byelaws that were in place and bending of stated policies resulting in haphazard construction, encroachment of green areas, allowing illegal construction, thriving encroachment of state land, violation of parking rules in commercial plazas, unchecked commercialization in residential areas

Views of Encroachments on various roads

There is no segregation between market places, commercial areas and through roads in Lahore. Resultantly all roads have become market places resulting in a chaotic situation for the vehicular traffic.

2.4.4 Mix of Traffic

In addition to unlicensed mini-bus and wagon service, over the past decade Lahore has witnessed the increasing phenomenon of Qingqis and Rickshaw.

About 5,000 route permits have been issued to Qingqis, but it is estimated that as many as 40,000 are currently operating in Lahore. In parallel, the presence of more than 80,000 rickshaws not only causes congestion but serious threat to efficiency and service quality.

It is sad to state that even in the year 2014; animal drawn vehicles have not been banned from most city roads. There is no segregation of slow and fast moving traffic on the roads resulting in great difficulty in vehicle maneuvering and causing congestion and hazardous driving conditions.

Views of Traffic Mix & Jams

2.4.5 Lack of Parking Spaces

The bylaws of the development authorities regarding parking spaces for commercial buildings kept inadequate spaces for parking which too were

not implemented most of the time. This resulted in vehicles being parked on the side as well as main roads creating obstruction for moving traffic.

2.4.6 Lack of Departmental Coordination

Another major issue is that of governance or the lack of it, which is exacerbating the problem. For instance, there are number of government bodies responsible for managing and planning the traffic and transport issues of the city.

Some of these departments include Punjab Transport Department, Traffic Engineering and Planning Authority, City & District Government, Urban Unit of Planning and Development Department, City Traffic Police etc. The roles and responsibilities of all these departments overlap. Additionally, they work in isolation and coordination is completely missing,

2.4.7 Lack of Awareness of Traffic Rules

On one hand the local public is utterly unaware of the traffic rules, which are made for their safety. There is no system of driver training and education either at the time of issuance of driving licenses or hereafter.

Anyone can get a license while sitting at home without going through any written test to check his/her knowledge of traffic rules or to verify his practical driving skills on the road.

Resultantly we have one of the most illiterate societies in the world with respect to knowledge of driving rules.

2.4.8 Non-implementation of Traffic Rules

While over the past decade a better system of Traffic Wardens has been introduced in the city, its implementation remains restricted due to lack of number of wardens and the overall culture of the rich and powerful getting away with traffic violations.

2.4.9 Absence of Ring Roads

As any modern urban centre grows, it is natural development policy to create concentric rings in the road network along with development of radial road arteries. Attention on this aspect has been completely lacking over the past 6 decades.

Various master plans and feasibility studies for Lahore Ring Road were carried out in the 70's, the 80's and the 90's but were never implemented either due to lack of funding or political will.

Since no corridor for the ring road was earmarked and acquired before the development of suburban areas reached the alignments, the task of acquiring land became more and expensive and difficult day by day.

Finally over the past decade work was taken up on the Lahore Ring Road, although due to the delay in action, the length and cost of this project had considerably increased.

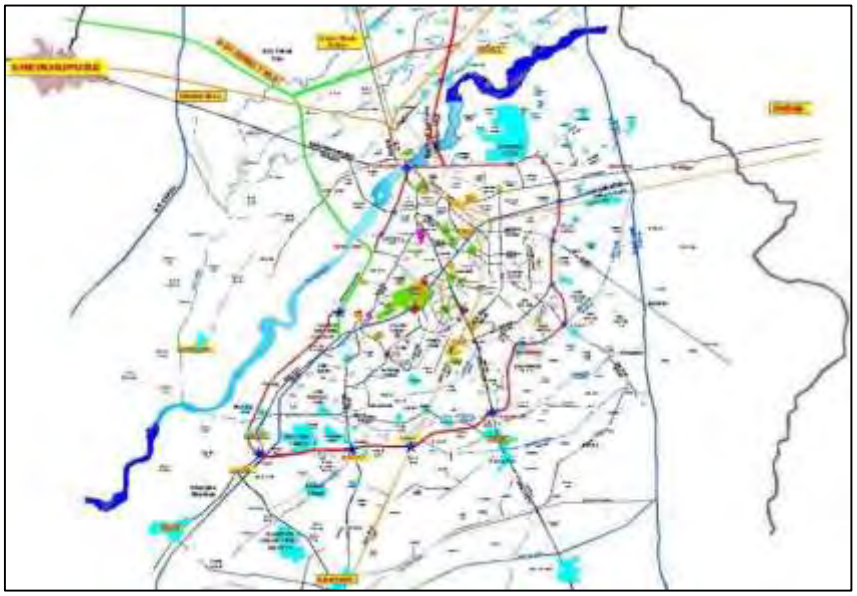


Figure 2.2: Lahore Ring Road

Over three quarters of the Lahore Ring Road has been completed while the southern section is yet to be taken up. Early completion of the complete loop is essential to relieve the congestion in the inner parts of the city.

2.4.10 Inadequate River Crossings

City of Lahore is bound on the west by River Ravi. So far there are only three river crossings namely:

a) Shahdarah (connecting to G.T.Road)
b) Saggian (connecting to Sheikhupura Road)
c) BabuSabu (connecting to the Motorway M-2)

Since all three of these crossings are located in the north of the city, it results in all the traffic intending to leave the city for cities in the north / west to

concentrate towards the north creating traffic jams and choking of roads leading to these exit points.

2.4.11 Inadequate Railway Crossings

The City is divided in half by the main Railway Line of the country that connects to Rawalpindi and Peshawar in the north and to Multan, Sukkur and Karachi in the south.

At the time of independence, only three crossings of the Railway Line existed within the city, namely EikMoriaPul, Do MoriaPul and the Garhi Shahu Bridge: Since then, following grade separated crossings over the Railway Line have been constructed to effectively connect the southern and northern parts of the city:

a) Allam Iqbal Road Underpass
b) Suharwardi (Canal) Underpass)
c) Mian Mir Bridge on Mall Road
d) Sherpao Bridge on Jail Road,
e) Walton Bridge on Ferozepur Road
f) Jinnah (Cavalry) Flyover

Lack of railway sufficient crossings also implies that the traffic intending to cross over from the north to the south of the Railway Line is forcibly concentrated on the available crossings creating traffic choke points.

2.4.12 Lack of Road Maintenance

Due to general weakness of the economy in the past, there has been a scarcity of available funds for maintaining existing roads and developing new routes. Lack of proper drainage and inadequate maintenance meant that parts of city roads are often in poor conditions resulting in increased travel time and congestions.

2.5 PROPOSED IMPROVEMENTS

The various studies mentioned above have come up mostly with similar findings related to steps that MUST be taken if the situation of traffic on the roads of Lahore has to be improved and a complete breakdown of transportation is to be prevented.

The Lahore Development Authority is currently following the policies outlines in the 1991 Study by JICA as well as the 2001 Master Plan for Lahore prepared by Nespak.

These studies conclude that the traffic system of Lahore requires certain changes which are quite essential to resolve the issue in a proper way. Some of the key projects that have been identified in these studies for improvement of the traffic congestion and improve the flow of traffic are listed below:

Public Transport Projects

1. Multimodal intercity bus terminal in Lahore
2. Effective and efficient School Bus System
3. Up-gradation of Bus Stands
4. Integrated Bus Operation
5. Establishment of Multimodal Bus Terminal at Shahdarah

LRTMS& BRT Projects

1. LRTMS Green Line
2. LRTMS Orange Line (As a BRT)
3. LRTMS Blue Line (As a BRT)
4. BRT Purple Line
5. BRT Line 1
6. BRT Line 2
7. BRT Line 3a
8. BRT Line 3b

Priority Traffic Management Projects

1. Establishment of centralized driver licensing authority
2. Parking management company
3. Traffic Education center
4. Traffic control plan of city
5. Vehicle inspection and certification system (VICS)
6. Construction of new parking plaza
7. Construction of pedestrian bridge
8. Improvement of 52 junctions
9. Ferozpur Road Pilot Projects
10. Conversion of 2- Stroke Rickshaw into CNG Fitted 4-Stroke Rickshaw

11. Remodeling of Inner and Outer Circular Road 12.

Priority Road Sub-Sector Projects

1. Construction of LRR (Airport-Ferozpur Road)
2. Construction of Kalma Chowk Flyover
3. Remodeling of Canal Bank Road
4. Remodeling of Barki Road (LRR- Green City)
5. Remodeling of Kala Khatai Road
6. Remodeling of Allama Iqbal Road
7. Remodeling of Multan Road
8. Remodeling of Thokar Niaz Beg
9. Remodeling of Ferozpur Road

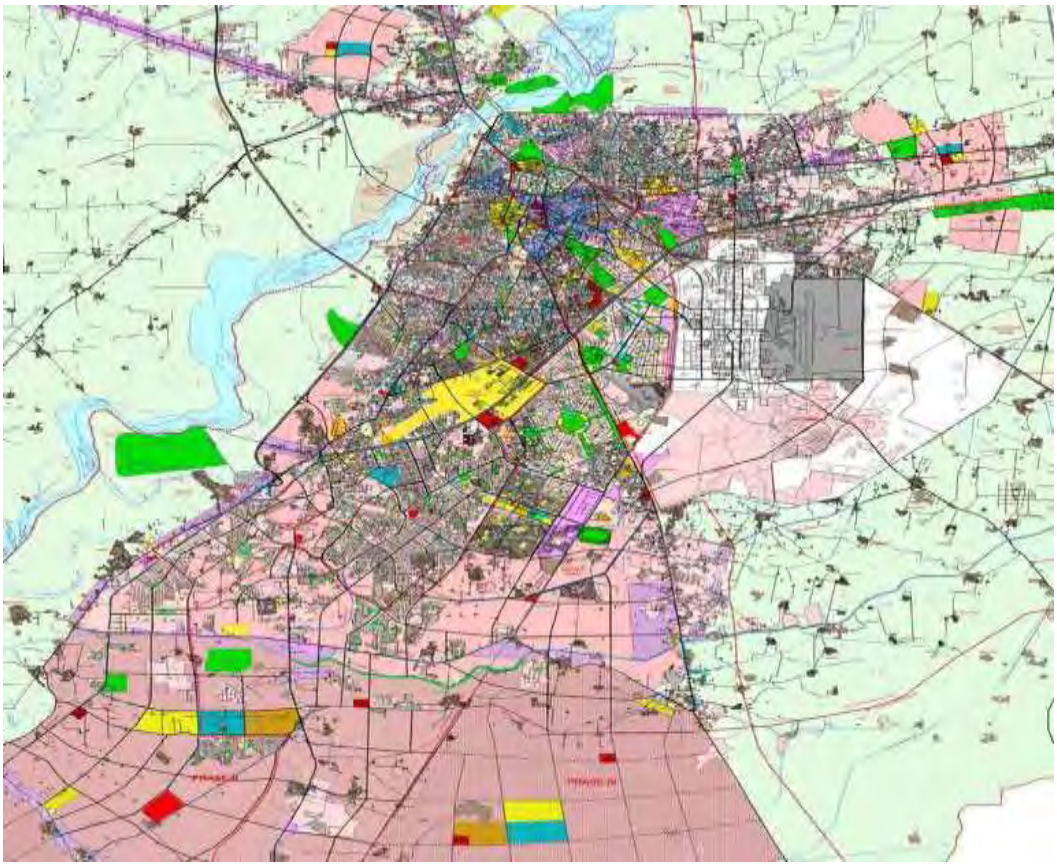


Figure 2.3: Traffic Analysis of Road Network in JICA Study

Long Term Road Sub-Sector Projects

1. Barki Road (Green City – BRB Canal)
2. Badian Road (DHA-LRR-Ferozpur Road)
3. Shabbir Usmani Road (Barkat Market – Maulana Shaukat Ali Road)
4. Link PECO Road – Ferozpur Road)

5. Link Ferozpur – Nalaywali Road (Completion of Link between Ferozpur and Multan Road)
6. Old Ravi Bridge and Road (Bridge .5 Km)
7. G.T Road (Copper – EK-Moria Pull)
8. College Road (Ghos-e-Azam Road – Defence Road)
9. Structure Plan Road (Shahrah Nazria-e- Pakistan-Defence Road)
10. Expo-Kahna Kacha Station Road (Khyaban-e-Jinnah – Kahna Kacha Station)
11. Main Boulevard PIA Society Road (Beg Road – Ittehad Road)
12. Raiwind Road (Lahore Ring Road Southern Loop – Raiwind City)
13. Maderat-e-Millat Road – Defence Road
14. Extension of Malulana Shaukat Ali Road (Canal Bank Road – Noor ul Amin Road through Punjab University)
15. KamahanLidher Road (Ferozpur Road – Bedian Road)
16. SuaAsil Road (Ferozpur Road – Raiwind Road)
17. Kahna Station – Raiwind City (KahnaKacha approach Road – Raiwind City along Railway line)
18. KahnaKacha (Kahna Station – Ferzopur Road)
19. Sharaqpur Road (LRR-SaggianWala Bypass) (Bridge 0.7 Km)
20. Lahore – Shekhupura Road (SaggianWala Bypass – G.T Road) (Bridge 0.6 Km)
21. Lahore Shiekhupra (West) (Sharaqpur Road – Lahore Sheikhupra Road)
22. Link Thokar NiazBaig Canal Bank Road – Ferozpur Road (Khyban-e-Jinnah Road – Defence Road – Ferozpur Road)
23. Manga – Raiwind Road (Multan Road – Raiwind Road)
24. Southern Bypass South Road (Ferozpur Road - College Road)
25. Southern Bypass North Road (Canal Bank Road – M2)
26. Raiwind – Patoki Road (Rawind City – Boundary of Study Area)
27. Raiwind Road (Thokar – LRR Southern Loop)
28. Defence Road (Multan Road – Ferozpur Road)
29. ThokarNiazBaigCnala Road Extension (Defence Road – LRR Southern Loop)
30. Construction of LRR West (Multan Road – M2)
31. Construction of LRR South (Ferozpur Road – Multan Road)
32. Secondary Roads in Dharanmpura Area
33. Secondary Roads in Shadbagh Area
34. Secondary Road in Samanabad Area
35. Lahore Bypass (G.T Road – Kala Shah Kaku Bypass)
36. M2 – Lahore Islamabad Motorway (Lahore – Sheikhupura Road - Boundary of Study Area) (Bridge 0.6 Km)
37. M-2 – Lahore – Islamabad Motorway (Bund Road – Lahore Sheikhupura Road)
38. N-5 – Multan Road (LRR Southern Loop – Boundary of Study Area)
39. Sharief Complex Road (Defence Road – Manga Raiwind Road – Bhai Pheru Kot RadaKishan Road)

40. North West Secondary Ring Road (Sharaqpur Road – Lahore-Sheikhupura Road – G.T Road)
41. Sheikhupura – Muredkey Road (G.T Road – M2)
42. Link G.T Road (Sharaqpur Road – Lahore Shiekhupura Road – G.T. Road)
43. Link Kala Shah Kaku – Lahore - Sialkot Motorway
44. Lahore- Sialkot (Bridge 0.8 Km)
45. Link G.T Road Lahore – Sialkot Motorway)
46. Construction and Remodeling of Secondary Road- South of LRR in the South- Western Quadrant between Ferozpur Road and Multan Road)

Long Term Traffic Management Projects

1. Junction Design and Traffic Signal Improvement – CBD
2. Existing Junction Design and Network Improvement
3. Road Function and Capacity Improvement Project
4. Low Occupancy Vehicles Planning for Outskirt/Rural areas
5. Traffic Circulation System Design and Implementation
6. Public and Freight Transport Terminals
7. Linking Communities – Smart Roads
8. Feasibility Study for Traffic Demands Management measures
9. Planning and Design Study for Non-Motorized Traffic
10. Non- Motorized Traffic facilities Implementation
11. Pedestrian and Bicycle Path Network
12. Comprehensive Parking System Development
13. Parking Facilities Implementation
14. Park and Ride Facilities Development
15. Traffic enforcement Strengthening Programs
16. Traffic Calming
17. Traffic Safety Education Improvement
18. Intelligent Transportation System Development
19. Local Standards and Guidelines and Development

Over the past decade, the Government of Punjab, through the Communication & Works Department, the Lahore Development Authority (LDA) and the Traffic Engineering and Planning Authority (TEPA) has moved forward to implement many of the steps outlined in the above mentioned studies.

The Government has successfully completed three quarters of the mammoth Lahore Ring Road Project.



Views of Lahore Ring Road

Another Mega Project for Metro Bus Service has been implemented and made operational in record time.


MBS near Azadi Chowk


MBS Elevated Section


MBS Bus Station

Various projects for constructing flyovers and underpasses as well as developing of new radial as well as concentric rings to ease the traffic flow within the road network are also being taken up on priority basis.


Canal Road Underpass


Jinnah (Cavalry) Flyover


Kalma Underpass

The subject project is also part of the Government's efforts to materialize the findings envisaged in the Lahore Master Plan and outlined in the various studies in the past.

This project involves construction of a bridge on eastern side close to Mughal Gateway project will facilitate the N-5 traffic destined to the eastern Lahore and will reduce the load on existing N-5 between Ravi Bridge and Kala Shah Kaku.

2.6 LAND USE DETAILS

Lahore Smart City is designed to have international standard smart city features such eco-friendly and green environment, green buildings, smart traffic control, an advanced security system, etc.

The proposed development of Lahore Smart City consists of mixed land use (residential, commercial, recreational, and office). The development is divided into different zones. Table 2.2 provides details of the mixed land use of Lahore Smart City.

Table 2.2: Land Use and Its Types

Sr. No.	Land use	Area (Kanals)	%Age (Actual)
1	Residential		
	Residential Reserve	12,178.72	39.45
2	Commercial	3,085.70	10
3	Parks /O.Space	3,358.54	10.88
4	Public Buildings	875.58	2.84
6	S.T.P	11.94	0.04
7	Roads	11,360.67	36.8
Total		**30,871.15**	**100**

CHAPTER 3: DESIGN CRITERIA

3.1 DESIGN CRITERIA AS PER TOR

Criteria adopted for design of loops of Interchange is given as Table 3-1 based on the provided TORs.

Table 3-1 Design Criteria

Sr. No.	Items	Specified Min. Value
1	Road Classification	Loops of Interchange
2	Design Speed	40 km/h
3	Min Stopping Sight Distance	50 m
4	Min. Passing Sight Distance	140 m
5	Max. Rate of Super elevation	6 %
6	Horizontal Curvature	
	Absolute Min Radius	43 m
7	Road Formation Width	11.5 m
8	Width of travelled way	7.3 m
9	Width of Shoulder	3 m (outer) 1.0 m (inner)
10	Cross Slope (travelled way)	2 %
11	Cross Slope (shoulder)	4 %
12	Maximum Vertical Gradient	Up to 4 %
13	Minimum Vertical Gradient	0.3%
14	Rate of Vertical Curvature	
	i) K Value for Crest Curve	4
	ii) K Value for Sag Curve	9
15	Fill Slopes	2:1
16	Min Vertical Clearance over roadway	5.1 m
17	Min Vertical Clearance over railway (rail top)	6.1 m
18	Right of Way	50 m

3.2 DESIGN CRITERIA ADOPTED FOR LAHORE EASTERN BYPASS

Criteria adopted for design of Lahore Eastern Bypass is given as table 3-2

Table 3-2 Design Criteria

Sr. No.	Items	Specified Min. Value
1	**Road Classification**	3 Lane Dual Carriageway
2	**Design Speed**	120 km/h
3	**Road Cross Section**	
a	Lane Width	3.65
b	No. of Lanes	6
c	Paved Shoulder	
	(i) Outer (m)	3.0
	(ii) Inner(m)	1.0
4	**Carriageway Cross Slope**	11.5 m
	Pavement	2%
	Shoulder	
	(i) Outer Shoulder	4 %
	(ii) Inner Shoulder	4 %
5	**Horizontal Alignment**	
	Minimum Radius	1500
	Maximum Superelevation	6%

CHAPTER 4:GEOMETRIC DESIGN

4.1 GENERAL

Geometric Design describes the horizontal and vertical shape of the highway and plays the most important part in the design.

In Pakistan, AASHTO standards are followed for the geometric design of highways and Interchanges especially for the following parameters:

- Typical Cross-Section
- Horizontal curve radii
- Horizontal curve lengths
- Curve Widening
- Sight Distances
- Vertical Gradients
- Vertical curve lengths
- Super-elevation.

It is very important for the designers to conform to the standards as a little mistake in the design can lead to the serious accidents and loss of precious lives. On the other hand, sometimes it becomes very difficult to follow the standards exactly in the hilly areas where certain unavoidable constraints exist and one has to compromise on some deviations. But serious effort should be made to follow the criteria as much as one can.

4.2 TYPICAL CROSS-SECTION

Typical Cross-Section ensures the cross-sectional design accommodates traffic volume and vehicle types, providing appropriate lane widths, shoulders, and clear zones for safety and efficiency.

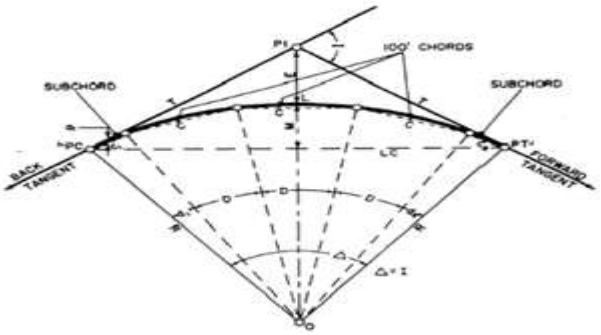
All the X-sections for Lahore Smart City are deigned keeping in view the traffic volume. Appropriate lane widths shoulders are designed prioritizing safety and efficiency.

4.3 HORIZONTAL ALIGNMENT

Horizontal Curves are one of the two important transition elements in geometric design for highways (along with Vertical Curves). A horizontal curve provides a transition between two tangent strips of roadway, allowing a vehicle to negotiate a turn at a gradual rate rather than a sharp cut. The design of the curve is dependent on the intended design speed for the roadway, as well as other factors including drainage and friction. These

curves are semicircles as to provide the driver with a constant turning rate with radii determined by the laws of physics surrounding centripetal force.

PC = Point of Curvature at Beginning of Curve
PI = Point of Intersection of Tangents
PT = Point of Tangency at end of Curve
L = Length of Curve
T = Tangent length
Δ = Degree of Curve



Horizontal Alignment is designed as per AASHTO 2018 Design Standards and is discussed below briefly:

4.3.1 Horizontal Curve Radii

Horizontal curve radii provides the minimum required radii for curves to allow safe vehicle manoeuvring, preventing skidding and loss of control, especially at higher speeds.

According to table 3.7 of AASHTO Design Guide 2018, the minimum radius is 43m for the design speed of 40 KPH. The criteria for minimum radius for this project is in compliance with AASHTO Standards.

4.3.2 Horizontal Curve Lengths

The proper lengths of horizontal curves facilitate smooth transitions, reducing lateral acceleration on vehicles and enhancing driver comfort and safety.

According to ASHTO Design Guide 2018, the minimum length for horizontal curves on main highways, L_c min, should be 15times the design speed expressed in mph], or L_c min = 3V [15V [three times the design speed expressed in km/h].

The criteria for Horizontal Curve Lengths for this project is in compliance with AASHTO Standards.

4.3.3 Curve Widening

Accounted for additional lane width on curves to accommodate the dynamics of larger vehicles and reduce the risk of encroachment onto adjacent lanes, improving overall safety.

According to AASHTO Design Guide 2018, Curve Widening is typically needed for design speed of 50 km/hr or above. Since design speed of this project is 40 km/hr i.e. lesser than 50 km/hr, therefore no need of curve widening

4.3.4 Sight Distances

Sight Distances ensure that drivers have sufficient visibility to react to road conditions, signs, and potential hazards, which is crucial for preventing accidents and promoting safe driving. Site Distances have been taken into account.

4.3.5 Stopping Sight Distance

Vertical curves are designed to ensure that the headlight beam of the vehicle can illuminate an object on the road ahead. It ensures roadway safety by allowing drivers enough distance to detect hazards and stop safely. It helps prevent collisions, supports effective road design, accommodates varying vehicle speeds, and ensures compliance with safety standards, particularly on curves and at intersections.

According to table 3.2 of AASHTO Design Guide 2018, Site Distances have been taken into account while designing of interchange.

4.3.6 Passing Sight Distance

Passing Sight Distance (PSD) is a critical design criterion for ensure safe passing manoeuvres on two-lane roads. It is crucial for ensuring safety on two-lane roads, reducing head-on collision risks, and allowing smooth traffic flow by providing adequate visibility for passing manoeuvres.

As all the loops of this interchange are 4 lanes or above and a divided highway. So, the criteria of passing sight distance is not applicable on this project.

4.3.7 Super-elevation

Evaluated the banking of the roadway on curves to counteract centrifugal force, improving vehicle stability and safety while navigating turns. Proper super-elevation also helps with drainage and reduces the risk of accidents.
According to design criteria of TORs, the maximum rate of Super elevation is taken as 6%. None of the curves in the design have more than 6% super elevation.

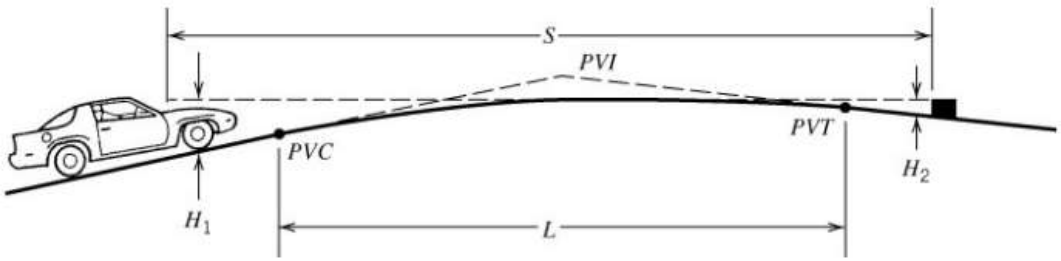
4.4 VERTICAL ALIGNMENT

Considering design speed, algebraic difference of gradients, Passing Sight Distance and K value vertical alignment design has been done using ROADCALC software program. Vertical Curve lengths and gradients have been adjusted. Detail of which is given for three sections separately as given below: -

Rate of vertical curvature, K is the length of curve per percent of algebraic difference in intersecting grades (A). Value of K has not been kept less than 40 because the road along with interchange will be used by trucks so it has been kept above design standard.

For quick perception of Sag & Crest Vertical Curves along with, definition of all geometric variables pertaining to these curves are narrated by the following figures: -

Crest Vertical Curve



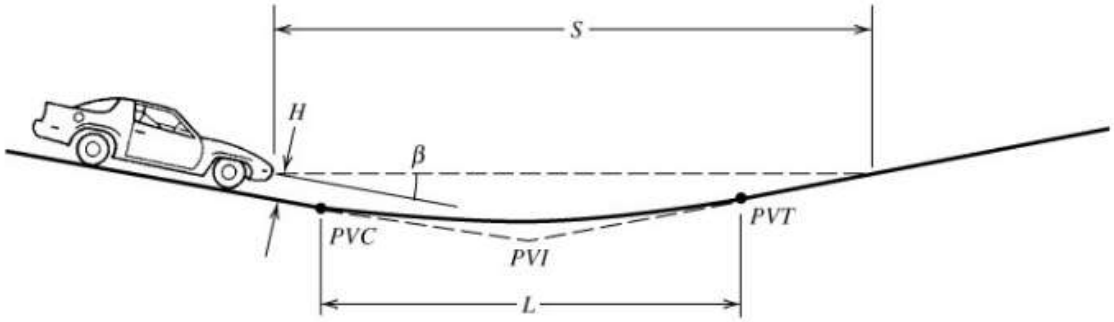
Definitions:

PVI = Point of vertical intersection of tangent lines
PVC = Point of vertical curvature
PVT = Point of vertical tangency
L = Length of curve
G_1 = initial roadway grade in percent
G_2 = final roadway grade in percent

A = absolute value of difference in grades

h_1 = Height of eye above roadway, measured in meters or feet
h_2 = Height of object above roadway, measured in meters or feet
S = Sight distance

Sag Vertical Curve



Where:

H = height of headlight above road surface
β = inclined angle of headlight beam

Definition of PVI, PVC, PVT, L & S are the same as given for Crest vertical curve.

4.4.1 Vertical Curve Lengths

Vertical Curve Lengths determine the lengths of vertical curves to provide smooth transitions between different grades, enhancing comfort and minimizing abrupt changes in elevation.

According to ASHTO Design Guide 2018, the minimum lengths of vertical curves are expressed as about 0.6 times the design speed in km/h, $L_{min} = 0.6V$, where V is in kilometres per hour and L is in meters, or about three times the design speed in mph, [$L_{min} = 3V$], where V is in miles per hour and L is in feet. Criteria of Vertical Curve Lengths have been taken into account while designing of interchange.

4.4.2 Max K-value Crest Vertical Curve for SSD

According to AASHTO guidelines, the recommended minimum k value for crest vertical curves is 4 for design speed of 40kph. This criterion is established to ensure safe and efficient roadway design, accommodating factors such as driver comfort, visibility, and vehicle stability.
All the crest vertical cuvees are designed in compliance with AASHTO Design Guide

4.4.3 Max K-value Crest Vertical Curve for PSD

It ensures sufficient Passing Sight Distance (PSD) for safe overtaking by providing clear visibility of oncoming traffic. It minimizes collision risks, complies with safety standards, and balances driver comfort with cost-effective road design.

4.4.4 Max K-value Sag Vertical Curve for SSD

It is critical for ensuring Stopping Sight Distance (SSD) because it affects night-time visibility under headlights and driver comfort during transitions. A higher K-value provides a flatter curve, allowing adequate headlight reach for safe stopping, compliance with safety standards, and smoother road design.
According to AASHTO guidelines, the recommended minimum k value for Sag vertical curves is 9 for design speed of 40kph. This criterion is established to ensure safe and efficient roadway design, accommodating factors such as driver comfort, visibility, and vehicle stability.
All the Sag vertical curves are designed in compliance with AASHTO Design Guide

4.4.5 Vertical Gradients

According to TORs, the maximum grade is 4% for design speed of 40. All the vertical curves are in compliance with this criteria.

4.4.6 Cross Slope Pavement

AASHTO standards with a cross slope of 2% for level terrains, ensure proper drainage and road safety. This compliance prevents water accumulation on the road surface, reducing the risk of hydroplaning and pavement damage.
This project is in compliance with the design criteria.

4.4.7 Cross Slope Shoulder

The shoulder's cross slope is designed to facilitate drainage and provide a safe area for stopped vehicles. It is generally steeper than the main pavement to enhance water runoff. According to TORs, the cross slope of shoulders is 4%
This project is in compliance with the design criteria.

4.4.8 Formation Width

According to TORs, Formation width is kept 11.5m. This criteria ensures adequate space for vehicle operation, safety, and effective drainage for providing a safe and efficient roadway design suitable for rural local roads.

This project is in compliance with the Formation Width design criteria.

4.4.9 Fore Slopes / Fill Slopes

Fore Slopes, ensure safe and stable road conditions. By incorporating maximum foreslope rates appropriate to local soil conditions and design constraints, the road promotes safety, facilitates maintenance, and supports sustainable roadside vegetation. According to TORs, Fore Slopes / Fill Slopes is kept 2:1. This project is in compliance with the design criteria.

4.4.10 Shoulder Width

Shoulder width ensures safety and accessibility emphasizing local context while adhering to international standards for road infrastructure. Shoulder width provides a safety buffer for stopped vehicles, supports pavement stability, and accommodates pedestrians or cyclists. It also aids in drainage and maintenance.
According to TORs, shoulder width for inner shoulder is 1m while for outer shoulder is 3m
This project is in compliance with the design criteria.

4.4.11 Lane Width

The lane width of a roadway influences the comfort of driving, operational characteristics, and, in some situations, the likelihood of crashes.

According to TORs, lane width of the project is 3.65m. This project is in compliance with the TORs

4.5 RECONNAISSANCE SITE VISIT

Soon after approval of alignment, numerous reconnaissance site visits were planned and carried out by team of consultants comprising Senior Highway Engineer, Traffic Expert, Chief Surveyor, Hydrologist and Pavement expert.

During the site visit various critical locations were examined and appropriate policy was finalized with respect to geometric design.

4.6 APPROVED ALIGNMENT

The Plan of approved alignment is attached below.

4.7 GEOMETRIC DESIGN (PLAN & PROFILE)

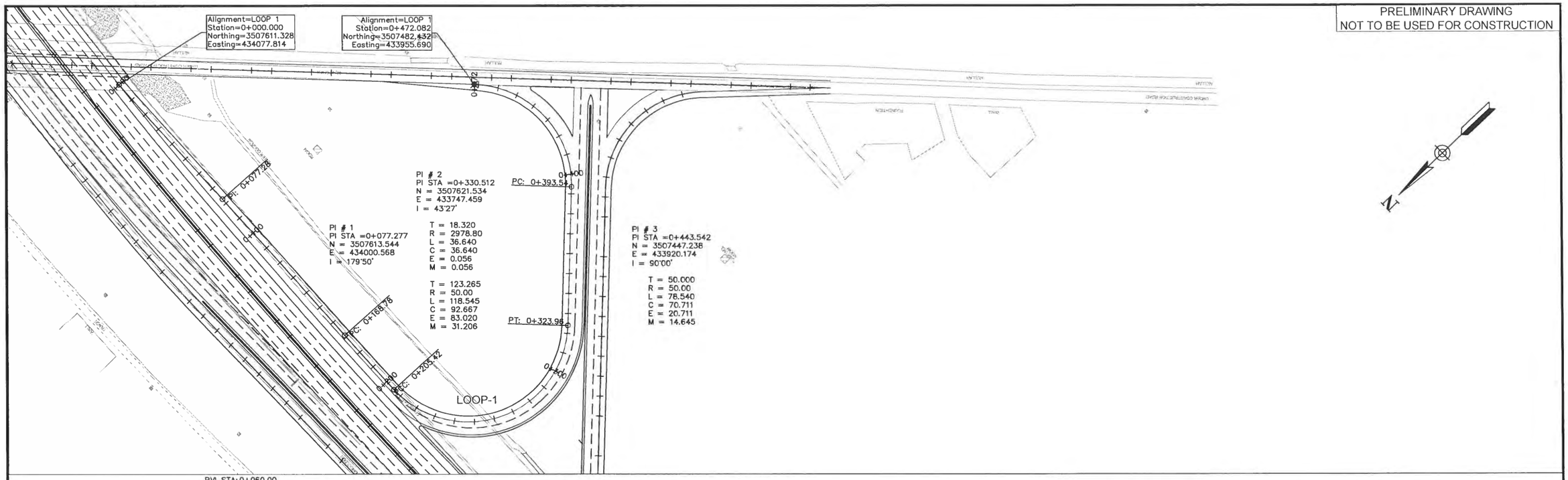
The Plan and Profile drawings are attached as ANNEXURE-A.

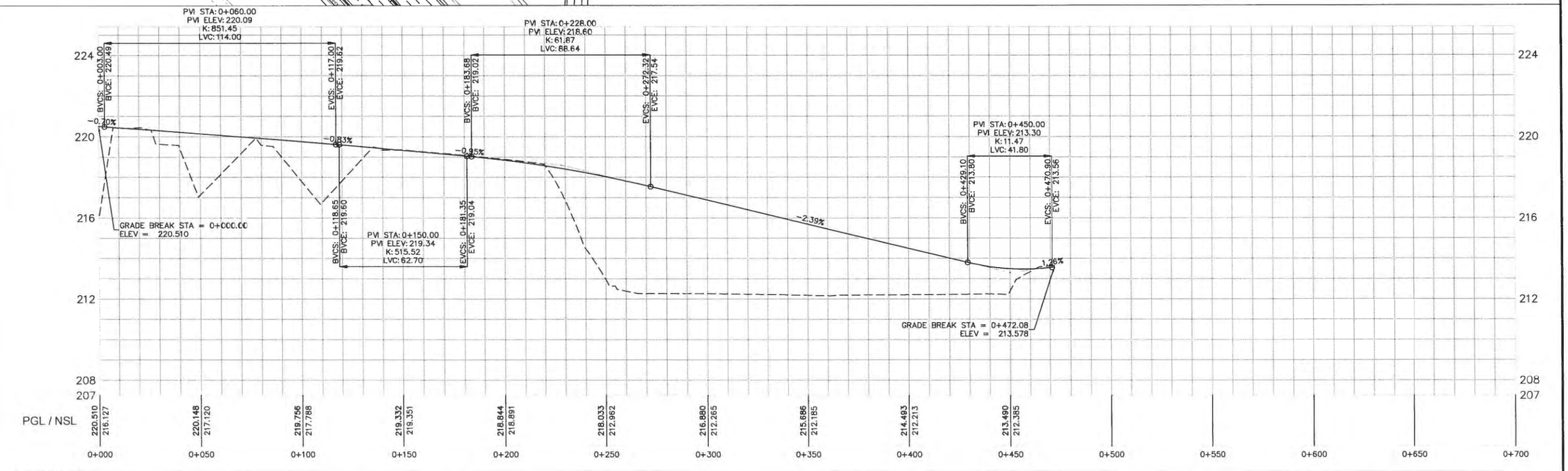
ANNEXURES

ANNEX-A

PLAN AND PROFILE DRAWINGS

PRELIMINARY DRAWING
NOT TO BE USED FOR CONSTRUCTION





CLIENT	LAHORE SMART CITY	
CONSULTANT	NATIONAL ENGINEERING SERVICES PAKISTAN (PVT.) LTD.	ASIF ALI & ASSOCIATES (PVT) LTD

REV.	DATE	DESCRIPTION	APPROVED		
04				DRAWN	Faisal
03				SUBMITTED	
02				RECOMMENDED	
01				CHD VER	
				APPROVED	

PROJECT
DETAILED FEASIBILITY STUDY FOR INTERCHANGE ALONG EASTERN BYPASS, LAHORE SMART CITY

PLAN & PROFILE
LOOP-1
FROM Km. 0+000 TO Km. 0+472.08

SCALE

DATE: JULY, 2025

DRAWING No.: 4945/102/PR/1C001

REV.: 0

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PRELIMINARY DRAWING
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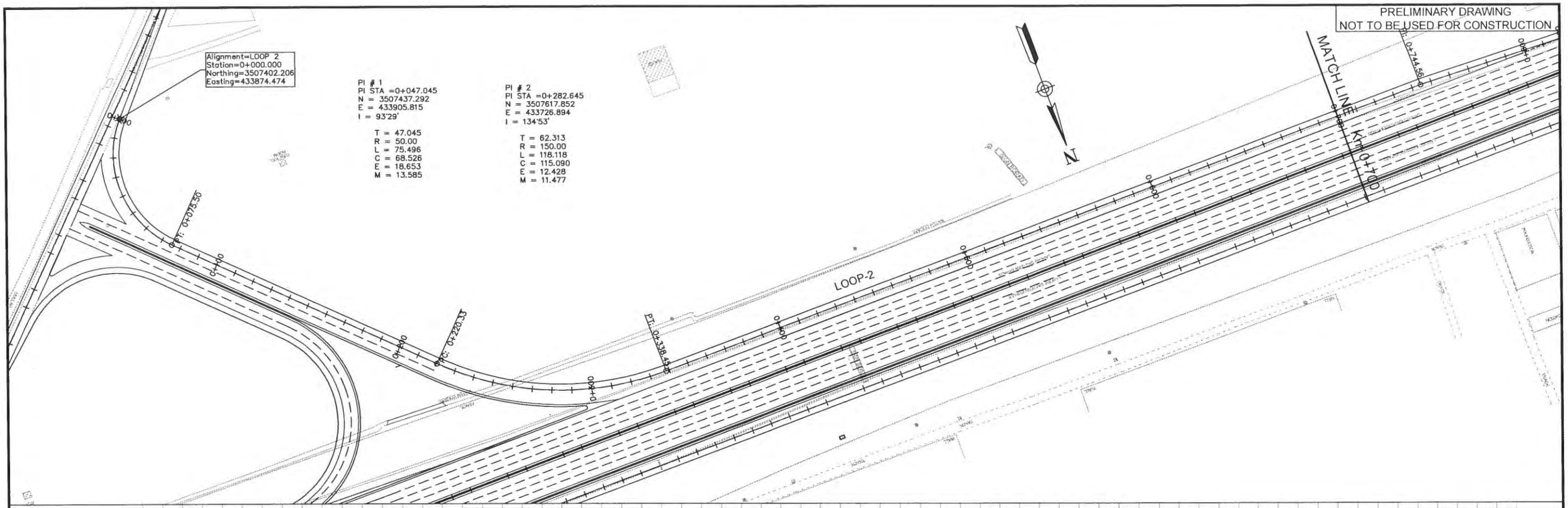

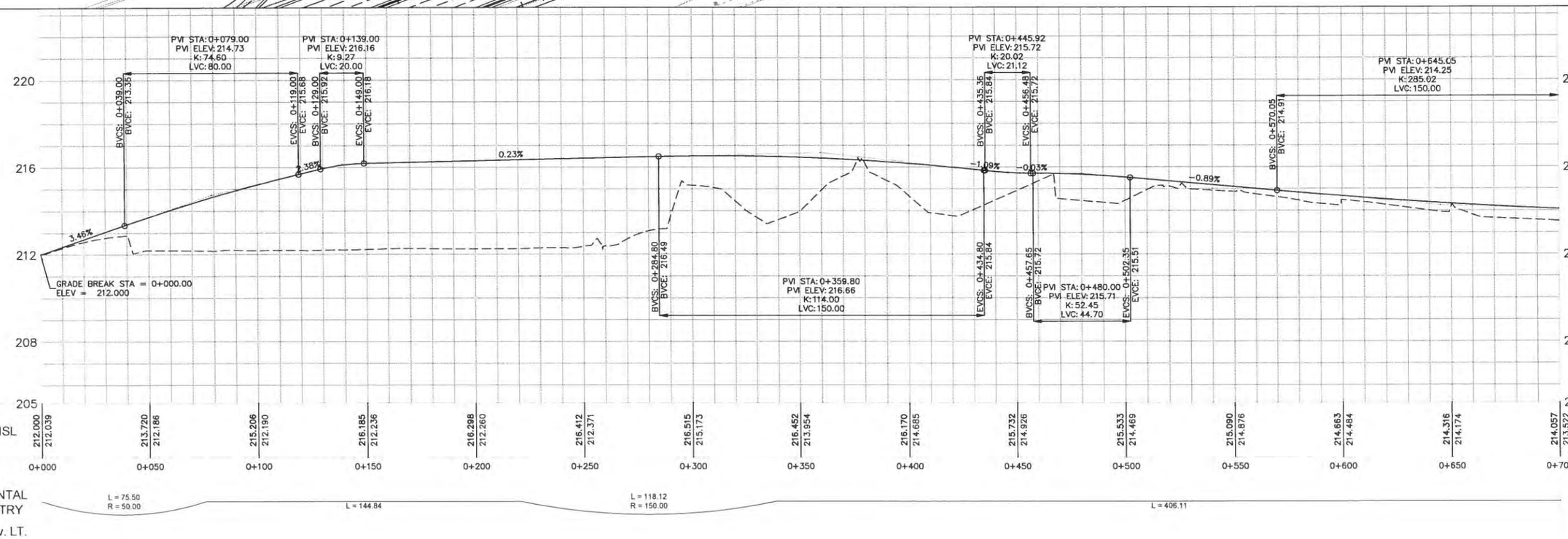

CLIENT: LAHORE SMART CITY	CONSULTANT: NATIONAL ENGINEERING SERVICES PAKISTAN (PVT.) LTD.; ASIF ALI & ASSOCIATES (PVT) LTD			PROJECT: DETAILED FEASIBILITY STUDY FOR INTERCHANGE ALONG EASTERN BYPASS, LAHORE SMART CITY	SCALE
				PLAN & PROFILE LOOP-2 FROM Km. 0+000 TO Km. 0+700	
				DATE: JULY, 2025	DRAWING No.: 4945/102/PR/1C002
					REV.: 0

PRELIMINARY DRAWING
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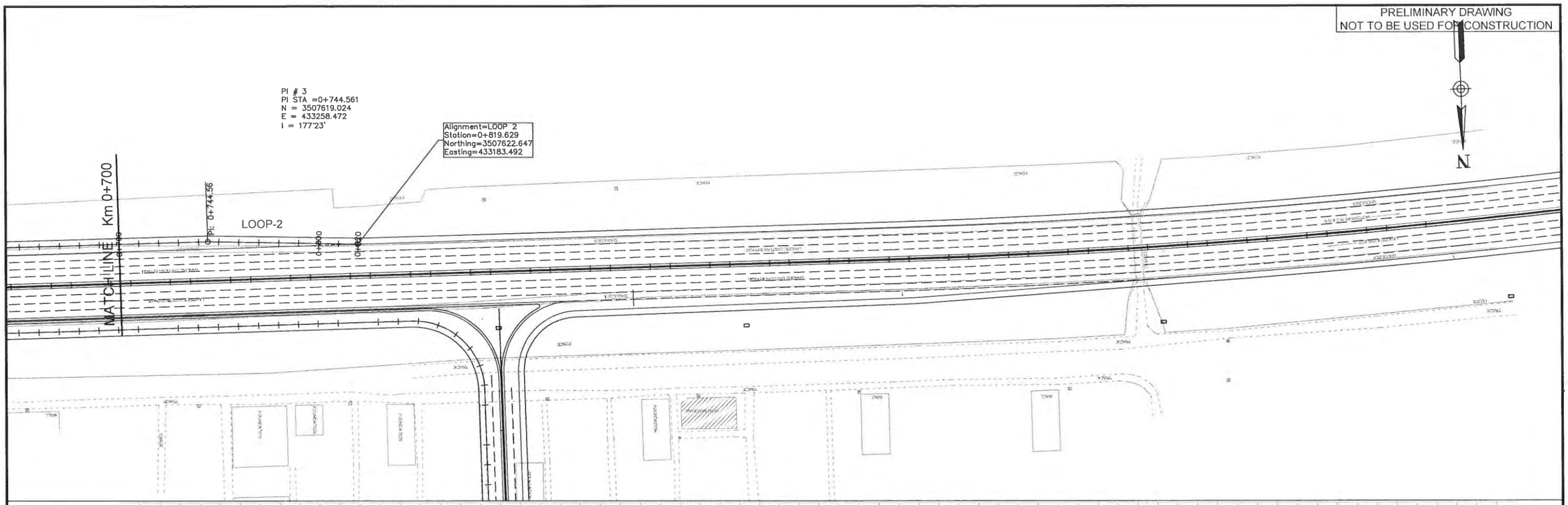

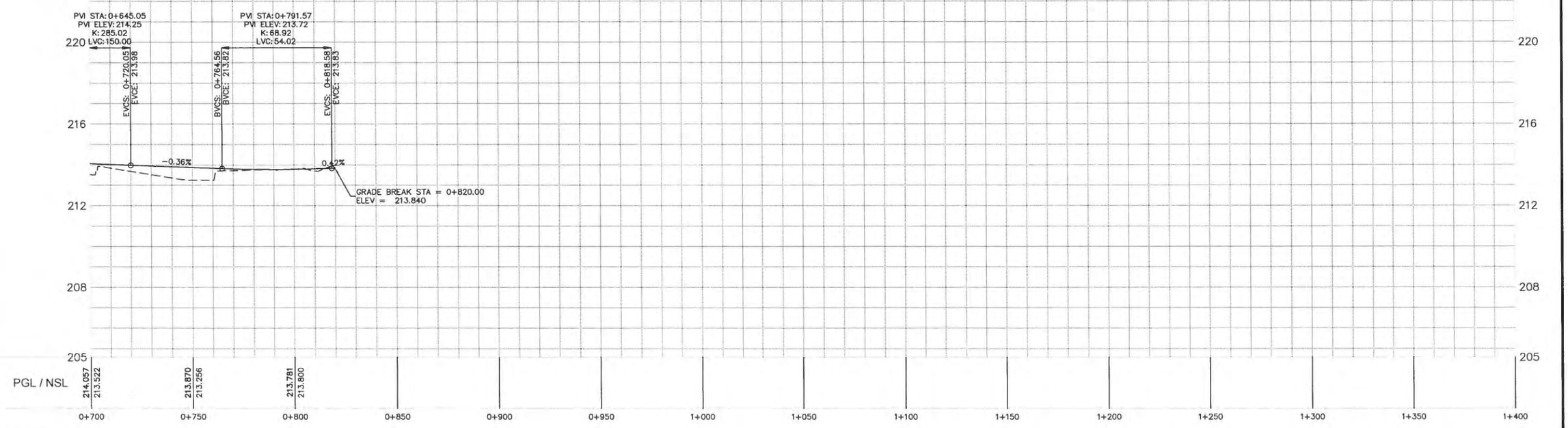

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		02	SUBMITTED		
		03	RECOMMENDED		
		04	APPROVED		
		NO. DATE DESCRIPTION	APPROVED	REVIEWED	

PLAN & PROFILE
LOOP-2
FROM Km. 0+700 TO Km. 0+820

DATE	DRAWING No.	REV	SCALE
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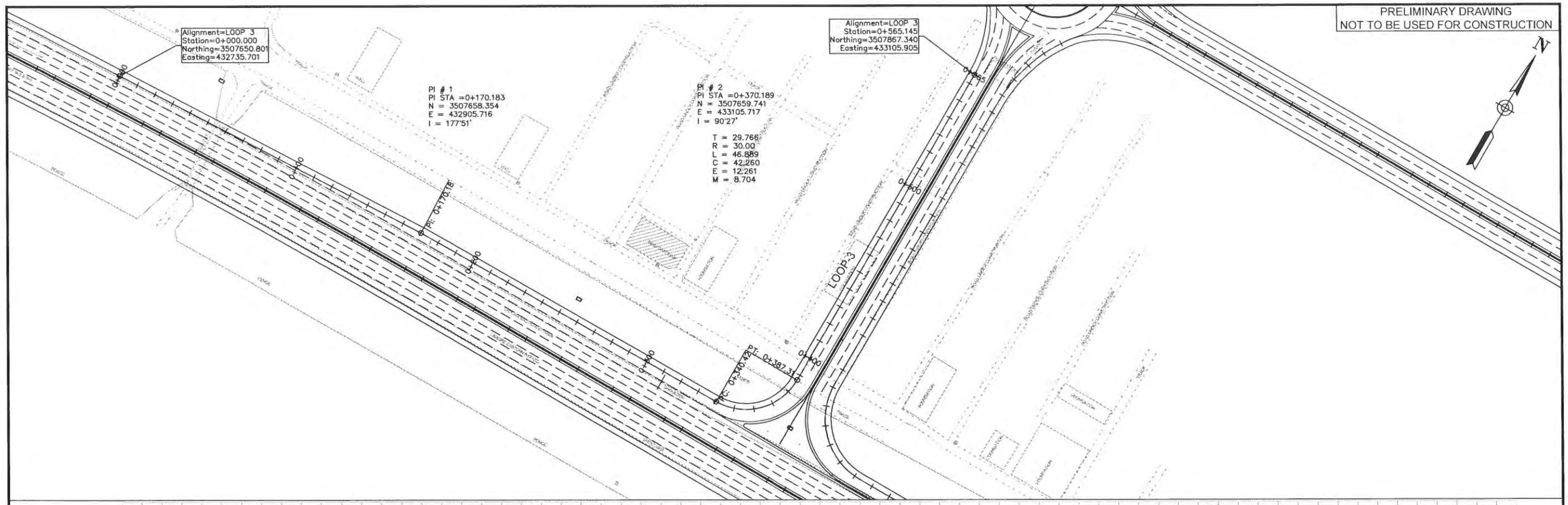
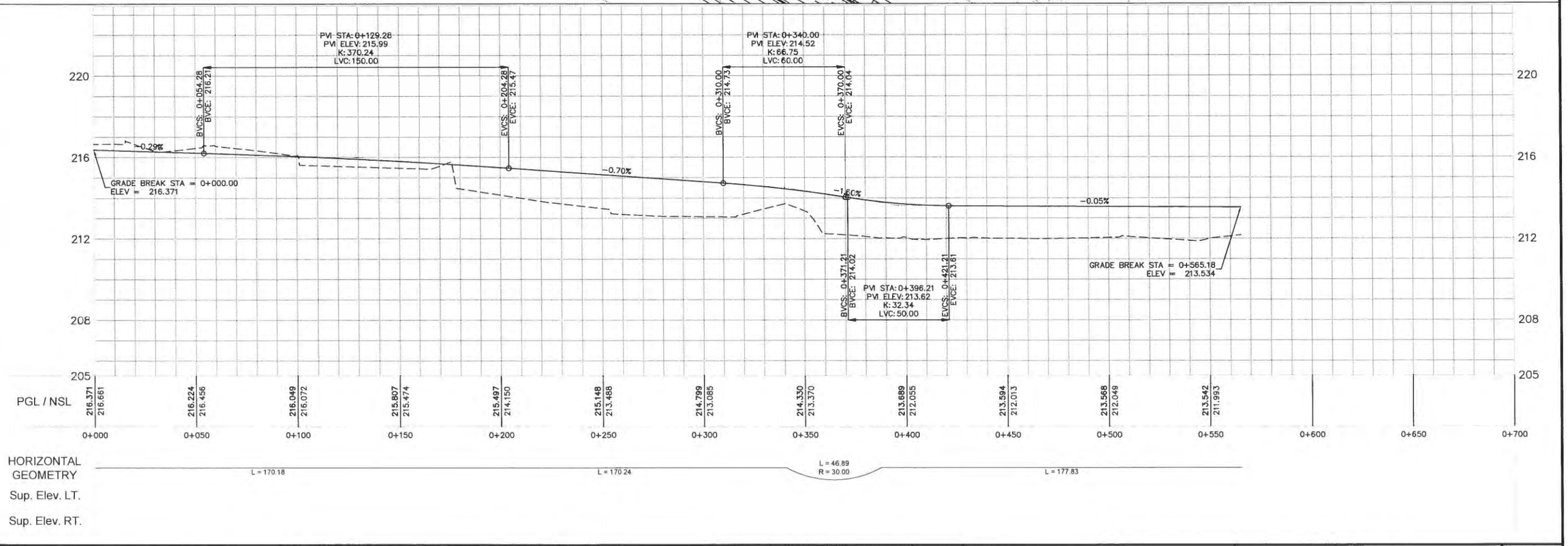
PRELIMINARY DRAWING
NOT TO BE USED FOR CONSTRUCTION





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					REV.: 0

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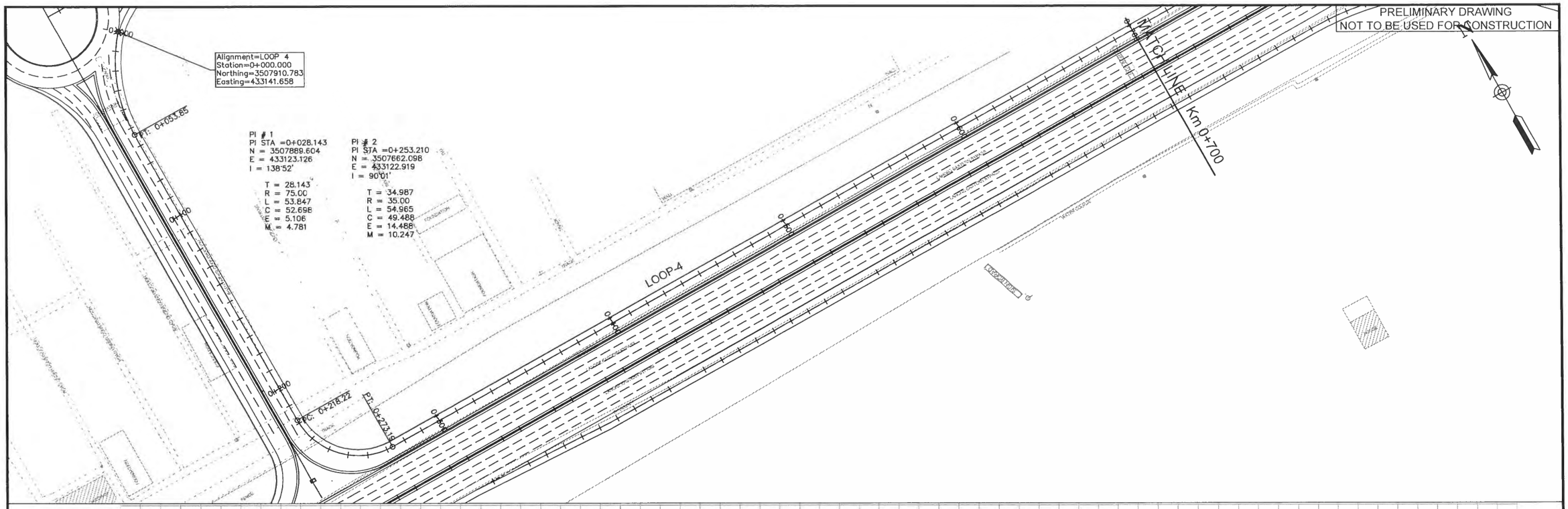
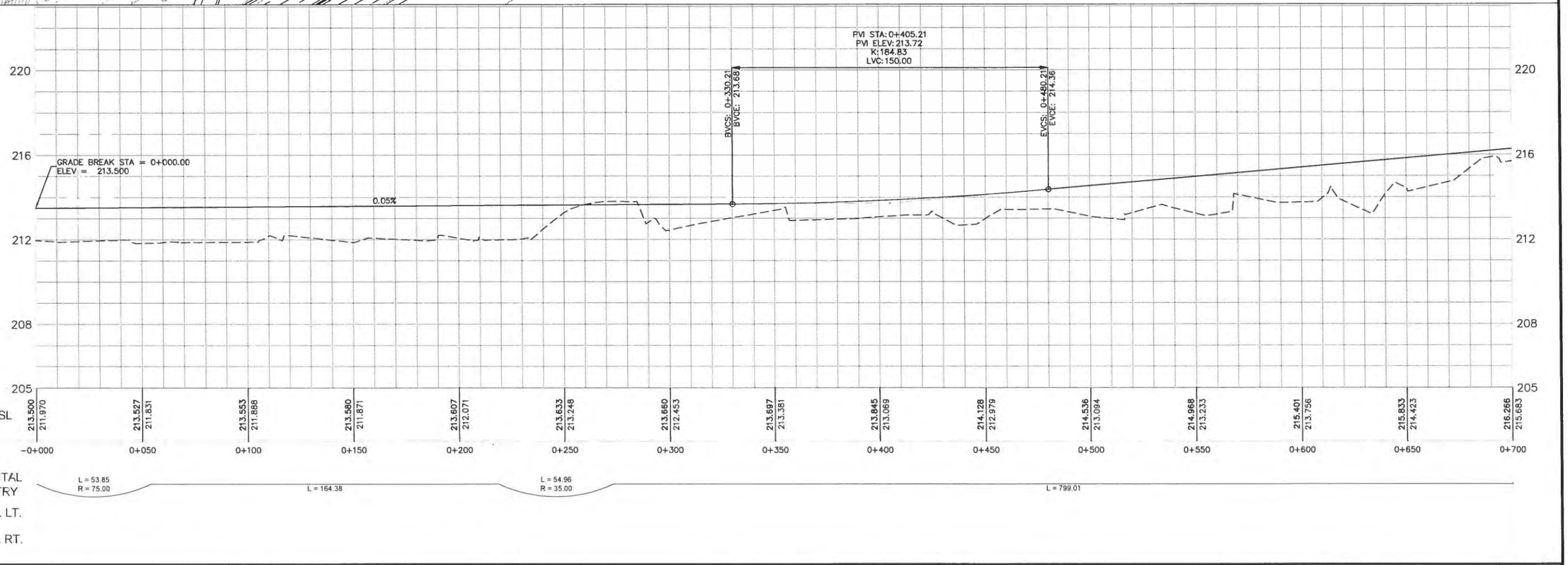
PRELIMINARY DRAWING
NOT TO BE USED FOR CONSTRUCTION





CLIENT: LAHORE SMART CITY	CONSULTANT: NATIONAL ENGINEERING SERVICES PAKISTAN (PVT.) LTD.; ASIF ALI & ASSOCIATES (PVT) LTD			PROJECT: DETAILED FEASIBILITY STUDY FOR INTERCHANGE ALONG EASTERN BYPASS, LAHORE SMART CITY	PLAN & PROFILE LOOP-4 FROM Km. 0+000 TO Km. 0+700
					DATE: JULY, 2025
					DRAWING No.: 4945/102/PR/1C005
					SCALE:
					REV.: 0

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PRELIMINARY DRAWING
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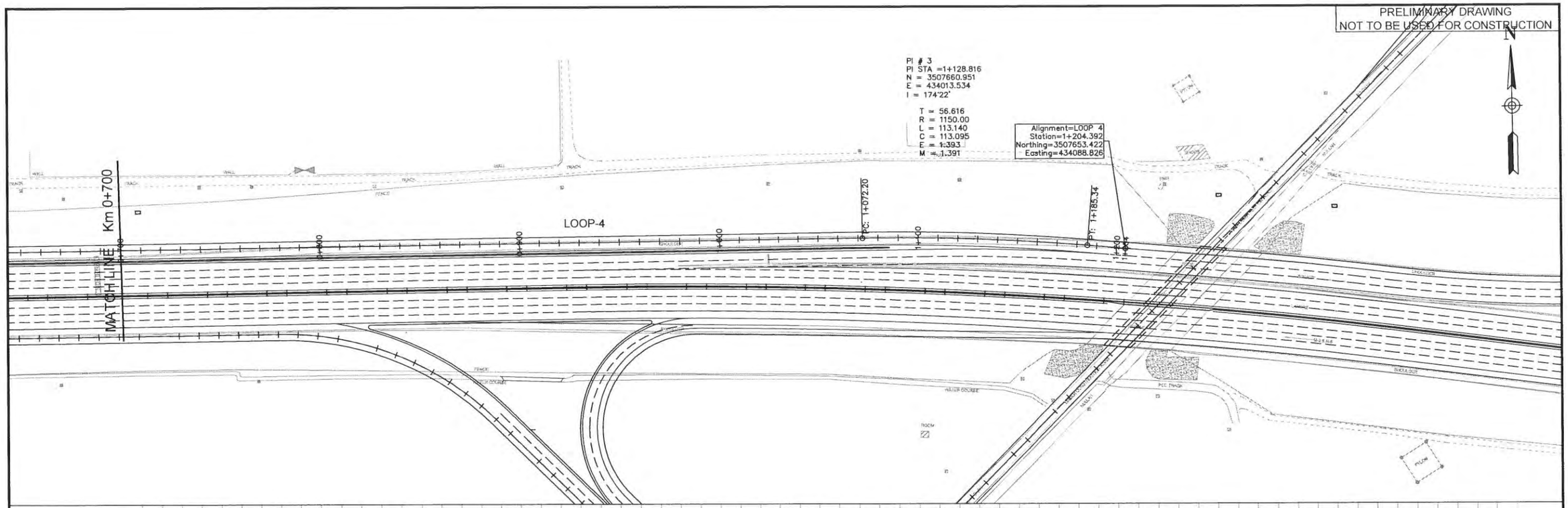

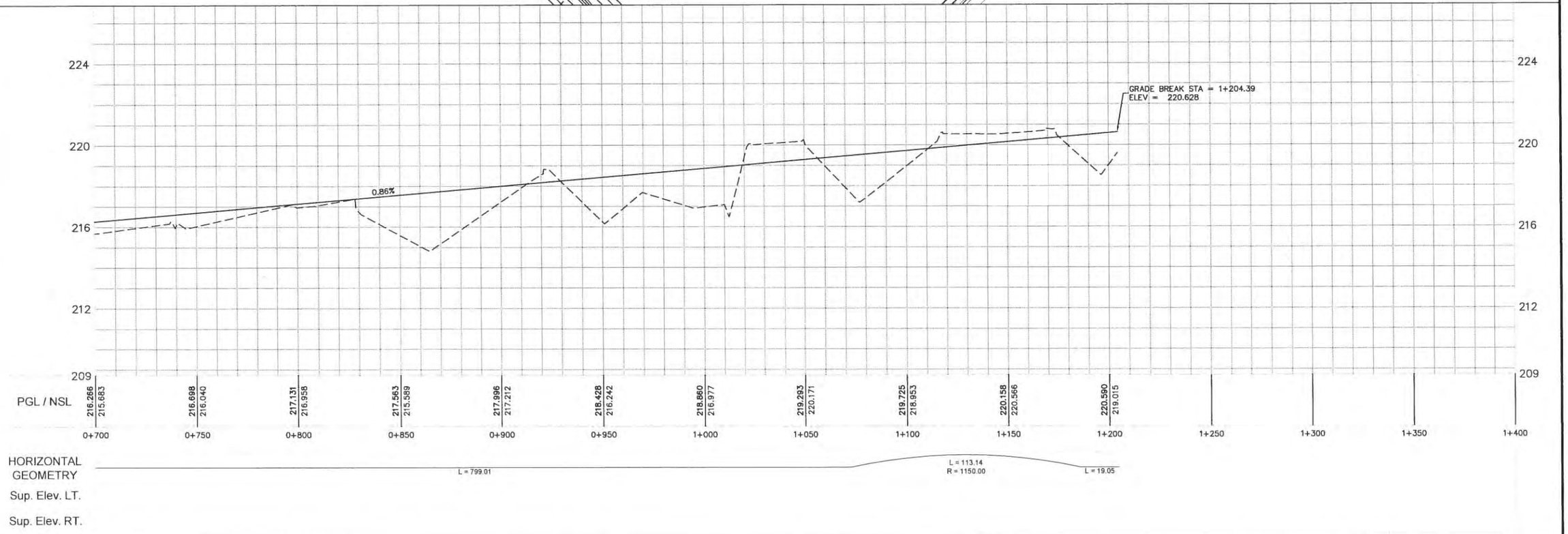

CLIENT: LAHORE SMART CITY	CONSULTANT: NATIONAL ENGINEERING SERVICES PAKISTAN (PVT.) LTD.; ASIF ALI & ASSOCIATES (PVT) LTD	PROJECT: DETAILED FEASIBILITY STUDY FOR INTERCHANGE ALONG EASTERN BYPASS, LAHORE SMART CITY	PLAN & PROFILE LOOP-4 FROM Km. 0+700 TO Km. 1+204.39	SCALE	
			DATE: JULY, 2025	DRAWING No.: 4945/102/PR/1C006	REV.: 0

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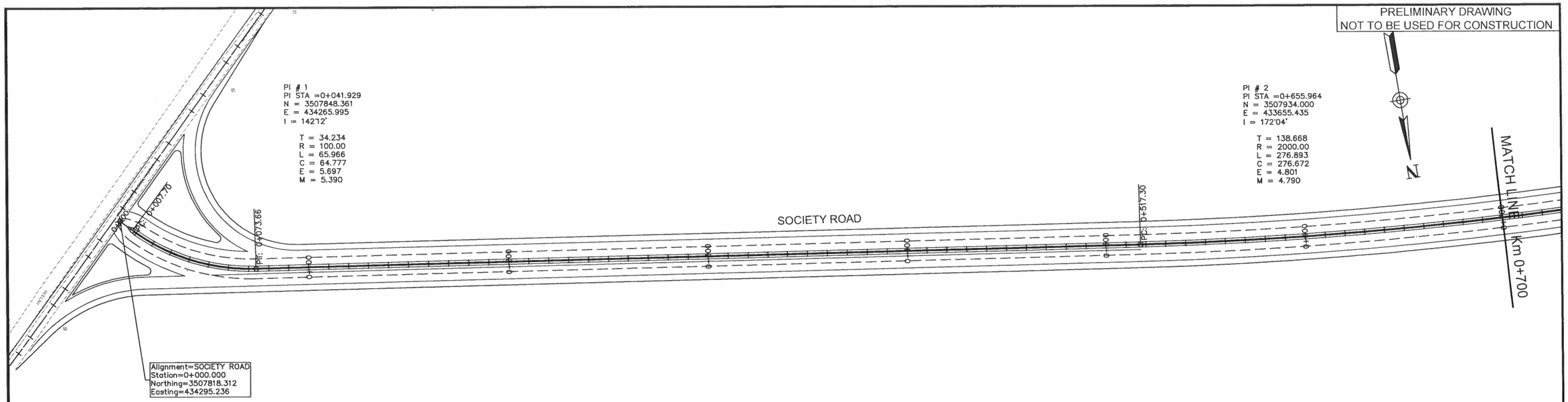

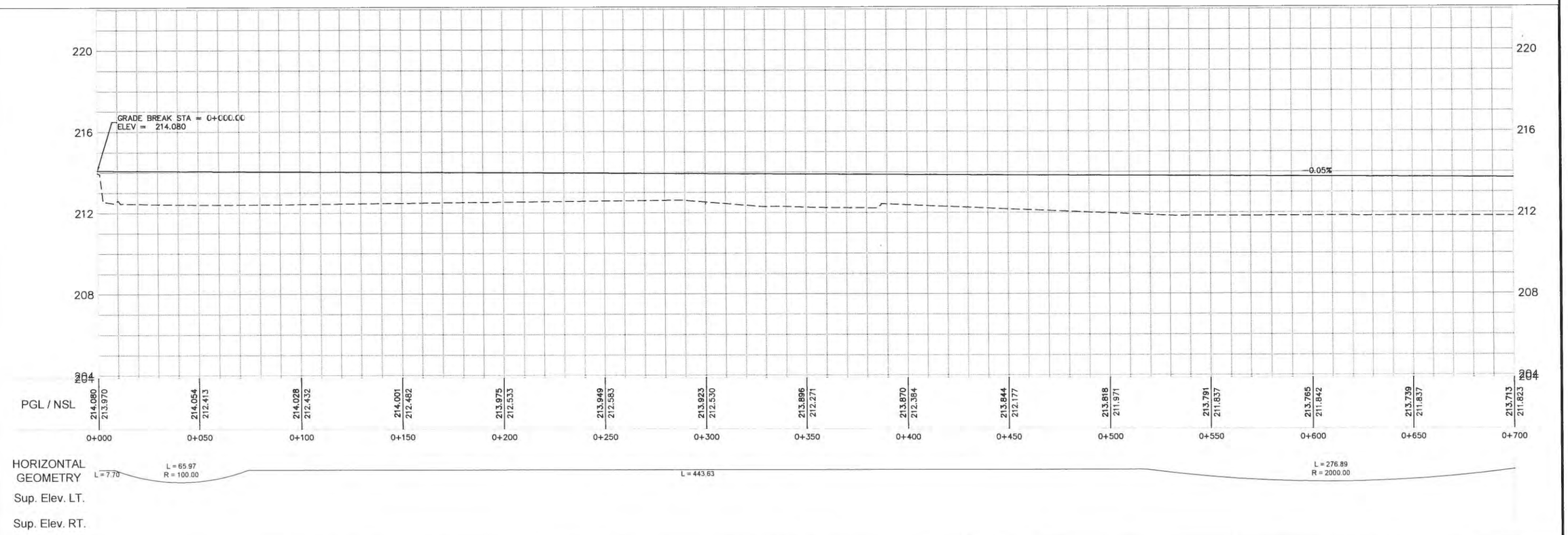

CLIENT: LAHORE SMART CITY	CONSULTANT: NATIONAL ENGINEERING SERVICES PAKISTAN (PVT.) LTD.; ASIF ALI & ASSOCIATES (PVT) LTD			PROJECT: DETAILED FEASIBILITY STUDY FOR INTERCHANGE ALONG EASTERN BYPASS, LAHORE SMART CITY	SCALE
			DRAWN: Faisal	PLAN & PROFILE SOCIETY ROAD FROM Km. 0+000 TO Km. 0+700	
			SUBMITTED		
			RECOMMENDED		
			SHEET	DATE: JULY, 2025	DRAWING No.: 4945/102/PR/1C007
			APPROVED		REV.: 0

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PRELIMINARY DRAWING
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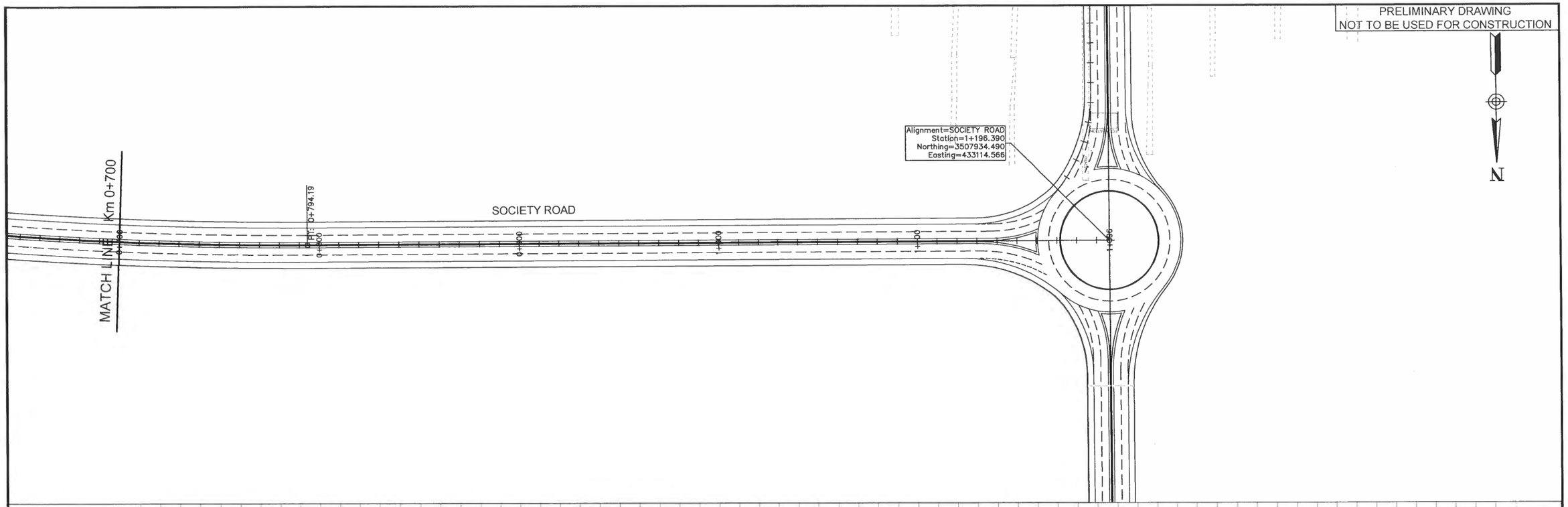

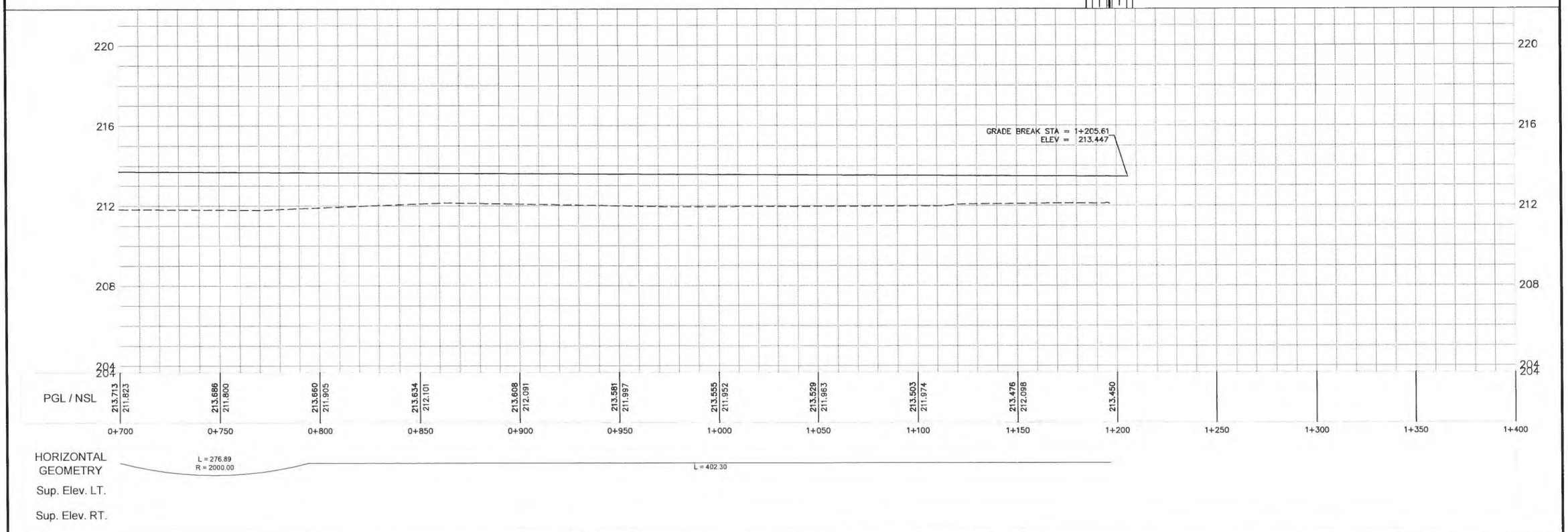

CLIENT: LAHORE SMART CITY	CONSULTANT: NATIONAL ENGINEERING SERVICES PAKISTAN (PVT.) LTD.; ASIF ALI & ASSOCIATES (PVT) LTD	04		DRAWN	FAISAL
		03		SUBMITTED	
		02		RECOMMENDED	
		01		CHECKED	
		REV.	DATE / DESCRIPTION	APPROVED	

PROJECT: **DETAILED FEASIBILITY STUDY FOR INTERCHANGE ALONG EASTERN BYPASS, LAHORE SMART CITY**

PLAN & PROFILE
SOCIETY ROAD
FROM Km. 0+700 TO Km. 1+205.61

SCALE:

DATE: JULY, 2025

DRAWING No.: 4945/102/PR/1C008

REV.: 0

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