



**REHABILITATION OF BUND ROAD FROM BABU SABU
INTERCHANGE TO RING ROAD ALONG WITH PROVISION
OF UNDERPASS AT GULSHAN-E -RAVI T JUNCTION,
LAHORE**

**ENVIRONMENTAL IMPACT ASSESSMENT
(EIA) REPORT**

Executing Agency



**LAHORE DEVELOPMENT AUTHORITY
(LDA)**

**Khyaban-E-Firdousi Road, 467-D-II M.A
Johar Town, Lahore**

Report Prepared By:



**INTEGRATED ENVIRONMENT
CONSULTANTS**

**Head Office: Suite # 11, 2nd Floor, Anwar Tower, 99-
Shadman, Lahore, Pakistan.
Tell Office: +92 42 35960091
Email: inenvconsultants@yahoo.com;
Web: www.iec-consultants.com**

LAHORE DEVELOPMENT AUTHORITY

Project : Rehabilitation of Bund Road from Babu Sabu Interchange to Ring Road along with Provision of Underpass at Gulshan-E -Ravi T Junction,

**ENVIRONMENTAL IMPACT ASSESSMENT
(EIA)**

Project Proponent

LAHORE DEVELOPMENT AUTHORITY

Consultant

INTEGRATED ENVIRONMENT CONSULTANTS

Head Office: Suite # 11, 2nd Floor, Anwar Tower, 99-Shadman, Lahore, Pakistan.
Tell Office: +92 42 35960091; Email: inenvconsultants@yahoo.com;

Peshawar Office: Suite # 302, Level III, Afzal Appartements, Phase III Chowk, Peshawar.
Tell Office : +92 91 5852913: Web:www.iec-consultants.com

LIST OF ABBREVIATIONS

CTMP	Construction Traffic Management Plan
EA	Environmental Approval
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
EPC	Environmental Protection Council
GFPs	Grievance Focal Points
GoP	Government of Pakistan
HSE	Health Safety Environment
IEE	Initial Environmental Examination
LDA	Lahore Development Authority
M&E	Monitoring and Evaluation
MVEs	Motor Vehicle Examiners
NCS	National Conservation Strategy
NGOs	Non–Government Organizations
NOC	No Objection Certificate
O&M	Operation and Maintenance
OHS	Occupational Health and Safety
OHSAS	Occupational Health and Safety Assessment Series
OSHA	Occupational Safety and Health Administration
PEPA	Punjab Environmental Protection Act
PKR	Pak Rupees
PPE	Personal Protective Equipment
PSQCA	Pakistan Standards Quality Control Authority
PEQS	Punjab Environmental Quality Standards
RAR	Refined Activity Rate
SH & E	Safety Health & Environment
TEPA	Traffic Engineering & Transport Planning Agency
UNCED	United Nations Conference on the Environment and Development
WASA	Water and Sanitation Agency

Table of Contents

EXECUTIVE SUMMARY	A
1.0 INTRODUCTION	1
1.1 Purpose of Report	1
1.2 Identification project & Proponent	1
1.3 Detail of Consultant.....	1
1.4 Brief Description of Nature, Size and Location of Project.....	2
2.0 Screening of project	4
3.0 Scoping of project	5
3.1 Spacial and temporal boundaries of environmental assessment.....	5
3.2 Important issues and concerns raised during consultation	6
3.3 Significant impacts and factors to be determined.....	6
4.0 Consideration of alternatives.....	7
4.1 No Project Option.....	7
4.2 Site alternatives, their selection and rejection criteria	7
4.3 Alternate Route Options	7
4.3.1 Option-1.....	7
4.3.2 Option-2.....	12
4.4 Project as Proposed.....	14
4.5 Review of Alternatives	14
4.6 Environmental Alternatives, their selection and rejection criteria	15
5.0 DESCRIPTION OF PROJECT	17
5.1 Objectives of Project.....	17
5.2 Location and Site Layout of Project	17
5.3 Land Use on the Site.....	19
5.4 Road Access.....	19
5.2 Vegetation Features of the Site	19
5.3 Cost and Magnitude of Operation.....	20
5.4 Description of the Project	21
5.5 Project Description	21
5.5.1 Economic Justification.....	25
5.5.2 Sectoral Specific Information	25
5.5.3 Typical Road Cross Section.....	25
5.5.4 Land Acquisition	34
5.5.5 Construction Camp	36
5.5.6 Construction Equipment	36
5.6 Traffic Analysis	36
5.6.1 Traffic on Gulshan-e-Ravi Junction	36
5.7 RESTORATION/REHABILITATION AT THE END OF PROJECT LIFE	40
6.0 DESCRIPTION OF ENVIRONMENT	41

6.1	PHYSICAL RESOURCES.....	41
6.1.1	Topography.....	41
6.1.2	Soil.....	42
6.1.3	Climate and Meteorology	42
6.1.4	Surface Water & Ground Water	46
6.1.5	Geology.....	50
6.1.6	Seismology	51
6.1.7	Flooding.....	51
6.1.8	Water Logging and Salinity.....	51
6.2	ECOLOGICAL RESOURCES.....	51
6.2.1	Marine and Aquatic Ecology	51
6.2.2	Flora.....	51
6.2.3	Fauna.....	54
6.2.4	Endangered Species	54
6.3	SOCIOECONOMIC ENVIRONMENT	54
6.3.1	Political and Administrative Setup	54
6.3.2	Economy and Industrial Activities	54
6.4	QUALITY OF LIFE	55
6.4.1	Demographic Characteristics of the Project Area	55
6.4.2	Rural and Urban Distributions.....	57
6.4.3	Religion.....	58
6.4.4	Ethnic Structure	58
6.4.5	Mother Tongue	58
6.4.6	Institutions	58
6.4.7	Transportation.....	58
6.4.8	Health Facilities	59
6.4.9	Architecture Style	59
7.0	ASSESSING IMPACTS.....	62
7.1	Impacts Assessment.....	62
7.2	Mitigation Assessment.....	65
7.3	Purpose of Mitigation and Impact Assessment	65
7.4	Environmental Monitoring Plan (EMP)	65
8.0	SCREENING OF ENVIRONMENTAL IMPACTS & MITIGATION MEASURES	68
8.1	General.....	68
8.2	Environmental Parameter including Location of Project	68
8.3	Environmental Parameter regarding Design.....	68
8.4	Impact Phases	68
8.5	Types of Impacts.....	69
8.6	Potential Impact Sources	69

8.7	Environmental Impacts and Their Mitigation Measures during Construction and Operational Phase	70
8.8	Potential Environmental Enhancement Measures	82
8.8.1	Construction Traffic Management Plan (CTMP)	82
8.8.2	Labor Camps.....	86
8.8.3	Machinery Maintenance and Equipment Yards	86
8.8.4	Material Depots	86
8.8.5	Machinery Repair Workshops& Asphalt Plant	86
8.8.6	Healthcare	86
8.8.7	Work Uniform and Health Safety Equipment	86
8.8.8	Signage	86
8.8.9	Lighting and Illumination	87
8.8.10	Environmental Training.....	87
8.8.11	Awareness Raising.....	87
9.0	ENVIRONMENT MANAGEMENT & MONITORING PLAN	88
9.1	Environmental Management and Monitoring Program	88
9.2	Environmental Management Plan.....	88
9.3	Objectives of Environmental Management Plan	88
9.3.1	General Objectives.....	88
9.3.2	Objectives during Pre–Construction and Construction Stages	88
9.3.3	Objectives during Operation and Maintenance (O&M) Stage	89
9.4	Institutional Capacity	89
9.5	Organizational Structure: Roles & Responsibilities	89
9.5.1	Primary Responsibilities	89
9.5.2	Operation Management & Control	89
9.6	Performance Indicators	89
9.7	Community and Worker Health & Safety	89
9.8	Institutional Monitoring Arrangements	90
9.8.1	Establishment of Environmental Monitoring Cell.....	90
9.8.2	Training of Monitoring Team.....	90
9.9	Environmental Management Plan during Construction and Operational Phase	91
9.10	Equipment Maintenance Detail	100
9.11	Environment Management Cost	100
10.0	INVOLVEMENT OF STAKEHOLDERS / PUBLIC CONSULTATION	101
10.1	General.....	101
10.2	Proponent’s Environment Management Team	101
10.3	The Responsibility Authority	101
10.4	Other Departments and Agencies	101
10.5	Environmental Practitioners and Experts	102
10.6	Affected and Wider Community	102

10.7	Public Consultation:.....	102
11.0	CONCLUSION AND RECOMMENDATIONS.....	103
	REFERENCES	104
	GLOSSARY	105

LIST OF TABLES

Table 1-1: Project Brief	2
Table 5-1: Project Cost Estimate Summary.....	20
Table 5-2 : Machinery and Equipment Required for Project	36
Table 6-1 Meteorological and Climatic Features	43
Table 6-2 Average Monthly Temperature, Precipitation and	44
Table 6-3 Inventory of Trees Present in Lahore District	52
Table 6-4 Intercensal Demographic Survey	56
Table 7-1: Classifications of Impacts	62
Table 7-2 : Anticipated Impacts and their Magnitude of the Project	63
Table 7-3 : Environmental Monitoring Plan.....	66
Table 8-1 : Anticipated Impacts and their Mitigation Measures during Construction Phase.	71
Table 8-2 : Anticipated Impacts and Their Mitigation Measures during Operational Phase .	79
Table 8-3 : Construction Traffic Management Plan	83
Table 9-1 : Environmental Management Plan during Construction Phase.....	92
Table 9-2 : Environmental Management Plan during Operational Phase	98
Table 9-3 : Environment Management Cost.....	100

LIST OF FIGURES

Figure 3-1: Location Plan of Project	5
Figure 4-1 Proposed Protected U-Turn at Gulshan-e-Ravi Junction on Bund Road.....	8
Figure 4-2 View of Proposed Protected U-Turn at Gulshan Ravi Junction on Bund Road	9
Figure 4-3 Land Acquisition Plan for U-Turns at Gulshan-e-Ravi Junction on Bund Road .	11
Figure 4-4 Alignment Plan of Elevated Expressway Multan Road to Bund Road	13
Figure 4-5 Summary of Consideration of Alternatives	14
Figure 5-1 : Proposed Project Area	18
Figure 5-2 Existing Land use of the Site	19
Figure 5-3 Proposed Alignment Plan	23
Figure 5-4 Diversion Plan for Sludge Carrier Drain	24
Figure 5-5 : Layout Plan of Gulshan-e-Ravi Underpass	26
Figure 5-6 Plan and Profile from km 0+000 to 0+700 km	27
Figure 5-7 Plan and Profile from km 0+700 to 1+400 km	28
Figure 5-8 Plan and Profile from km 1+400 to 1+950 km	29

Figure 5-9: Typical Cross Section A"A"	30
Figure 5-10 : Typical Cross Section B"B"	31
Figure 5-11 Proposed Plan at Grade Junction Gulshan-e-Ravi Junction	32
Figure 5-12 Underpass Barral and Ramp Portion Typical Section	33
Figure 5-13 Land Acquisition Plan.....	35
Figure 5-14: Traffic Analysis Study at Gulshan-e-Ravi (Average Daily Traffic).....	38
Figure 5-15: Traffic Analysis Study at Gulshan-e-Ravi Junction (Peak Hour Traffic)	39
Figure 6-1 Topographic Map of the Study Area	41
Figure 6-2: Soil map of Punjab.....	42
Figure 6-3 Temperature profile of Lahore	43
Figure 6-4 Solar Elevation Profile of Lahore	46
Figure 6-5 Watershed of Punjab	46
Figure 6-6 Groundwater Contours of Lahore	49
Figure 6-7 Geographical Map of Lahore	50
Figure 6-8: Seismic Zoning Map of Pakistan	51
Figure 6-9 Graphical Representation of Intercensal Demographic Survey	56
Figure 6-10: Educational Institutes in Lahore	58
Figure 6-11: Hospitals in Lahore	59
Figure 8-1 Availability of Traffic Diversion	82
Figure 8-2 : Road Safety Signs.....	87

EXECUTIVE SUMMARY

I. TITLE & LOCATION OF PROJECT

Rehabilitation of Bund Road from Babu Sabu Interchange to Ring Road along with Provision of Underpass at Gulshan-E -Ravi T Junction, District Lahore

II. A BRIEF OUTLINE OF THE PROPOSAL

At Bund road-Gulshan Ravi main boulevard junction, high traffic volume is observed daily which results in worse traffic congestion and gridlocks especially during peak hours. In order to mitigate traffic congestion at the intersection, three lanes underpass in Saggian to Babu Sabu direction is proposed to alleviate congestion and delays at the Intersection. This intervention along with at-grade intersection remodeling will alleviate congestion by significantly reducing the average travel time for crossing the intersection especially for the directions where the grade separation will provide direct relief.

The project includes widening of existing Bund Road section from Gulshan Ravi to Babu Sabu Interchange and construction of a three lane Underpass at Gulshan-e-Ravi Junction (Babu Sabu Bound). This project will help in reducing traffic jams/congestion at the intersections. This will result in reduction in Vehicle Operating Cost (VOC) and at the same time alleviating noise and air pollution up to certain extent.

Therefore, Rehabilitation of Bund Road from Babu Sabu at this location and Underpass at Gulshan-E -Ravi T Junction will facilitate the through traffic to access commercial hubs, offices, schools, business places and residences etc. in a reduced travel time and vehicle operating costs hence decreasing fuel consumption and noise & air pollution.

The objectives of the project are to:

- (a) This project will help in reducing traffic jams/congestion at the intersections.
- (b) This will result in reduction in Vehicle Operating Cost (VOC) and at the same time alleviating noise and air pollution up to certain extent.
- (c) To reduce travel time.
- (d) Job Opportunities for local people would be created.
- (e) Safe movement of pedestrian across the road would be possible

III. THE MAJOR IMPACTS AND THEIR MITIGATION MEASURES DURING CONSTRUCTION PHASE

Impacts

- ❖ The main impact during the construction will be the clearing of ROW, cutting and filling of borrow pits including erosion of topsoil cover.
- ❖ Soil erosion due to Construction activities, earthwork, and cut and fill, stockpiles etc.
- ❖ Contamination of soil due to leakage / spillage of oil, bituminous and non-bituminous debris generated from demolition and road construction
- ❖ Dust Generation due to construction activities and transport, storage and handling of construction materials.
- ❖ Noise from construction activities and operation of equipment and heavy machinery
- ❖ Sourcing of water during Construction

- ❖ Construction waste and debris may affect local people.
- ❖ Safety of Workers and accident risk from construction activities
- ❖ Approach / hindrance problems for the local resident's / business owners and movement of the people will be disturbed during construction activities.
- ❖ Construction will pose burden on the existing natural resources

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
- ❖ Construction vehicles and equipment will be maintained and refueled in such a fashion that oil / diesel spillage does not contaminate the soil.
- ❖ Unloading of loose and fine materials through covered vehicles.
- ❖ All equipment to be timely serviced and properly maintained
- ❖ Arrangements shall be made by contractor that the water availability and supply to nearby communities remain unaffected
- ❖ Dumping sites will be selected away from residential areas and water bodies
- ❖ Dumping sites must be having adequate capacity equal to the amount of debris generated.
- ❖ Safe work practices will be followed and applied by the contractor.
- ❖ At construction site fluorescent and retro refractory signage will be used
- ❖ Timely completion of the construction work and provision of alternate routes for the areas where the construction is being carried out
- ❖ One strategy for conserving aggregate resources and reducing the demand for virgin aggregate is to recycle and reuse materials in road construction

IV. THE MAJOR IMPACTS AND THEIR MITIGATION MEASURES DURING OPERATIONAL PHASE

Impacts

- ❖ Accident risks associated with traffic movement
- ❖ Lack of maintenance during operational phase can cause harm
- ❖ Noise generation

Mitigation

- ❖ All safety features provided in the main approach roads such as guide rails, speed bumps, will be maintained and kept in good condition.
- ❖ Traffic control measures, including speed limits, will be enforced strictly
- ❖ Implementation of HSE Plans during the maintenance period.
- ❖ Strict implementation of PPEs.
- ❖ Ban on use of pressure horns;
- ❖ Proper implementation of inspection and maintenance program for vehicles

POSITIVE IMPACTS DURING OPERATIONAL PHASE

- ❖ Air quality will improve due to smooth flow of traffic
- ❖ Noise level will decrease because of smooth traffic flow

V. PROPOSED MONITORING PLAN

The monitoring program is designed to assess effective implementation of the Environmental Impact Assessment (EMP). Monitoring Program (MP) provides important information that allows for more effective planning and an adaptive response based on the assessment of effectiveness of mitigation measures. The monitoring of various parameters will help to determine the extent to which project operation activities causes' environmental disturbance

Sr. No.	Monitoring Parameter	Monitoring Location	Frequency
CONSTRUCTION PHASE			
1.	Ambient Air Monitoring for PM ₁₀ , CO, NO _x , SO ₂ , O ₂ , O ₃ , etc.	Construction site	Quarterly
2.	Noise Levels	Construction site	Monthly
3.	Drinking Water Quality	Construction site	Quarterly
4.	Occupational health & safety	Construction site	Daily basis
OPERATIONAL PHASE			
1.	Ambient Air Monitoring	Underpass	Quarterly
2.	Water Quality	Underpass	Quarterly & End of summer before the onset of Monsoon every year
3.	Noise Level	Underpass	Quarterly

1.0 INTRODUCTION

1.1 PURPOSE OF REPORT

This EIA report is being prepared to fulfill the legal requirements of the Punjab Environment Protection Act 1997 (PEPA Amended 2012) for obtaining the Environmental Approval (EA) for the project ‘Rehabilitation of Bund Road from Babu Sabu Interchange to Ring Road along with Provision of Underpass at Gulshan-E -Ravi T Junction’. The other relevant regulations and guidelines considered while preparing this EIA report include:

- (a) Policy and procedures for filing, review and approval of environmental assessments.
- (b) Guidelines for the preparation and review of environmental reports
- (c) Guidelines for public participation.
- (d) Guidelines for sensitive and critical areas.
- (e) Detailed sectoral guidelines.

Different environmental aspects like, physical, biological and other related features of the project during regular occupancy are highlighted in this EIA report. The necessary measures to be adopted to mitigate negative environmental impacts on any segment of the environment in and around are also described. All the important project related information is also provided as desired by the Guidelines for the Preparation of IEE / EIA reports–1997, based on which present report has been prepared. This report will also help the decision makers to issue the desired Environmental Approval (EA) / No Objection Certificate (NOC).

1.2 IDENTIFICATION PROJECT & PROPONENT

Project Name: Rehabilitation of Bund Road from Babu Sabu Interchange to Ring Road along with Provision of Underpass at Gulshan-E -Ravi T Junction, District Lahore”.

Sponsoring Agency: Government of Punjab

Project Proponent

Chief Engineer -II



Lahore Development Authority – LDA

Khyaban-E-Firdousi Road, 467-D-II M.A Johar Town, Lahore

1.3 DETAIL OF CONSULTANT

M/s **Integrated Environment Consultants** (IEC) has been entrusted for preparation of EIA report regarding proposed project. The IEC corresponding address is Suite # 11, 2nd Floor, Anwar Tower, 99-Shadman Chowk Lahore, Pakistan.

Phone: (042)-35960091

Email: inenvconsultants@yahoo.com

Web: www.iec-consultants.com

1.4 BRIEF DESCRIPTION OF NATURE, SIZE AND LOCATION OF PROJECT

This Environmental Impact Assessment (EIA) Study being carried out for the project, Rehabilitation of Bund Road from Babu Sabu Interchange to Ring Road along with Provision of Underpass at Gulshan-E -Ravi T Junction.

At Bund road-Gulshan Ravi main boulevard junction, high traffic volume is observed daily which results in worse traffic congestion and gridlocks especially during peak hours. In order to mitigate traffic congestion at the intersection, three lanes underpass in Saggian to Babu Sabu direction is proposed to alleviate congestion and delays at the Intersection. This intervention along with at-grade intersection remodeling will alleviate congestion by significantly reducing the average travel time for crossing the intersection especially for the directions where the grade separation will provide direct relief.

The project includes widening of existing Bund Road section from Gulshan Ravi to Babu Sabu Interchange and construction of a three lane Underpass at Gulshan-e-Ravi Junction (Babu Sabu Bound). This project will help in reducing traffic jams/congestion at the intersections. This will result in reduction in Vehicle Operating Cost (VOC) and at the same time alleviating noise and air pollution up to certain extent.

Therefore, Rehabilitation of Bund Road from Babu Sabu at this location and Underpass at Gulshan-E -Ravi T Junction will facilitate the through traffic to access commercial hubs, offices, schools, business places and residences etc. in a reduced travel time and vehicle operating costs hence decreasing fuel consumption and noise & air pollution.

Table 1-1: Project Brief

Major Components	6-Lane Dual Carriageway (Bund Road from Babu Sabu Interchange to Ring Road) • Carriageway Width = 11.1 m • No of Lanes = 3 (each sides) Underpass at Gulshan Ravi Junction (Babu Sabu Bound) • Underpass Width = 12 m • No of Lanes = 3 • Clearance Height = 5.1 m
Project Cost	Rs. 4,959.317/- Million (Submitted vide PC-1 to P&D D)
Construction Period	10 Months
Major Benefits	➤ Uninterrupted flow of traffic ➤ 71% of the Total Traffic benefitted

Environmental Impact	• Significant reduction in Carbon Emissions • Extensive tree plantation
-----------------------------	---

2.0 SCREENING OF PROJECT

According to the review of the Initial Environmental Examination (IEE) / Environmental Impact Assessment (EIA) Regulation 2000, this project falls in ***Schedule-II, Section-D “Transport”, Sub-Section-2 “Federal or Provisional highways or major roads (except maintenance, rebuilding and re-construction of existing roads) with total cost of Rs. 50 million and above”*** for which Environmental Impact Assessment (EIA) Report is required.

Therefore, to fulfill the legal requirements of Section-12 of the Punjab Environment Protection Act-1997 (PEPA Amended 2012), the proponent is required to submit the EIA Report in the Environmental Protection Agency, Government of the Punjab, to obtain the required Environmental Approval (EA).

3.0 SCOPING OF PROJECT

3.1 SPACIAL AND TEMPORAL BOUNDARIES OF ENVIRONMENTAL ASSESSMENT

Spatial boundaries for project related to the environmental effects and cumulative effects for Valued Environmental Components. It depends on the Project Development Area and Local and Regional Assessment Area.

The proposed project has already existed in the place where all facilities are available. The Google coordinates of the project are as followings:

For proposed underpass,

31°33'4.42" North,

74°16'13.73" East

Proposed widening of existing Bund Road section from Gulshan Ravi to Babu Sabu Interchange,

Starting from 31°32'26.01" North and 74°15'55.75" East

Ends at 31°33'18.83" North and 74°16'27.10" East.

Temporal boundaries based on timings and duration of project activity that will happen during construction and operational phase. Construction will be done in an environmental friendly manner that will not harm any existing boundaries and surroundings of project area. While during operational phase all the operation the activities will be done in order to meet the PEQS.

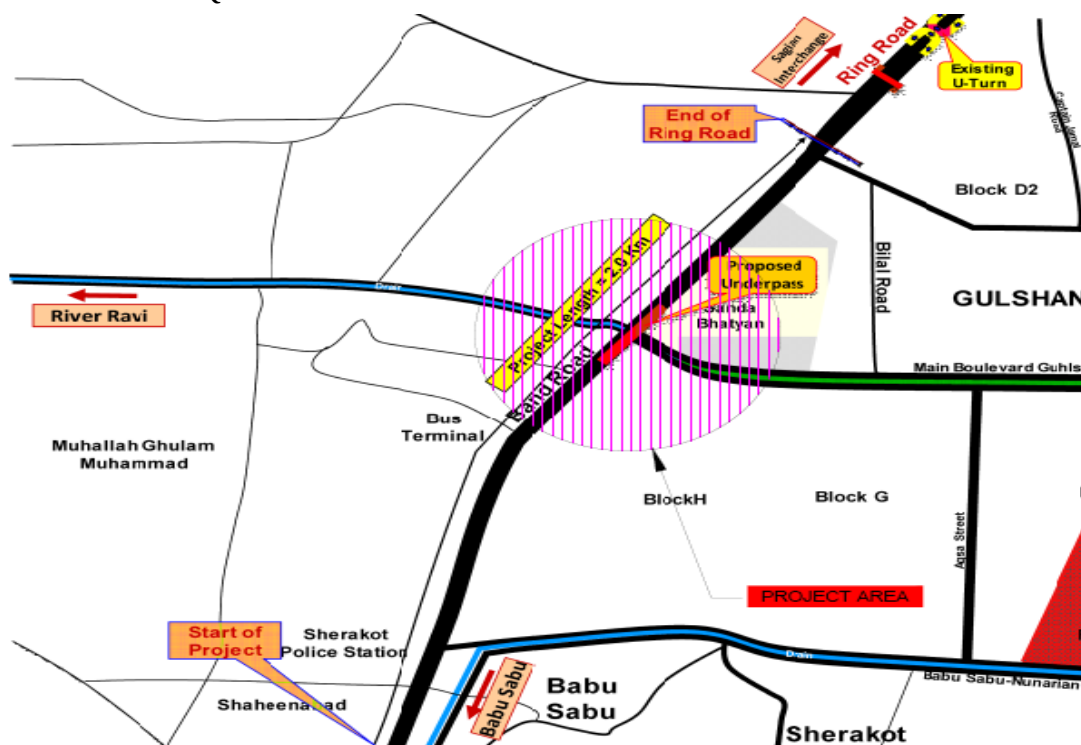


Figure 3-1: Location Plan of Project

3.2 IMPORTANT ISSUES AND CONCERNS RAISED DURING CONSULTATION

The regular survey and background studies were conducted to identify the stakeholders. People of surroundings were gathered which are likely to be affected, focus group meetings were conducted by the representatives. They were all briefed about the project whereabouts in the non-technical and understandable way. Certain issues and suggestion about the project that is included and raised by the locals were filed and recorded.

- Traffic Issues during construction activities
- Environmental Pollution
- Land Acquisition for proposed project Activity
- Social Conflicts

3.3 SIGNIFICANT IMPACTS AND FACTORS TO BE DETERMINED

Following impacts are considered to be significant and proper mitigation and maintenance plan of these are made

- Air pollution
- Noise Pollution
- Top Soil Removal
- Health and safety of workers
- Accidents due to transportation of construction material
- Accidental spillages of oil to surface water during operation

4.0 CONSIDERATION OF ALTERNATIVES

The following alternatives have identified to the project

- i. No project option;
- ii. Alternate route option; and
- iii. Project as proposed

An analysis of all above alternatives is as follows:

4.1 NO PROJECT OPTION

The No Build alternative does not meet the Purpose and Need as the severity of the structural deficiencies precludes their being addressed satisfactorily by repair or maintenance work.

Continuous use of the existing road section would not only mean an increase in travel risks but will also result in higher transportation costs and more travel time on Bund road. The No Project Option is the least preferred from the socio-economic and partly environmental perspective since if the project is not done.

4.2 SITE ALTERNATIVES, THEIR SELECTION AND REJECTION CRITERIA

Proposed project is widening of existing Bund Road section from Gulshan Ravi to Babu Sabu Interchange and construction of a three lane Underpass at Gulshan-e-Ravi Junction (Babu Sabu Bound). The site is considered suitable both in terms of environment and physical constraints. As the land use on the project site is already existing road and due to high traffic congestion on these roads the project is highly needful of proposed project. The current project is also facilitating people of the area and vehicular with escalating the opportunity of employment and others related facilities. Hence, there is no need for alternative sites as the current project has all possible aspects.

4.3 ALTERNATE ROUTE OPTIONS

The Project under consideration is with two options.

- i. Option-1 is of 6-Lane Dual Carriage way Road from Babu Sabu Interchange to Ring Road (Length=2.0Km) along with 2 Nos. Protected U-Turns on Bund Road
- ii. Option-2 is Construction of Flyover at Gulshan-e-Ravi Junction.

4.3.1 Option-1

The first option is to select the most appropriate alternate route. It proposed the rehabilitation of the Babu Sabu Interchange to Ring road, 6-Lane Dual Carriage way with the provision of the two protected U-turns on Bund road. The cost of this proposed option will be Rs.4, 103.945 Million (Project Cost).

However, land acquisition and resettlement will be significantly involved and there will be also potential negative impacts during construction period on temporary basis.

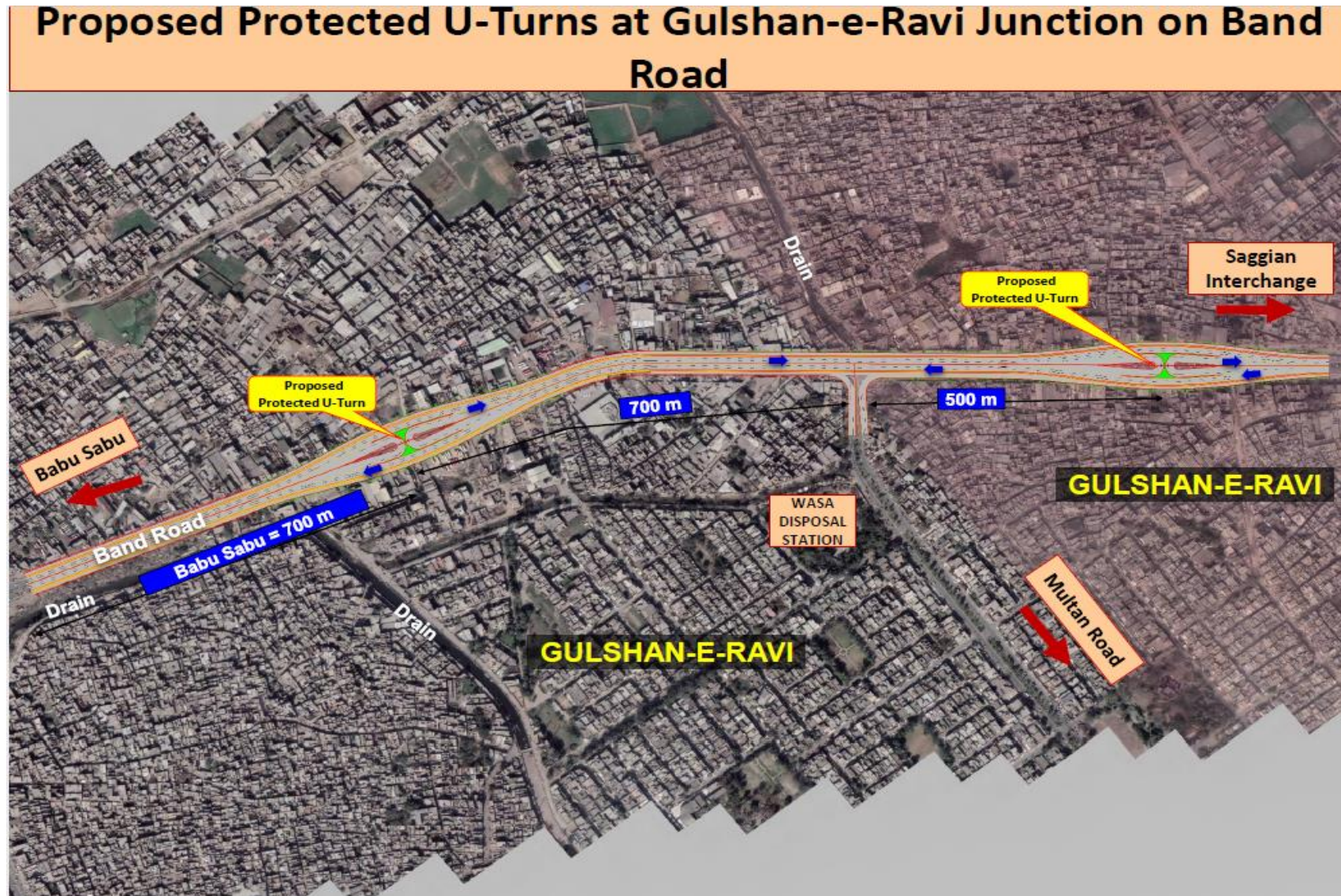


Figure 4-1 Proposed Protected U-Turn at Gulshan-e-Ravi Junction on Bund Road

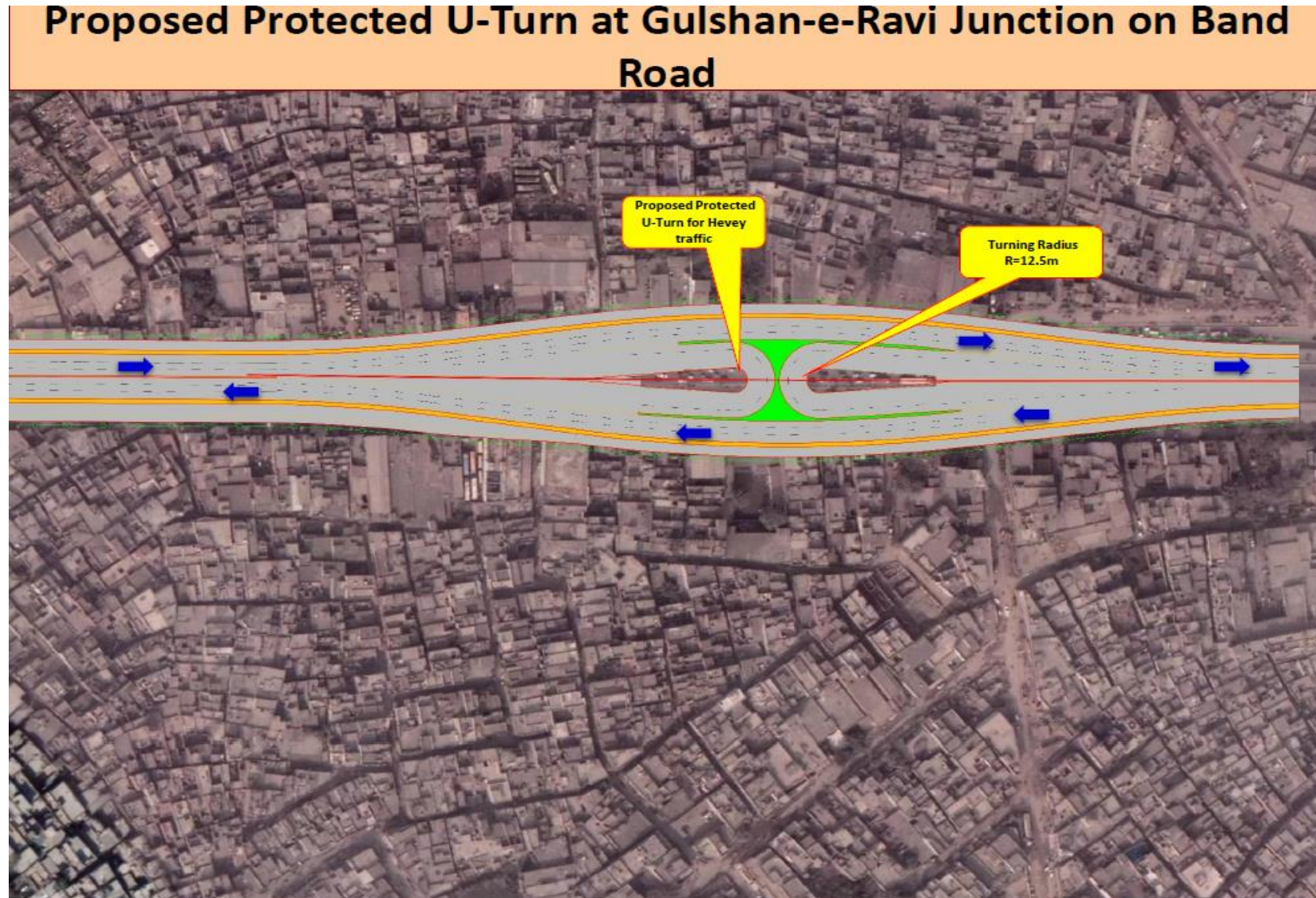


Figure 4-2 View of Proposed Protected U-Turn at Gulshan Ravi Junction on Bund Road

Limitations:

The major limitations of this considering this option are;

- Conflicts at Protected U-Turns locations due to large number of heavy commercial vehicles.
- Huge displacement of residents and shops due to massive land acquisition.
- Risk of restricted mobility in case of Articulated & Rigid Trucks turning at U-Turns.

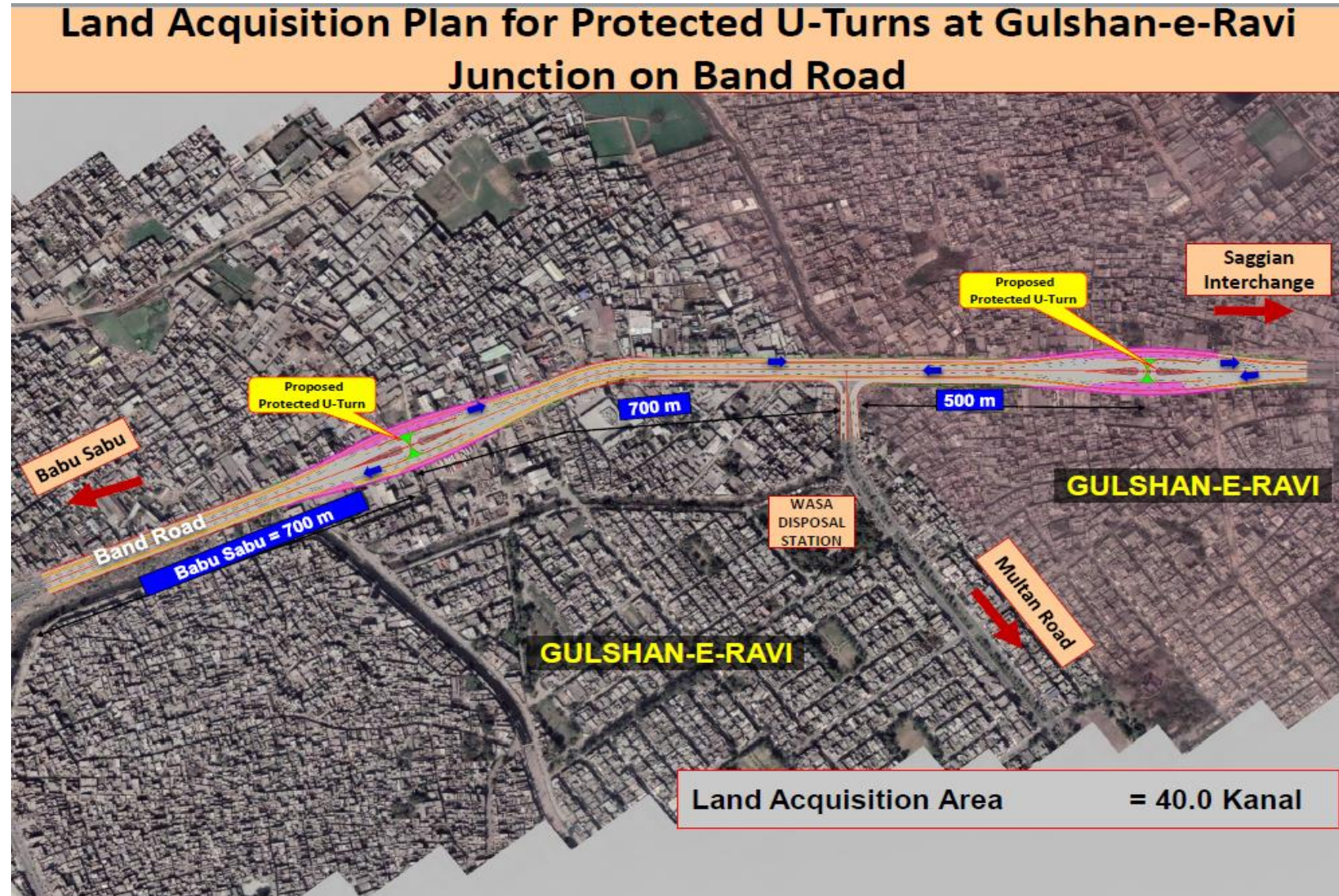


Figure 4-3 Land Acquisition Plan for U-Turns at Gulshan-e-Ravi Junction on Bund Road

4.3.2 Option-2

The Second option is to select the most appropriate alternate route. It proposed the rehabilitation of the Babu Sabu Interchange to Ring road, 6-Lane Dual Carriage way with the construction of 3 lane Flyover (Babu Sabu Interchange Bound).

However, elevated Expressway at the junction will be significantly involved

Limitations:

The major limitations of this considering this option are;

- Flyover Option not possible due to interception of Elevated Expressway at the Junction.
- Second Stage Flyover is not recommended due to traction effects of large number of heavy commercial vehicles.

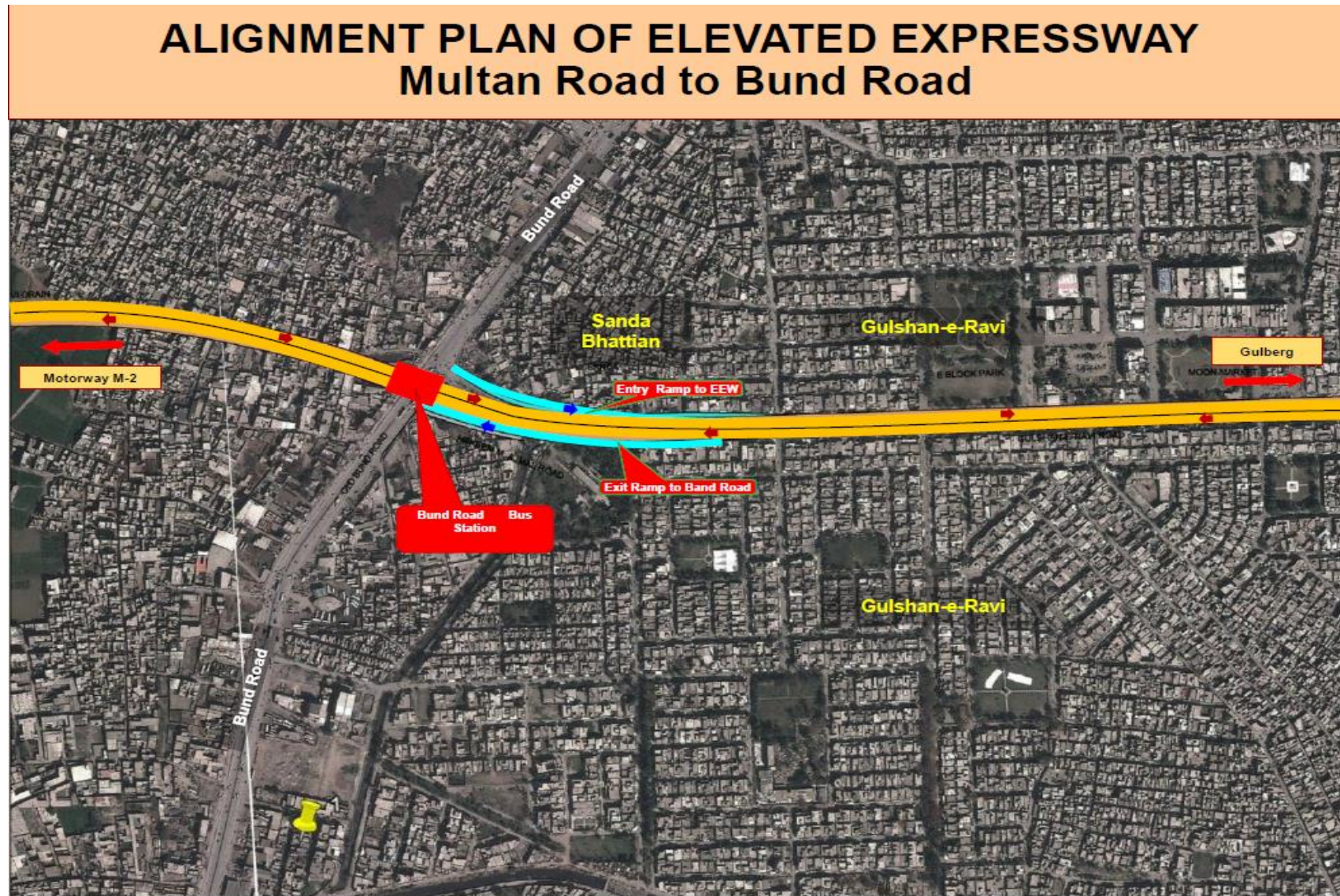


Figure 4-4 Alignment Plan of Elevated Expressway Multan Road to Bund Road

4.4 PROJECT AS PROPOSED

LDA has planned to Rehabilitate of Bund Road from Babu Sabu Interchange to Ring Road with the construction of underpass. There will be a single-way underpass constructed on the roads leading from Sagian to the Babu Sabu Interchange. The initiative of the project is to enhance traffic flow on one of the city's busiest routes that carry significant traffic and connect two of the city's busiest areas.

The land acquisition will be 10.5 kanal, with the project cost of Rs.4, 959.316 Million. The project will be financed by the Government of Pakistan .Construction of the project will help in improving traffic and transportation conditions. It will also help in promoting economic development along the project improving social stability.

4.5 REVIEW OF ALTERNATIVES

Given below table summarizes environmental and social aspects. Based on above discussion the proposed project involves the proposed option seems better under present scenario.

Figure 4-5 Summary of Consideration of Alternatives

OPTION ANALYS			
Sr#	Description	Benefits	Limitations
Option-1	Grade separated Underpass	- Uninterrupted flow of traffic 71 % of the Total Traffic benefitted - Least displacement of Residents and Shops	Sullage Drain needs to be shifted
Option-2	With protected U-turns	- Free Flow movement on Bund Road - No considerable shifting of Sullage Drain is required	- Conflicts at Protected U-Turns locations due to large number of heavy commercial vehicles. - Huge displacement of residents and shops due to massive land acquisition. - Risk of restricted mobility in case of Articulated & Rigid Trucks turning at U-Turns

Option-3	Grade Separated Flyover	• Uninterrupted flow of traffic	• Flyover Option not possible due to interception of Elevated Expressway at the Junction. • Second Stage Flyover is not recommended due to traction effects of large number of heavy commercial vehicles.
-----------------	-------------------------	---	--

From the environmental and economic perspective, alternative modes of transportation would have the least impact but are not viable propositions and go beyond the scope of this project. From social perspective, alternate route brings some benefit but have significant impacts on ecology and environment. Keeping in view the analysis of the alternative options, rehabilitation of the interchange with proposed design features appears to be the best option.

4.6 ENVIRONMENTAL ALTERNATIVES, THEIR SELECTION AND REJECTION CRITERIA

Road underpass is more environmentally friendly than other surface facilities. Traffic congestion would be reduced from the local streets. Air quality would be improved because traffic generated pollutants are captured and disposed of away from the public. Similarly, noise would be reduced and visual aesthetic and land use would be improved. By placing traffic underground, property values would be improved and communities would be less impacted in the long term. Furthermore, underpass will provide opportunities for land development along and over the alignment adding real estate properties and potential economic potential development.

In planning for an underpass, the construction impact on the community and the environment is important and must be addressed. Issues such as impact on traffic, businesses, institutional facilities, sensitive installations, hospitals, utilities, and residences should be addressed. Construction noise, dust, vibration, water quality, aesthetic, and traffic congestion are important issues to be addressed and any potentially adverse impact should be mitigated. For example, a cut-and-cover requires surface excavation impacting traffic, utilities, and potentially nearby facilities. When completed, it leaves a swath of disturbed surface-level ground that may need landscaping and restoration. In urban situations or close to properties, cut-and-cover can be disruptive and may cut off access and utilities temporarily. Alternative access and utilities to existing facilities may need to be provided during construction or, alternatively, staged construction to allow access and to maintain the utilities would be required. Sometimes, top-down construction rather than bottom-up construction can help to ameliorate the disruption and reduce its duration. Rigid excavation support systems and ground improvement techniques may be required to minimize potential settlements and lateral ground deformations, and their impact on

adjacent structures. When excavation and dewatering are near contaminated ground, special measures may be required to prevent migration of the groundwater contaminated plume into the excavation or adjacent basements. Dust suppression and wheel washing facilities for vehicles leaving the construction site are often used, especially in urban areas.

Similarly, for immersed tunnels the impact on underwater bed level and the water body should be assessed. Dredging will generate bottom disturbance and create solid turbidity or suspension in the water. Excavation methods are available that can limit suspended solids in the water to acceptable levels. Existing fauna and flora and other ecological issues should be investigated to determine whether environmentally and ecologically adverse consequences are likely to ensue. Assessment of the construction on fish migration and spawning periods should be made and measures to deal with them should be developed. The potential impact of construction wetlands should be investigated and mitigated.

On the other hand, using bored tunneling would reduce the surface impact because generally the excavation takes place at the portal or at a shaft resulting in minimum impact on traffic, air and noise quality, and utility and access disturbance.

Excavation may encounter contaminated soils or ground water. Such soils may need to be processed or disposed in a contained disposal facility, which may also have to be capped to meet the environmental regulations. Provisions would need to address public health and safety and meet regulatory requirements.

5.0 DESCRIPTION OF PROJECT

Describes type & category of project, its objectives location & layout, features of site related to vegetation, project schedule of implementation and complete description of project related to its process and steps. Restoration plan its rehabilitation is also mentioned in this chapter.

5.1 OBJECTIVES OF PROJECT

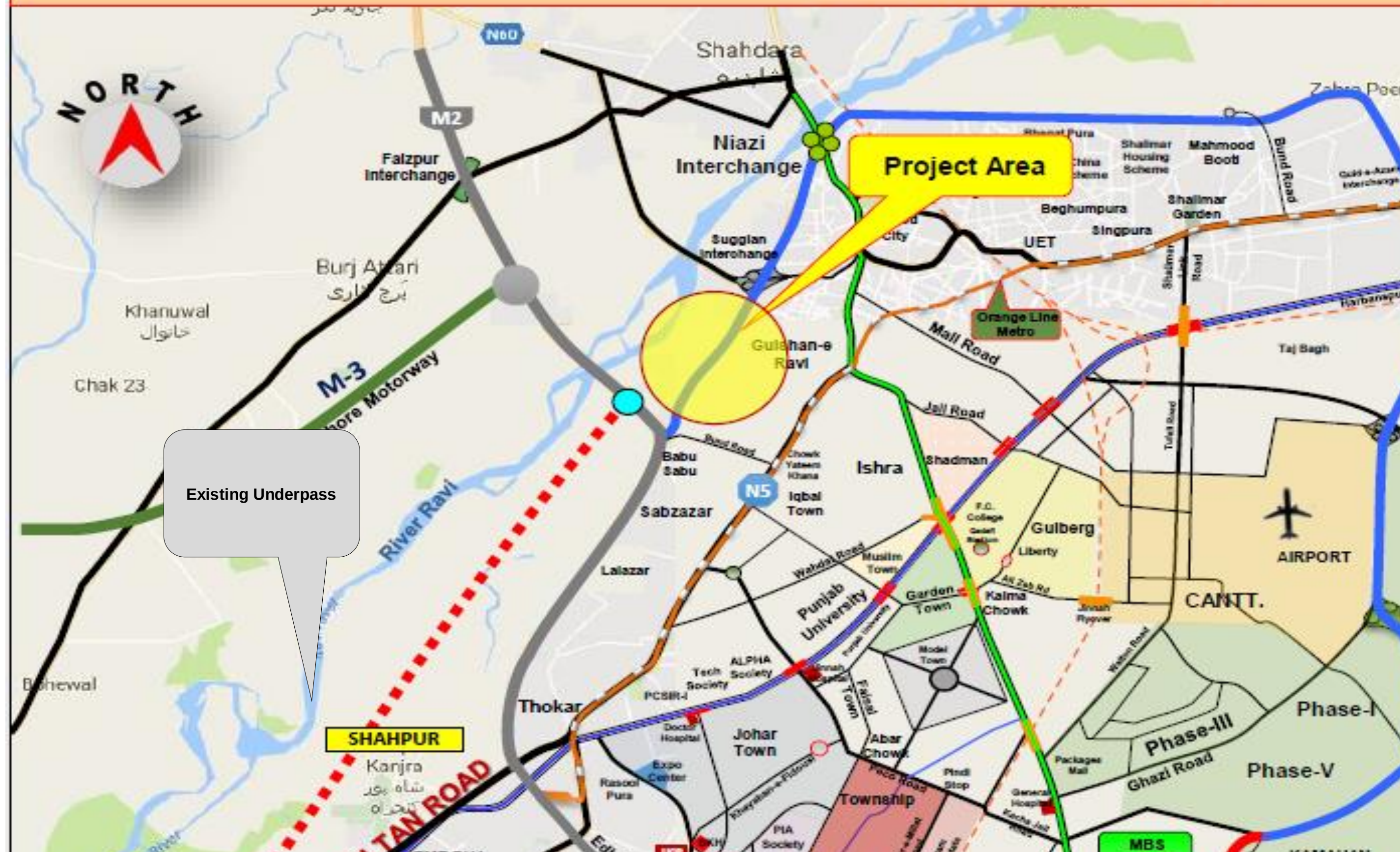
The objectives of the project are to:

- (a) This project will help in reducing traffic jams/congestion at the intersections.
- (b) This will result in reduction in Vehicle Operating Cost (VOC) and at the same time alleviating noise and air pollution up to certain extent.
- (c) To keep traffic flow smooth and uninterrupted.
- (d) To remove all the existing congestion of road.
- (e) To reduce Travel time.
- (f) Job Opportunities for local people would be created.
- (g) Safe movement of pedestrian across the road would be possible

5.2 LOCATION AND SITE LAYOUT OF PROJECT

The proposed underpass will be constructed at Gulshan-e-Ravi Junction, Lahore. Its geographical coordinates are 31°33'4.42" North, 74°16'13.73" East and proposed widening of existing Bund Road section from Gulshan Ravi to Babu Sabu Interchange starting from 31°32'26.01" North and 74°15'55.75"East and ends at 31°33'18.83"North and 74°16'27.10"East.

LOCATION PLAN



5.3 LAND USE ON THE SITE

The proposed project rehabilitation of the interchange Underpass is needed to be constructed on existing road. Due to high populated and extensive traffic issues the project area is congested.



Figure 5-2 Existing Land use of the Site

5.4 ROAD ACCESS

This project is itself a widening of existing Bund Road section from Gulshan Ravi to Babu Sabu Interchange and construction of a three lane Underpass at Gulshan-e-Ravi Junction (Babu Sabu Bound).

5.2 VEGETATION FEATURES OF THE SITE

There is no vegetation, as the current project has already existing road facility of Babu Sabu interchange to Rind road.

5.3 COST AND MAGNITUDE OF OPERATION

The project cost has been estimated as Rs.4, 959.316 Million.

Table 5-1: Project Cost Estimate Summary

REHABILITATION OF BUND ROAD FROM BABU SABU INTERCHANGE TO RING ROAD ALONG WITH PROVISION OF UNDERPASS AT GULSHAN-E-RAVI T-JUNCTION COST ESTIMATE SUMMARY		
Bill No	Description	Amount (Rs.)
1	Earthwork and Allied Activities	23,848,316
2	Subbase and Base	732,888,255
3	Surface Courses & Pavement	168,462,789
4.1	Structures (Underpass with Ramps)	1,742,127,617
4.2	Structures (Sump & Pump Station)	52,285,424
4.3	Structures (Drainage System)	45,894,175
4.4	Structures (LTP Room)	2,048,181
4.5	Structures (Manhole works)	15,622,444
4.6	Structures (Nullah Cover Concrete Drain)	475,575,852
5	Drainage & Erosion Works	356,450,057
6	Ancillary Works	119,233,105
7	General Items	-
8	Electrical Works	113,976,159
9	Mechanical Works	24,075,751
10	Traffic Signals (P.S)	5,000,000
	Construction Cost =	3,877,488,127
-	Horticulture/Replenishment Cost @ 1.0 % of Construction Cost	38,774,881
-	Shifting of Services LESCO, SNGPL, PTCL etc. (P.S)	150,000,000
-	Departmental Charges @ 1% of Construction Cost	38,774,881
-	Contingencies @ 3% of Construction Cost	116,324,644
-	Consultancy Charges for Design Service @ 1.2% of Construction Cost	46,529,858
-	Consultancy Charges for Construction Supervision @ 2% of Construction Cost	77,549,763
-	Land Acquisition with Compensation 10.5 Kanal @ 40 Million Per Kanal (P.S)	420,000,000
-	PST @ 5% of Construction Cost	193,874,406
	Total Project Cost =	4,959,316,560

5.4 DESCRIPTION OF THE PROJECT

PROJECT FEATURES

Sr. No.	Aspect	Details Description
1.	Title of the project	Rehabilitation of Bund Road from Babu Sabu Interchange to Ring Road along with Provision of Underpass at Gulshan-E -Ravi T Junction
2.	Components	6-Lane Dual Carriageway (Bund Road from Babu Sabu Interchange to Ring Road) - Carriageway Width = 11.1 m - No of Lanes = 3 (each sides) Underpass at Gulshan Ravi Junction (Babu Sabu Bound) - Underpass Width = 12 m - No of Lanes = 3 - Clearance Height = 5.1 m
3.	Project Cost	Rs.4,959.316 Million (Submitted PC-1 Cost)
4.	Land Acquisition	10.5 kanals
5.	Major Impact	Sullage Drain needs to be shifted
6.	Duration	10 months
7.	Project Benefits	Uninterrupted flow of traffic 71%oftheTotalTrafficbenefitted

5.5 PROJECT DESCRIPTION

At Bund road-Gulshan Ravi main boulevard junction, high traffic volume is observed daily which results in worse traffic congestion and gridlocks especially during peak hours. In order to mitigate traffic congestion at the intersection, three lanes underpass in Saggian to Babu Sabu direction is proposed to alleviate congestion and delays at the Intersection. This intervention along with at-grade intersection remodeling will alleviate congestion by significantly reducing the average travel time for crossing the intersection especially for the directions where the grade separation will provide direct relief.

The project includes widening of existing Bund Road section from Gulshan Ravi to Babu Sabu Interchange and construction of a three lane Underpass at Gulshan-e-Ravi Junction (Babu Sabu Bound). This project will help in reducing traffic jams/congestion at the intersections. This will result in reduction in Vehicle Operating Cost (VOC) and at the same time alleviating noise and air pollution up to certain extent.

Therefore, Rehabilitation of Bund Road from Babu Sabu at this location and Underpass at Gulshan-E -Ravi T Junction will facilitate the through traffic to access commercial hubs,

offices, schools, business places and residences etc. in a reduced travel time and vehicle operating costs hence decreasing fuel consumption and noise & air pollution.

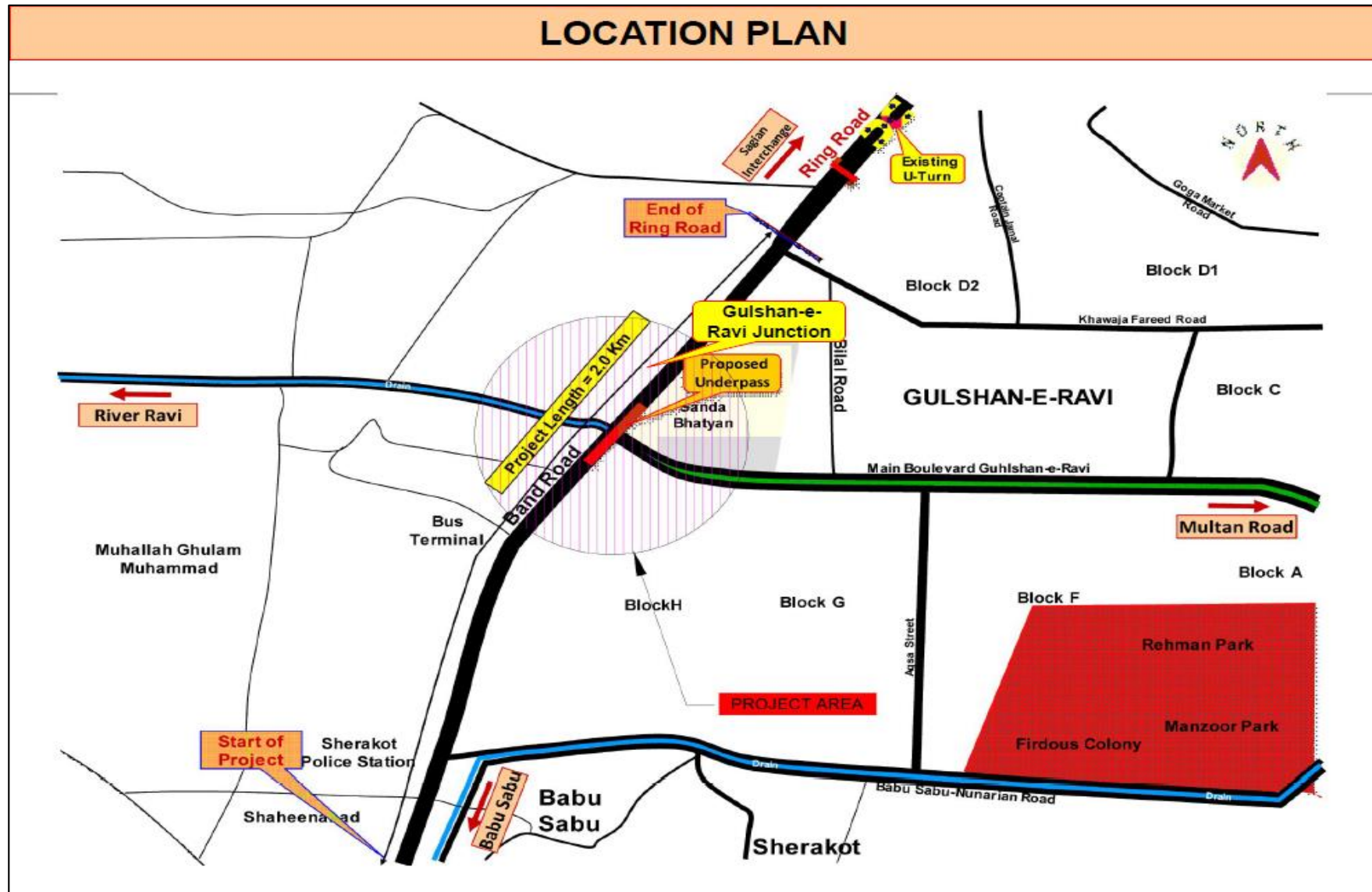


Figure 5-3 Proposed Alignment Plan



Figure 5-4 Diversion Plan for Sludge Carrier Drain

5.5.1 Economic Justification

Economic justification of the project has been established for widening of existing Bund Road section from Gulshan Ravi to Babu Sabu Interchange 6-lane dual carriage way and construction of a three lane Underpass at Gulshan-e-Ravi Junction (Babu Sabu Bound) with width of 12 m. At existing road, high traffic volume is observed daily. In order to ease out the traffic congestion at the junction, it would be alleviate congestion by significantly reducing the average travel time for crossing the intersection.

5.5.2 Sectoral Specific Information

The Geometric Design of the project is governed by prevalent standard codes for highways design. The Geometric design parameters are given below:

6-Lane Dual Carriageway (Bund Road from Babu Sabu Interchange to Ring Road)

Carriageway Width = 11.1 m

No of Lanes = 3 (each sides)

Underpass at Gulshan Ravi Junction (Babu Sabu Bound)

Underpass Width = 12 m

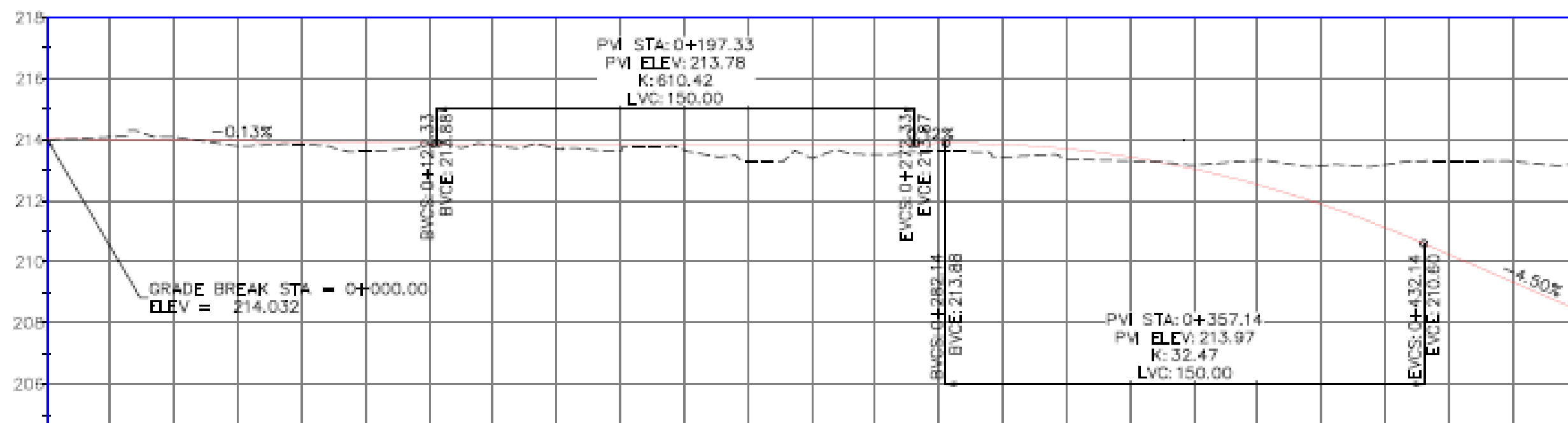
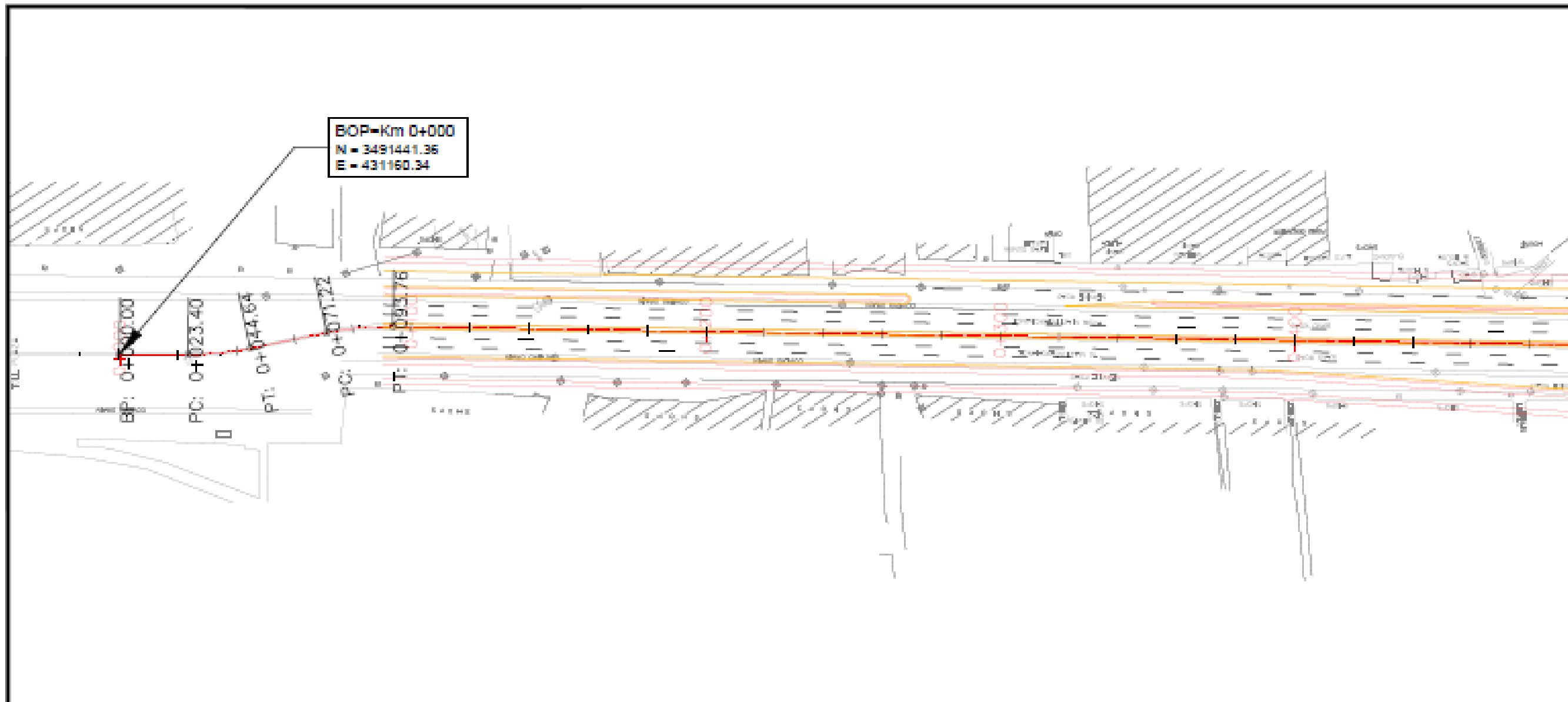
No of Lanes = 3

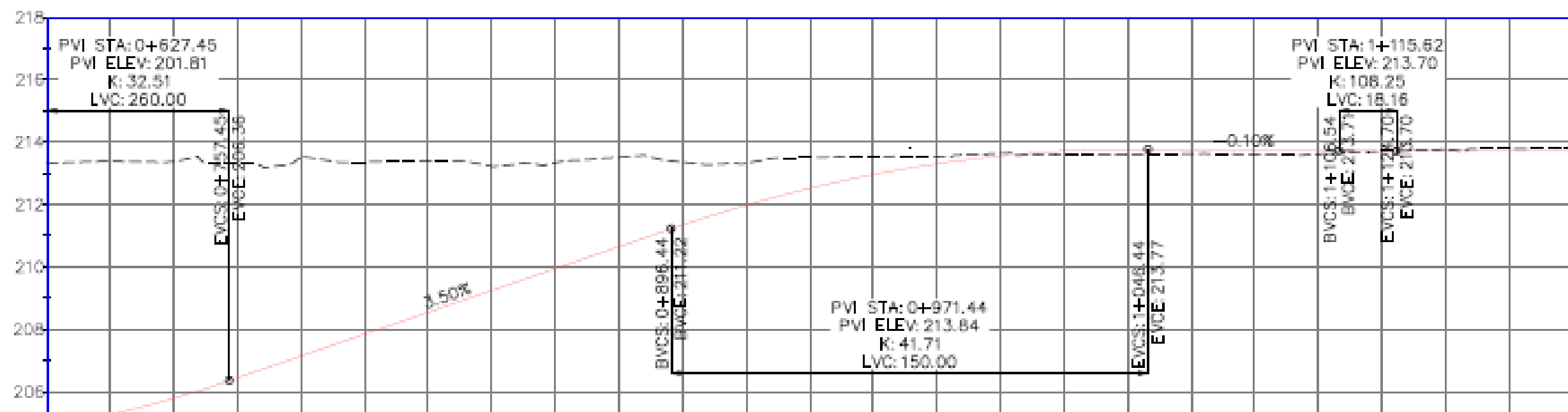
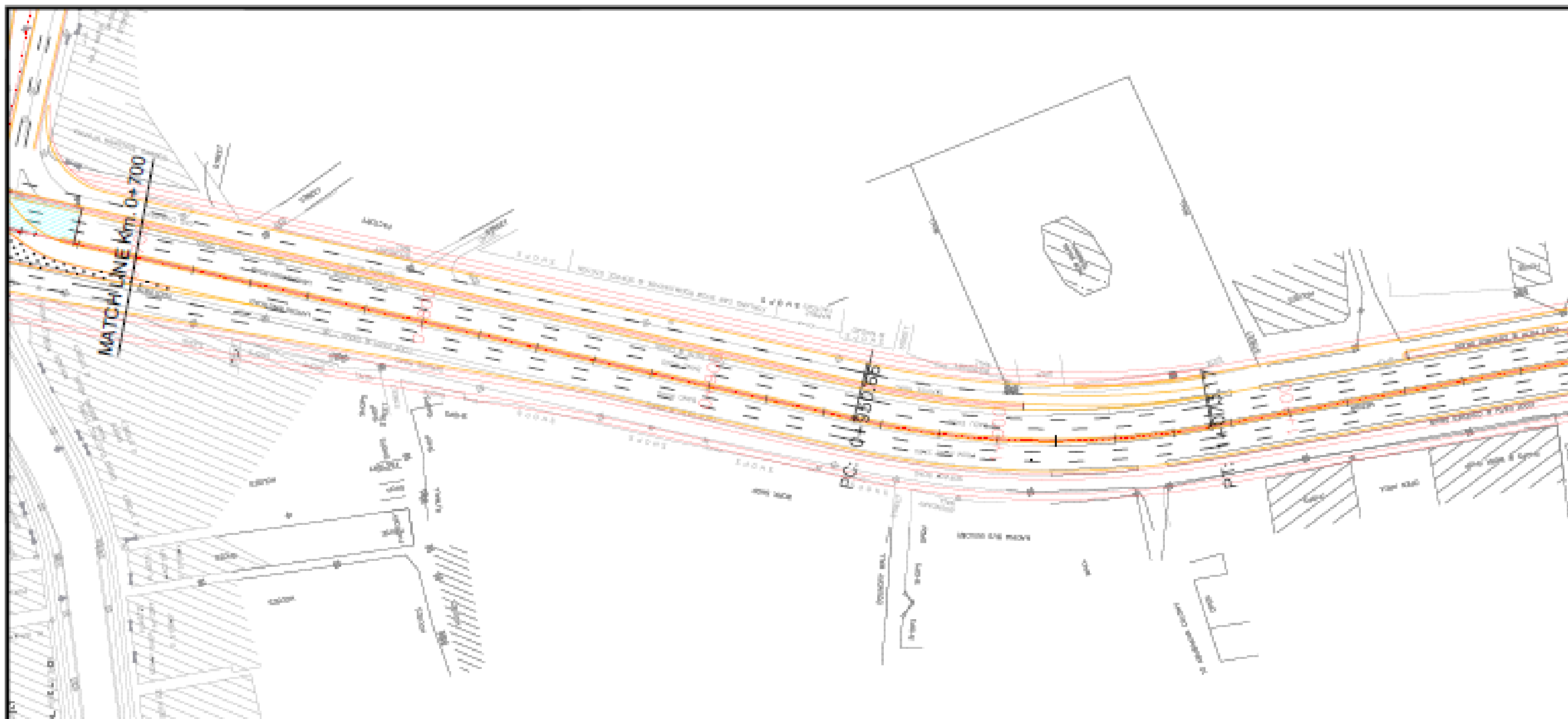
Clearance Height = 5.1 m

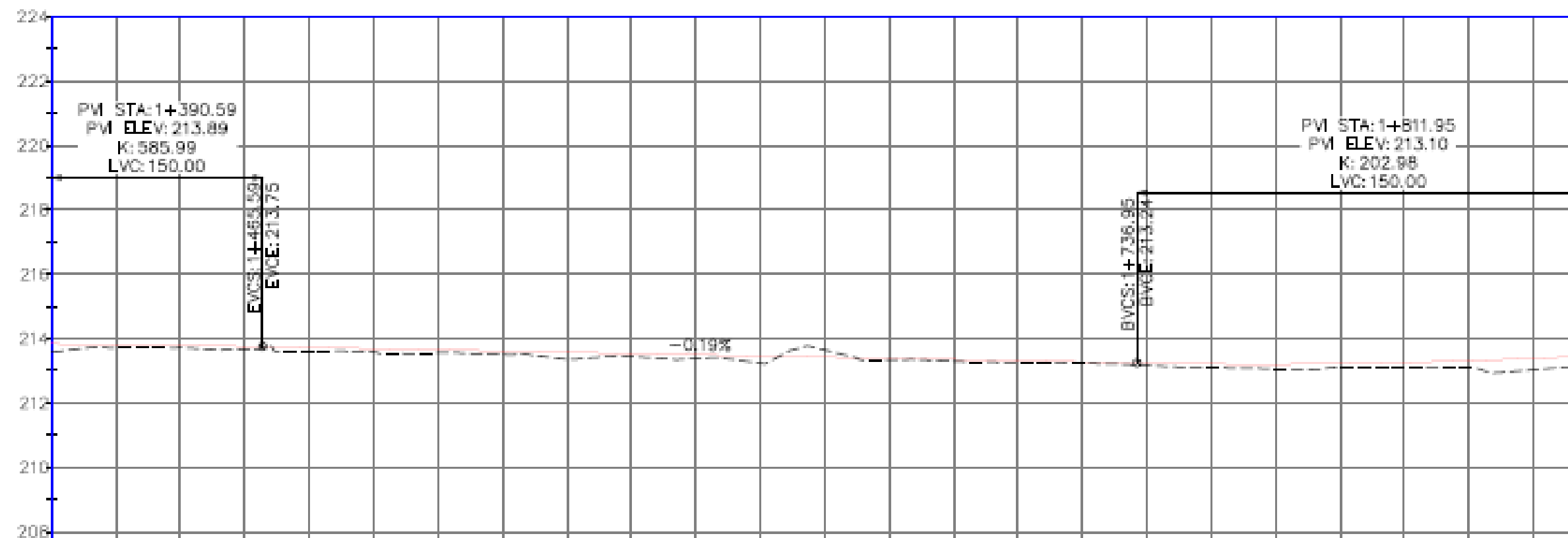
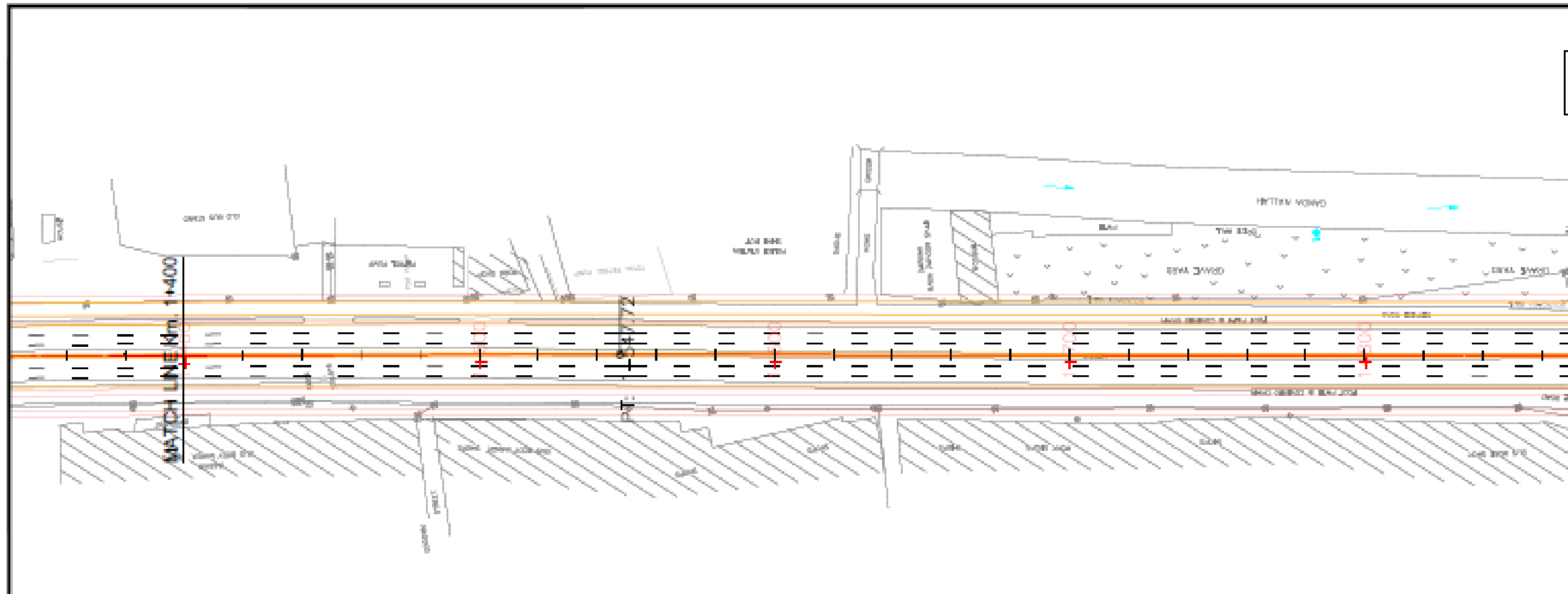
5.5.3 Typical Road Cross Section

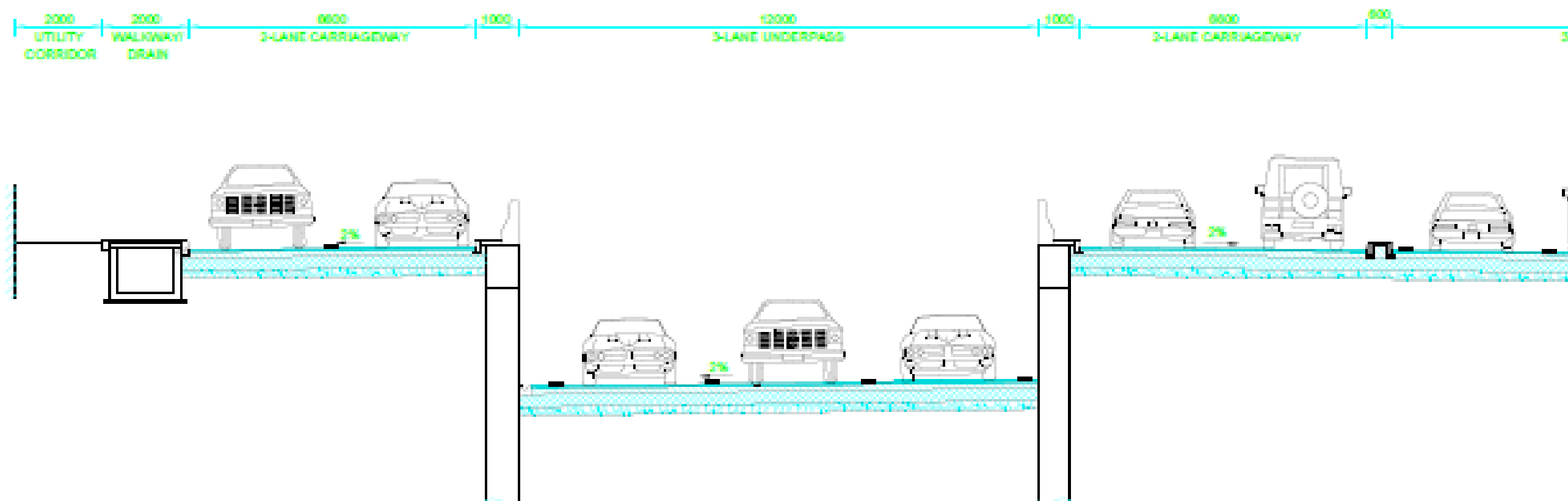
Cross Section of proposed project is given below.



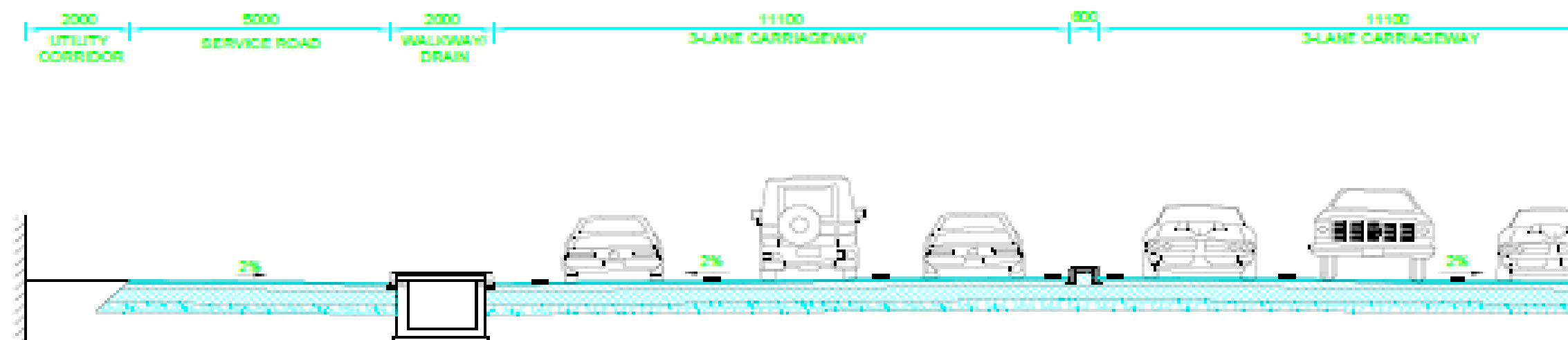








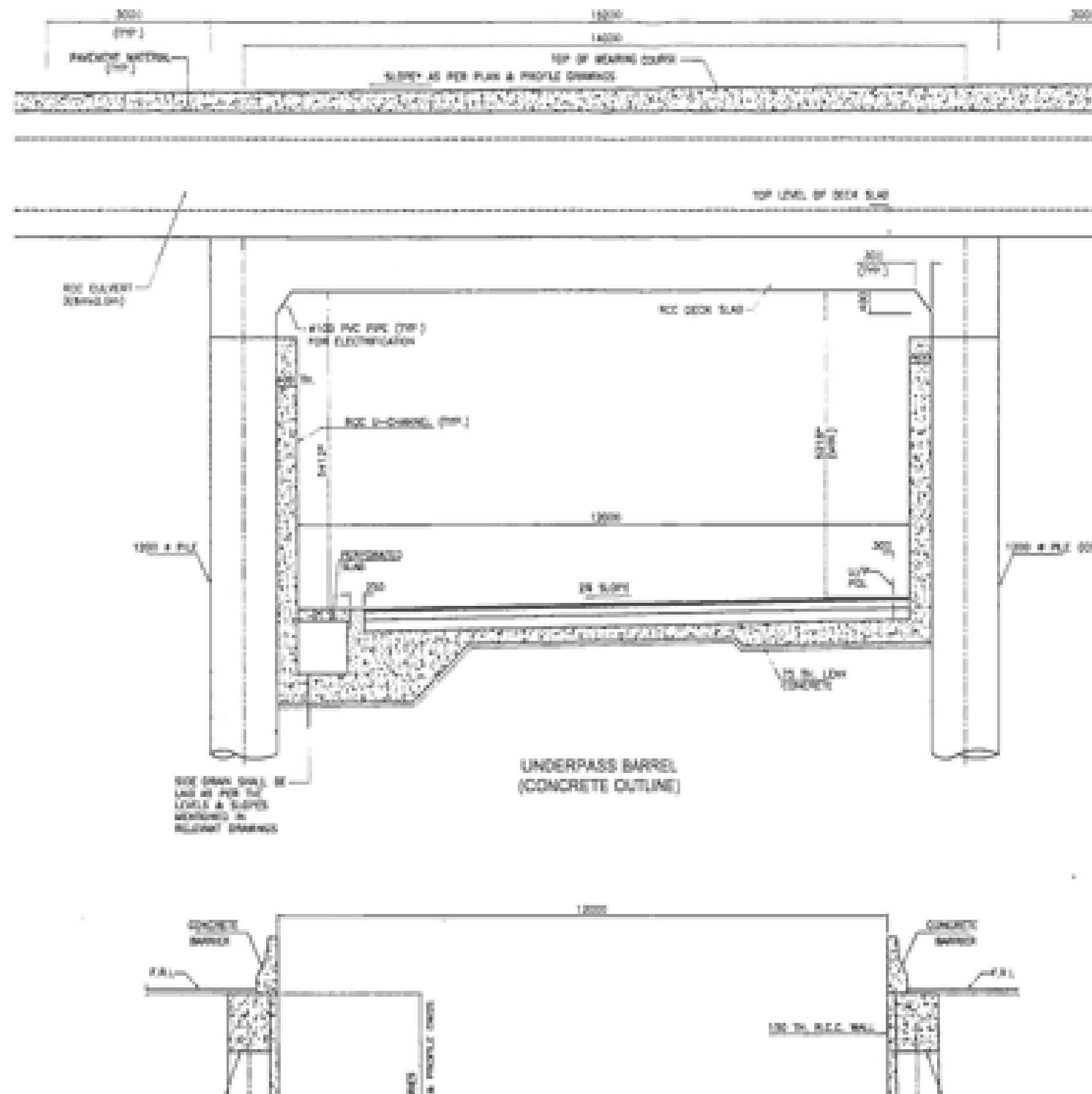
TYPICAL CROSS SECTION



TYPICAL CROSS SECTION

AT GRADE JUNCTION GULSHAN-E-RAVI J





5.5.4 Land Acquisition

Land acquisition with a compensation 10.5 kanal @40 million per kanal (P.S), with total cost of Rs. 420,000,000. The details of land acquisition are demonstrated in the figure below.

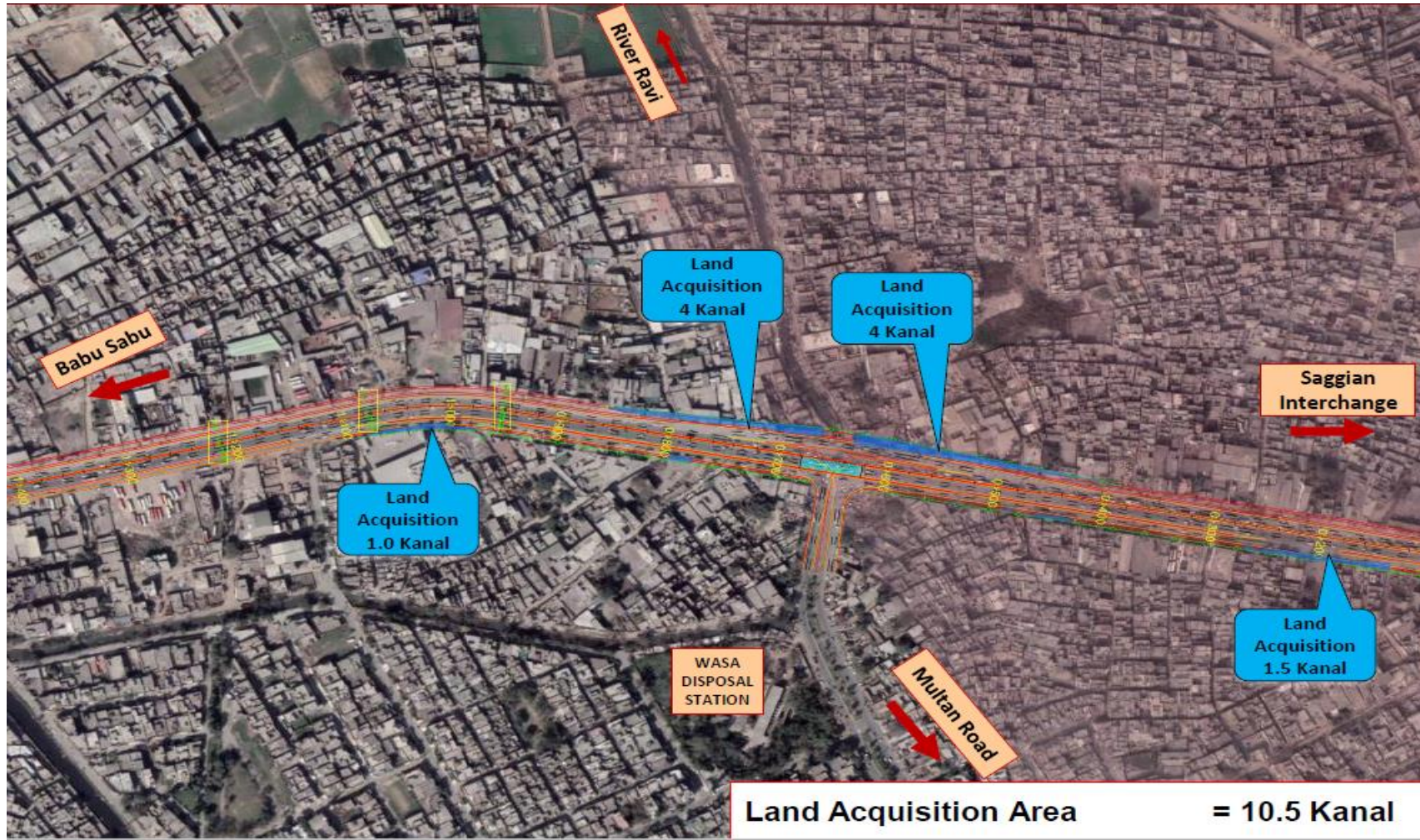


Figure 5-13 Land Acquisition Plan

5.5.5 Construction Camp

Camp sites will be selected keeping in view the availability of adequate area for establishing camp sites, including parking areas for machinery, stores and workshops, access to local markets, and an appropriate distance from sensitive areas in the vicinity. Final locations will be selected by the contractor after approval from LDA.

The area requirement for construction camps will depend upon the deployed manpower and the type and quantity of machinery mobilized. In view of the area required, the contractors will have to acquire land on lease from private landowners, unless the appropriate area would not be possible to locate camp sites within the ROW.

5.5.6 Construction Equipment

The List of Machinery and Equipment required for the proposed project is provided in Table 5-2.

Table 5-2 : Machinery and Equipment Required for Project

SR. NO.	MACHINERY & EQUIPMENT	SR. NO.	MACHINERY & EQUIPMENT
1.	Dump Truck	11.	Asphalt Distributor
2.	Front End Loader	12.	Batching Plant
3.	Dozer	13.	Concrete Transit Truck
4.	Grader	14.	Concrete Pump
5.	Vibratory Roller	15.	Excavator
6.	Water Tanker	16.	Water Pump
7.	Aggregate Spreader	17.	Cranes
8.	Three Wheel Rollers	18.	Vibrator
9.	Asphalt Plant	19.	Generator
10.	Paver	20.	Concrete Mixer

5.6 TRAFFIC ANALYSIS

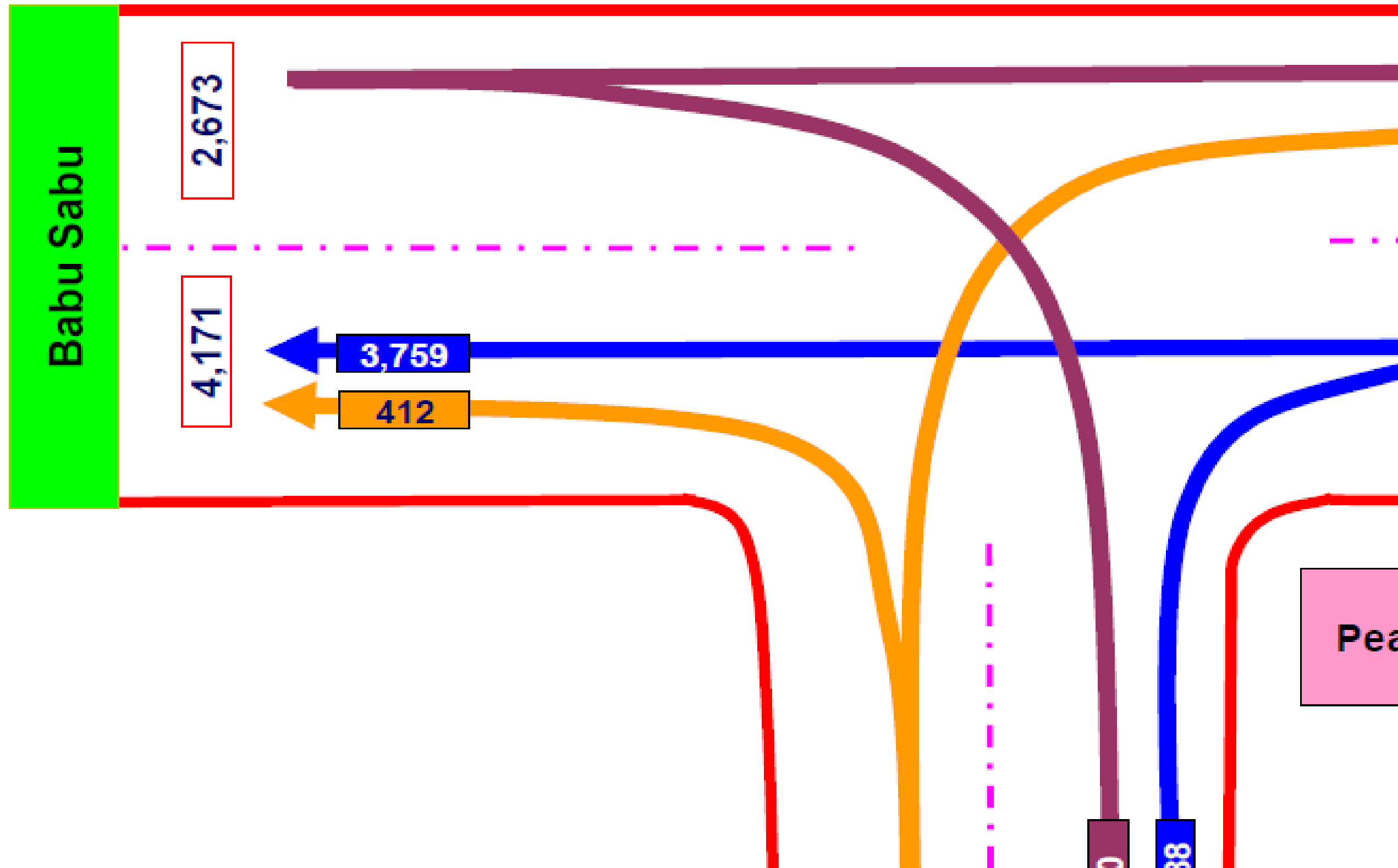
The main objective of Traffic Studies is to assess to traffic volumes and composition as well as relief in congestion that can be obtained through construction of underpass and widening of the existing road.

5.6.1 Traffic on Gulshan-e-Ravi Junction

In order to assess the traffic volumes on the intersection, 16-Hours Manual Classified Survey (MCC) at proposed location was carried out to compute present day as well as

future projected traffic volumes at the intersection and proposed underpass originating from the Gulshan Ravi, Saggian and Babu Sabu.. Figure 5.10 shows the total Average Daily traffic (ATD) at the intersection Whereas Figure 5.11 shows peak hour Vehicles per Hour (VPH) traffic volume.

PEAK HOUR TRAFFIC AT GULSHAN-E-R



5.7 RESTORATION/REHABILITATION AT THE END OF PROJECT LIFE

There will be no any matter of rehabilitation as the proposed project is already road. There will not be any let regarding safety factors as applicable from time to time for such projects on all accounts. However, at the end of the life of the underpass, it will be duly dismantled with special precautions to avoid/minimize pollution and at the same time taking all safety precautions to protect human life and property around the project site.

Debris or any other wastes resulting from demolishing will be disposed of in environmentally sustainable fashion. The materials capable of recycling/reuse will be either sold in the market or to be reused for other suitable purposes.

After completion; all construction matrix, debris, and garbage will be removed off immediately from the site within the minimum possible time under safe conditions. Any minor spillover of these materials will be cleared adequately. The land, if and where pitted will be adequately leveled. On the whole, the project site and the area in its near vicinity will be made neat and clean.

.

6.0 DESCRIPTION OF ENVIRONMENT

This chapter describes the baseline conditions, which cover the existing physical, ecological, and socio-economic environment of the Study Area. Information on these aspects has been derived from the desk study of available data, field visits to the project area as well as information obtained through visits to the Government departments and other agencies namely Health Department, Irrigation Department, Meteorological Department, Forest offices and prevailing environmental laws and environmental quality standards etc.

6.1 PHYSICAL RESOURCES

6.1.1 Topography

The topography of the project area is flat. The General height of the area is approximately 220 meters above the Mean Sea Level (MSL). The district Lahore is divided into two parts. The low lying alluvial soil is along the Ravi River and the upland in the east. Upland is a plain slope from north-east to south-west. The lowlands are generally inundated during the monsoon season by Ravi River, flowing in the west of district along its boundary with district Sheikhpura. Figure - 6.1 represents the topography of the area.

Topographic details of proposed project site are as given below:

Elevation: 704 feet

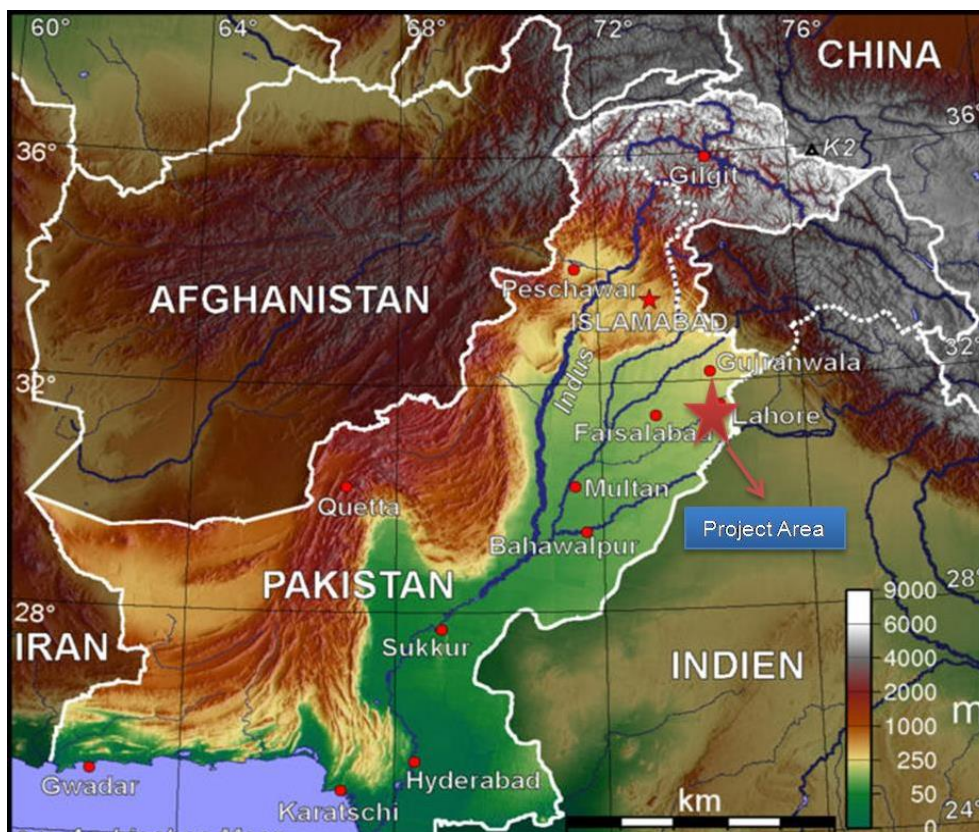


Figure 6-1 Topographic Map of the Study Area

6.1.2 Soil

The soil is different in character and generally inclined to be dry. However, it is rich in potential plant nutrients. Rainfall is low and groundwater is saline and brackish at the shallow depth and irrigation is largely dependent on the canals. Tube wells have also been sunk to the greater depths in the Project Area where fresh water is available.

The chemical quality of groundwater in the district varies with depth. However, the sweet potable water is available in a belt five to twenty miles wide paralleling the Ravi River.

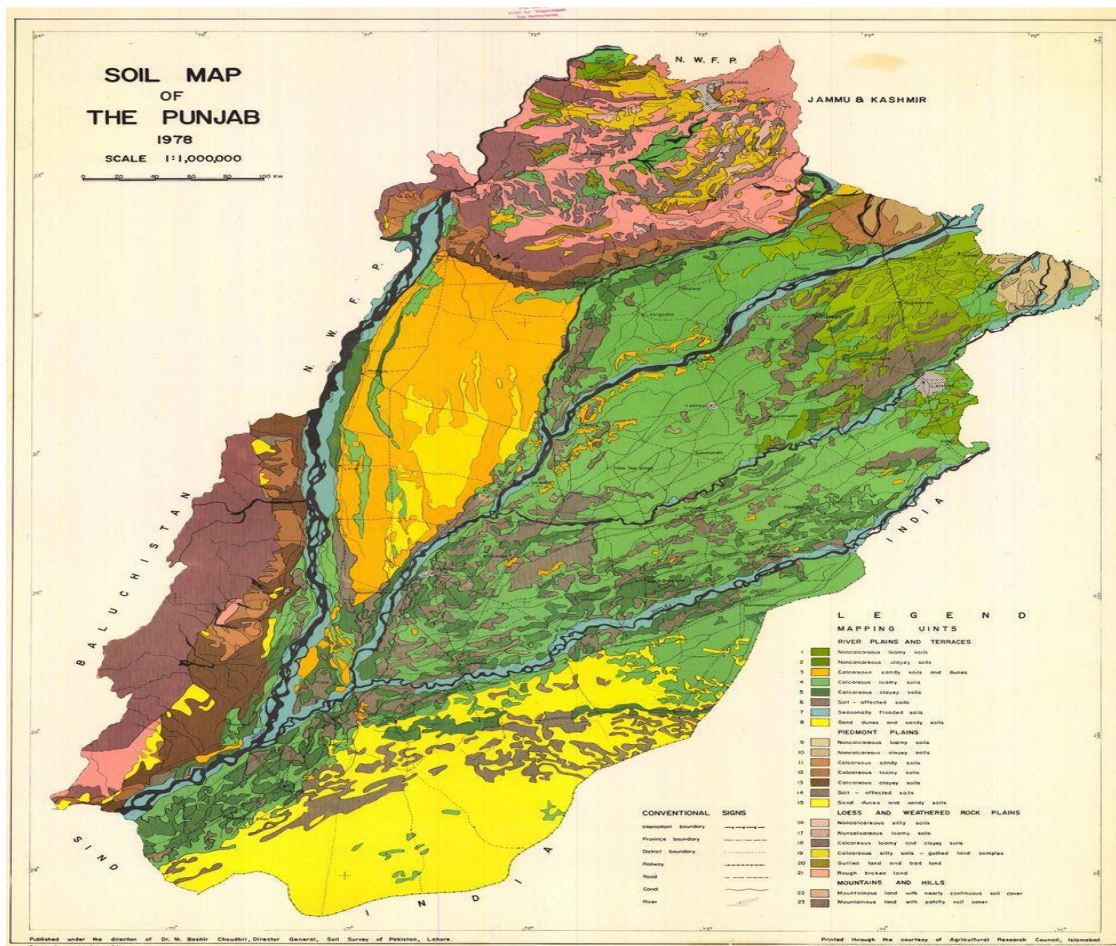


Figure 6-2: Soil map of Punjab

Alluvium is soil or sediments deposited by a river or other running water. Alluvium is typically made up of a variety of materials, including fine particles of silt and clay and larger particles of sand and gravel. A river is continually picking up and dropping solid particles of rock and soil from its bed throughout its length. Where the river flow is fast, more particles are picked up than dropped. Where the river flow is slow, more particles are dropped than picked up. Areas, where more particles are dropped, are called alluvial or floodplains and the dropped particles are called alluvium.

6.1.3 Climate and Meteorology

Seasonal climatic conditions must be considered for the design and execution of Project. The climate including air, temperature, precipitation, humidity, and evaporation is an

influencing factor, affecting the construction of the plant and other engineering structures. However, to determine the overall effect of the climatic stresses, daily and seasonal temperature changes, site altitude, direct solar radiation, and precipitation must be considered. The Project Area has extreme climate: it has hot summer and cold winters. The summer starts from April and lasts till September. May, June, and July are the hottest months. The summer starts from April and lasts till September. May, June, and July are the hottest months. The mean maximum and minimum temperature ranges from 40.4 °C and 27.3 °C respectively for these months.

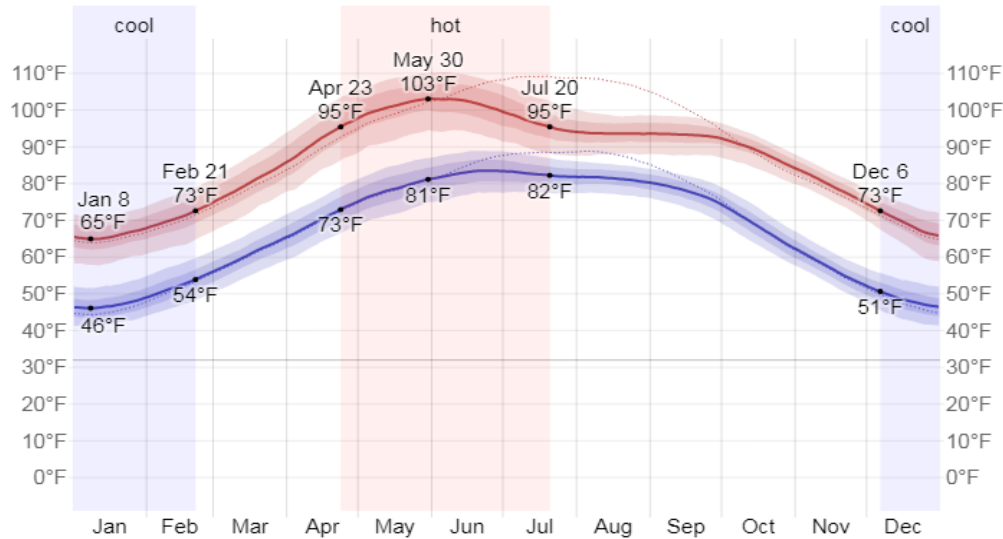


Figure 6-3 Temperature profile of Lahore

The winter seasons lasts from November to March. December, January, and February are the coldest months. The mean maximum and mean minimum temperature ranges from 19.8°C to 5.9°C in January. Temperatures in the Project Area vary from 5.9 °C to 40.4 °C.

Table 6-1 Meteorological and Climatic Features

Classification of Climate	Tropical (hot/humid)
Predominant Wind Direction	East/Northeast
Wind intensity	Weak to moderate
Average annual precipitation	>650 mm
Rainy season	July to September
Dry season	October to June
Average annual temperature	19-20 °C

Average summer temperature	36-38 °C
Average winter temperature	6.5-10.5 °C

**Table 6-2 Average Monthly Temperature, Precipitation and
Relative Humidity (2022)**

Month	Mean Temperature		Precipitation (mm)	Average Relative Humidity (%)
	Maximum	Minimum		
January	18	8	100	72
February	24	11	31	60
March	28	15	39	54
April	37	22	62	40
May	39	26	50	37
June	37	26	176	54
July	36	27	200	68
August	35	27	184	69
September	35	25	50	63
October	34	22	0	56
November	24	13	19	72
December	22	9	31	63
Annual	30.8	17.8	666	78.34

Pre-Monsoon Season

Pre-monsoon refers to the period from April to June prior to the setting in of the monsoon. This is the hottest and the driest season, with persistent dry and hot winds. Daytime temperature rises to 40° C. The flows in the river begin to rise simultaneously due to snow-melt water in the high mountains. The water table falls to the maximum depth

Monsoon Season

Monsoon is the main rainy period, which starts at the beginning of July, reaches its climax in August and gradually, subsides in September. High-intensity Rainfall causes soil erosion which is a function of erosivity and erodibility. The cool monsoon winds followed by heavy showers lower the temperature to great extent. The part of rain percolates into the soil and is conserved in the subsoil and part adds to the groundwater. The conserved moisture in the soils is generally sufficient to rejuvenate the vegetation. All plants grow rapidly and mature towards the end of the season. With the start of monsoon season, the rivers flow at their peak level. The groundwater level is improved toward the end of the season in September and October.

Post-Monsoon Season

Post monsoon season refers to autumn (October-November). The temperature starts falling but the extreme aridity prevents plants to flower early and sets seed toward mid-seasons. Groundwater level rises as a result of infiltration from rainfall.

Winter Season

Winter refers to the period from December to January. The lowest temperatures (< 20C) and cold winds characterize this season. The plants become dormant and most of them dry out. Most of the trees shed their leaves and few remain green or partly green. Sometimes this season becomes severe due to cold Siberian winds. Groundwater level declines in this season due to low flows in the rivers and no or little rains which usually fall in light showers causing little soil erosion.

Spring Season

Spring refers to the period from February to March. Temperatures become pleasant. The mean maximum temperature is 27oC with the highest precipitation of 41.2 mm and relative humidity of 57.6 percent. Some light showers of rain may also fall without generating runoff. The vegetation sprouts again because of conserved moisture from winter and spring rains, if any. The water table starts falling

Solar Elevation

Solar elevation over the year 2022, shown in the figure. The black lines are lines of constant solar elevation (the angle of the sun above the horizon, in degrees). The background color fills indicate the azimuth (the compass bearing) of the sun. The lightly tinted areas at the boundaries of the cardinal compass points indicate the implied intermediate directions (northeast, southeast, southwest, and northwest).

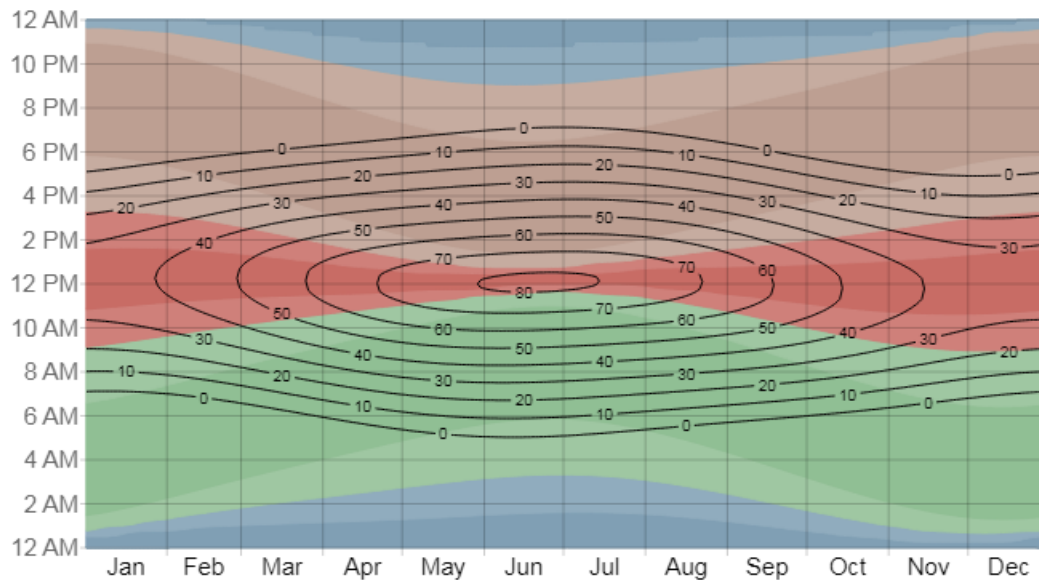


Figure 6-4 Solar Elevation Profile of Lahore

6.1.4 Surface Water & Ground Water

Hydrology

Lahore division is a part of Punjab Province of Pakistan. Geologically, this area is a part of lower Indus Basin. The name “Punjab” itself is an indicative of healthy presence and importance of rivers in this area. This word “**Punjab**” comes from 'punj-aab' meaning five rivers. The five rivers of Punjab were Sutlej, Bias, Ravi, Jehlum and Chenab Rivers. It is to be noted here that Bias River have discontinued to flow in Pakistan, as discussed later. This blessing has resulted in cultivation on mast part of land in Punjab as well as in the study area.

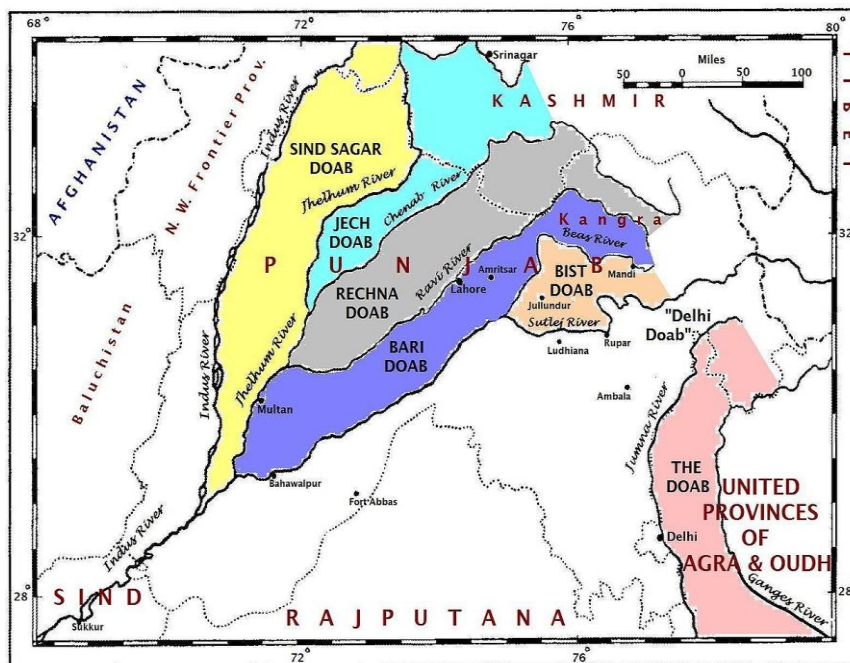


Figure 6-5 Watershed of Punjab

The only river passes from Lahore is Ravi River. The slope of the land in planned area is to the south-west, which directs the rivers to flow in this path. Average slope of the area is 0.32m/km.

The Ravi has a major contribution in glorious history of the study area. All the "historical assets" of Lahore, including but not limited to Lahore Fort, Badshahi Mosque and Kamran ki Baradari, were built adjacent to Ravi River.

As per the Indus basin treaty of 1960, six major rivers were divided among Pakistan and India. As per the treaty, the rights of Eastern Rivers (Sutlej, Bias and Ravi) were allocated to India, while the rights of Western Rivers (Chenab, Jehlum and Indus) were reserved with Pakistan. Since the Indus basin treaty, India has completed series of structures to store and divert water from upstream and use it for generation of electricity and irrigation. These interventions have put a stop to ecological and sustainable flows in these rivers, thereby depriving the downstream areas of Pakistan, including Lahore from naturally available water for irrigation. The Ravi allocated to India, still flows seasonally through the study area while Bias River have discontinued to flow.

Furthermore, the planned area has abundance of water in the form of groundwater aquifer. The aquifer of Lahore District is broadly viewed as a single contiguous, unconfined aquifer. The presence of alluvial soil, frequent flooding and excessive rains in this region for hundreds of years have enriched this aquifer with abundance of water.

Surface Water

No rivers exist in the vicinity; however, storm water drains cross the route for disposal into the Ravi River. Water from River Ravi, flowing on the northwestern side of the city of Lahore, is being used for other purposes other than drinking purposes. River Ravi receives almost all the municipal/ industrial wastes from the city of Lahore. The potential value as a recreational water body and breeding place for fish is threatened by the municipal and industrial pollution.

Groundwater

Groundwater quality is fresh (defined as acceptable in terms of its salinity). Raw water abstracted from the deep tube wells is believed to be essentially bacteria free. The status of quality of groundwater both in the country and Punjab Province is shown in fig. The water quality in the upper 50 meters' zone of the subsoil is generally brackish. For city's drinking purposes water is abstracted from groundwater aquifer by means of tube wells located throughout the city. The quality of water is generally adequate for direct consumption. About 83% of the city population is consuming groundwater for drinking purposes. Groundwater is available at a depth ranging between 15 to 23m below the natural surface level.

Water consumption varies significantly and its variation as of industrial units. Usual water consumption pattern for industrial units and data collected from the prospective industrialist will form the basis for total water demand.

Rehabilitation of Bund Road, Lahore

According to Master Plan-2030 for the city of Lahore, the mean average decline in groundwater is about 2.03 feet per year. The water table contour map for the Year-2000 is exhibited in Exhibit-4.14. It is noted from the exhibit that groundwater is at a greater depth in the central part of the city where abstraction is more than the re-charge and close to surface waters i.e. Ravi River and Canal, the situation is in the reverse order.

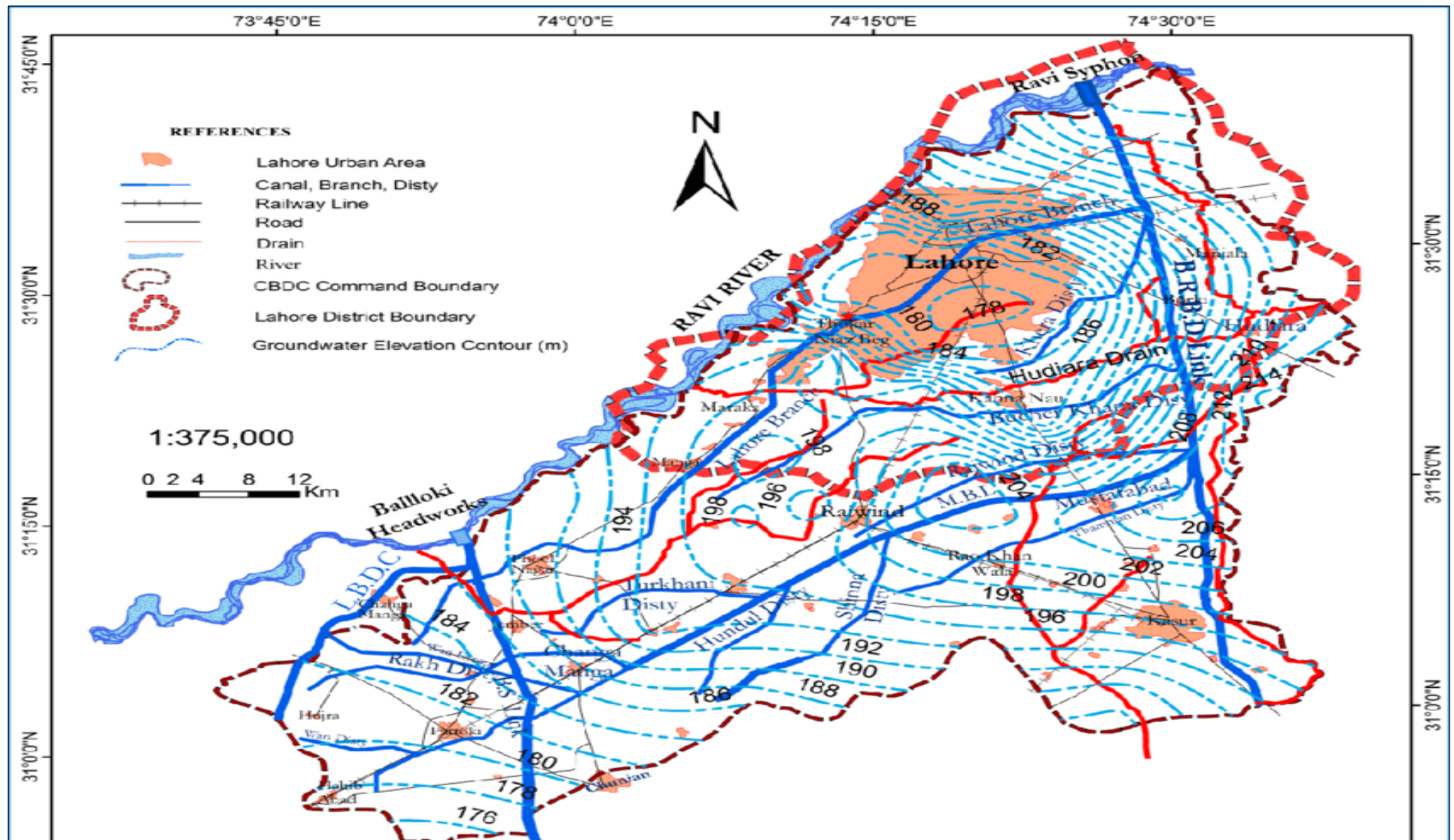


Figure 6-6 Groundwater Contours of Lahore

6.1.5 Geology

Geological history of Lahore along with that of the Punjab is linked with the uplift of Himalayas in the Tertiary times, where a subsiding through a fore deep was formed adjoining the mountains. The alluvium mostly derived from the Himalayan ranges has been deposited in the Punjab geosynclines by the present and the ancestral tributaries of the Indus river system. The exposed Lahore alluvial complex of Pleistocene and recent age represents the latest phase of sedimentation and subsidence. Nearly all the deposits underlying the city of Lahore and the surrounding area are the products of events that evolved during Pleistocene and recent geological times. The study of logs of boreholes and tubewells conducted in and around Lahore show that the alluvium consists principally of fine to medium sand, silt and clay. Associated with the fine grained strata are concretionary zones of nodules of Kankar and silty clay, occasionally containing beds of reddish and ferruginous material. Drilling data obtained from several deep wells shows the absence of thick horizons of clay within the alluvium. Clay lenses occur only locally and have little horizontal continuity. In 1961 bed rock (mica schist) was struck at 1,274 feet depth near Niaz Beg (Table 1) after which the drilling was abandoned by Water and Power Development Authority (WAPDA). In subsequent years drilling operations in and around Lahore did not exceed 800 feet depth. At present our knowledge of the deep geological formations underlying beneath the city of Lahore is incomplete.

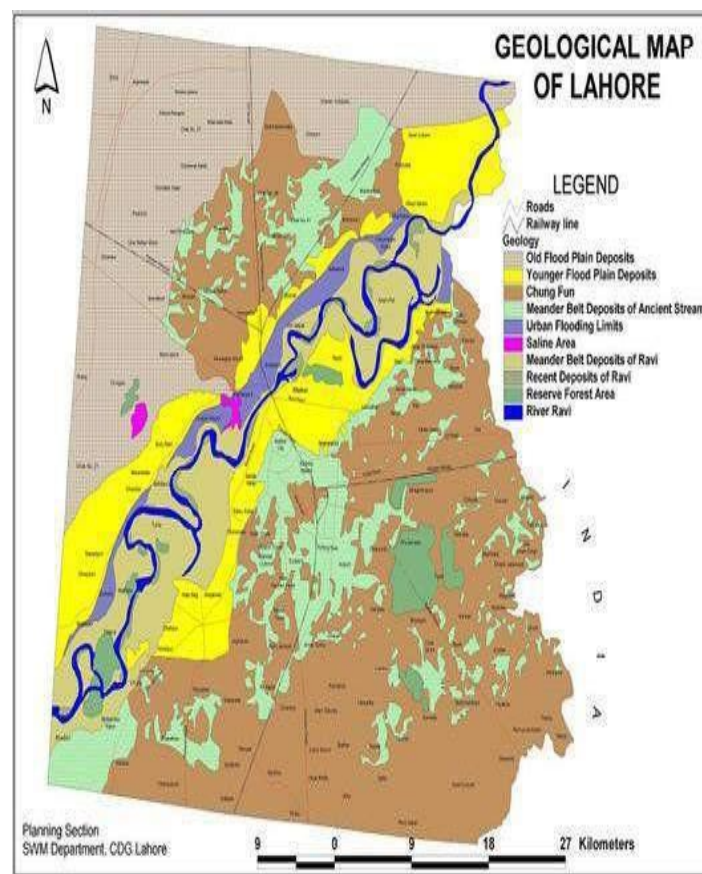


Figure 6-7 Geographical Map of Lahore

6.1.6 Seismology

Pakistan Building Code distributes the country into 4-zones, fig. The project site falls in Low Hazard Zone with seismic factor ground acceleration $g/10$ or less, as such structural design of buildings and others will follow the applicable criteria for the zone. Seismic details are a very important consideration for any planning activity. As it directly lays impact on the construction of the site.

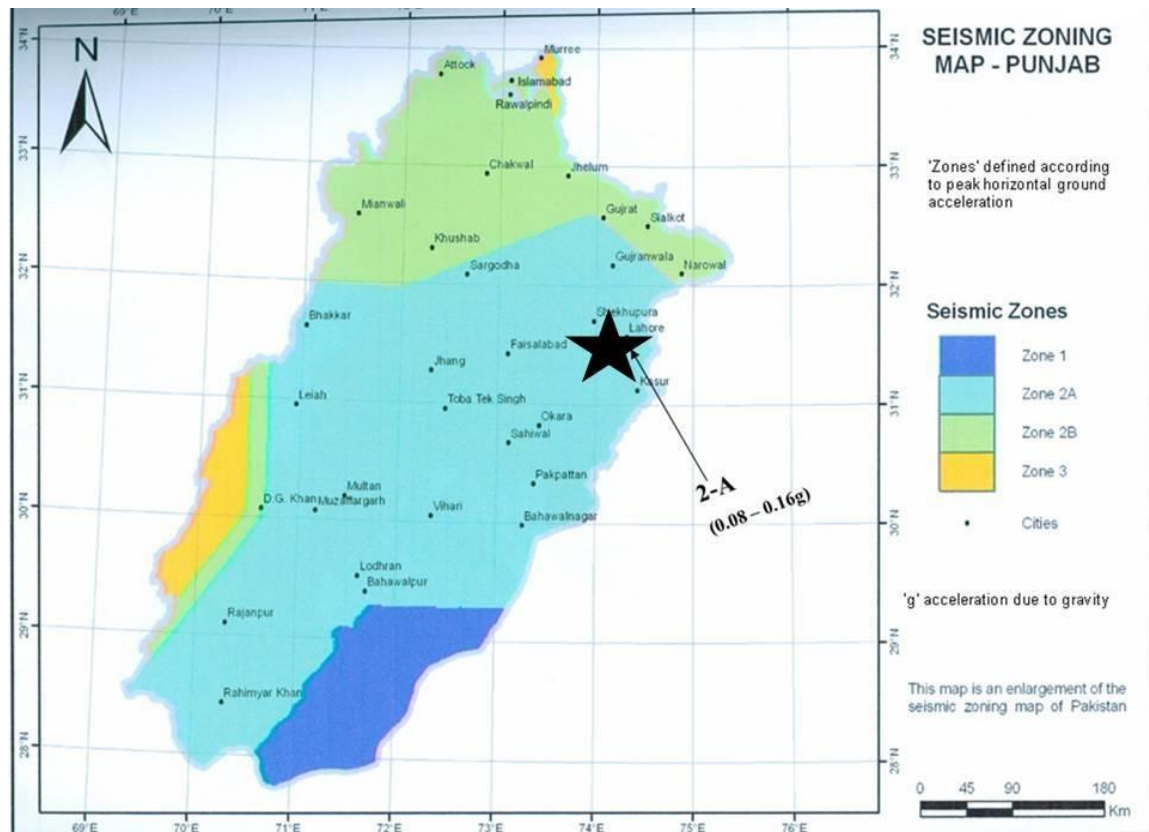


Figure 6-8: Seismic Zoning Map of Pakistan

6.1.7 Flooding

No surface drainage problems are foreseen as surface water can be disposed of in the existing primary and secondary drainage network including partly moving into the sewerage.

6.1.8 Water Logging and Salinity

There are no signs of water logging in the project site.

6.2 ECOLOGICAL RESOURCES

6.2.1 Marine and Aquatic Ecology

This is not applicable to the Project area.

6.2.2 Flora

Lahore the city of gardens is heart of Pakistan. The city has seen the heydays of the Mughals, Sikhs and the British; all left their footprints on the history and cultural mosaic of the city. Resultantly Lahore is a treasure-trove of monuments, historical relics and remains which these nations have left in this historical metropolis of Punjab.

Though an ancient city; over the years Lahore has considerably expanded. However, along these modern additions, the ancient monuments, old gardens, trees, graveyards and traditional bungalows having attached gardens, large expanses of lawn and old roadside trees some of them can still be seen, are gradually disappearing. These green areas and old endemic trees of Lahore are home to many resident bird species as well as many summer, winter and transit migrants. So, Lahore is also very important due to its ecological conditions.

Several types of floral species are present in Lahore, however, some of the principal trees, shrubs (plants) and herbs (ground covering plants) are given below, which illustrates their nomenclature including local names, English names and Botanical names.

Table 6-3 Inventory of Trees Present in Lahore District

Serial No.	Common Names	Botanical Names
1.	Arjun	<i>Terminalia arjuna</i>
2.	Dhak	<i>Butea frondosa</i>
3.	Mahwa	<i>Bassia latifolia</i>
4.	Bahara	<i>Terminalia bellerica</i>
5.	Amaltas	<i>Cassia fistula</i>
6.	Gul-e-nishter	<i>Erythrina subrosa</i>
7.	Putajan	<i>Putranjiva roxburghi</i>
8.	Gab	<i>Diospyros embryopteris</i>
9.	Berna	<i>Crateva religiosa</i>
10.	Khark	<i>Celtis australis</i>
11.	Putajan	<i>Putranjiva roxburghi</i>
12.	Fiddle wood/Kashmir Lagotis	<i>Eithryllum ruberratum</i>
13.	Gul-e-mast	<i>Dalini indica</i>

Rehabilitation of Bund Road, Lahore

14.	Gul-e-mohr	<i>Poinciana regia</i>
15.	Alstonia	<i>Alstonia scholaris</i>
16.	Ashoke	<i>Saraca indica</i>
17.	Sheesham	<i>Dalbergia sisso</i>
18.	Alata	<i>Stercolia colorata</i>
19.	Kenair	<i>Nerium grandiflora</i>
20.	Weeping Willow	<i>Salix babylonica</i>
21.	Keekar	<i>Parkinsonia aculeata</i>
22.	Nilem	<i>Jacaranda mimosfolia</i>
23.	Kachnar	<i>Bauhinia purpurea</i>
24.	Molsary	<i>Mimosop elengi</i>
25.	Bel	<i>Aegle marmelos</i>
26.	Siris	<i>Albizia lebbek</i>
27.	Tun	<i>Cedrela toona</i>
28.	Jamin	<i>Eugenia jambolana</i>
29.	Moor pankh	<i>Thuja orientalis</i>
30.	Silkoak	<i>Grevillea robusta</i>
31.	Sufeda	<i>Eucalyptus citriodora</i>
32.	Peepal	<i>Ficus relegiosa</i>
33.	Simbal	<i>Hyacinthus orientalis</i>
34.	Berri	<i>Diospyros melanoxyton</i>
35.	Suk chain	<i>Pongamia glabra</i>
36.	Poplar	<i>Populus alba</i>

37.	Aam	<i>Mangifera indica</i>
38.	Shehtoot	<i>Morus alba</i>
39.	Peepal	<i>Ficus religiosa</i>

*Source: PHA, Lahore***6.2.3 Fauna**

Common birds found in the area are crows and sparrows. Chirping birds are having their nests at the well-grown trees that are providing a natural habitat for the birds. Some squirrels, parrot, rats, weaver, sparrows are also found in the area.

Different species of reptile and amphibians such as lizards and frogs are also found. Various bird species known to occur in the area include myna, bulbul, crow and sparrow.

6.2.4 Endangered Species

The endangered plant in Pakistan is the Elm i.e., *Ulmus wallichiana* which is not found here. No endangered species exist in the project area.

6.3 SOCIOECONOMIC ENVIRONMENT

Lying between 31°31'—08°41' N and 74°21'—18°76' E, Lahore is bounded on the north and west by the Sheikhpura District, on the east by Wagah, and on the south by Kasur District. The Ravi River flows on the northern side of Lahore. Lahore city covers a total land area of 404 square kilometers (156 sq mi) and is still growing. With a rich history dating back over a millennium, Lahore is a main cultural center of Punjab and one of the most densely populated cities in the world. The city of Lahore remains an economic, political, transportation, entertainment, and educational hub. It is referred to as the "Mughal City of Gardens" due to the historic presence of gardens in and around the city dating back to the Mughal period.

6.3.1 Political and Administrative Setup

The project area falls in Lahore City of the Lahore District. District Co-ordination Officer is the highest ranked administrator of the district. For the collection of revenue and administration, the districts are subdivided into Tehsils. Local governments also administer the area through Union Councils and Tehsils. The total area of the district Lahore is 2,300 square kilometers.

6.3.2 Economy and Industrial Activities

As of 2008, the city's gross domestic product (GDP) by purchasing power parity (PPP) was estimated at \$40 billion with a projected average growth rate of 5.6 percent. This is at par with Pakistan's economic hub, Karachi, with Lahore (having half the population) fostering an economy that is 51% of the size of Karachi's (\$78 billion in 2008).

The contribution of Lahore to the national economy is supposed to be around 13.2%. As a whole, Punjab has \$115 billion economy making it first and to date only Pakistani Subdivision of economy more than \$100 billion at the rank 144.

Lahore's GDP is projected to be 102 billion\$ by the year 2025, with a slightly higher growth rate of 5.6% per annum, as compared to Karachi's 5.5%. Central to Lahore's economy is the Lahore Stock Exchange (LSE), Pakistan's second largest stock exchange.

Lahore has offices of several Pakistani government corporations including the Water and Power Development Authority (WAPDA) and Water and Sewage Authority (WASA). Food and restaurant businesses remain open all night. Lahore is the second largest financial hub of Pakistan and has industrial areas including Kot Lakhpat and the new Sundar Industrial Estate (near Raiwand). Lahore's economic base is broad and varied.

Major industries include the manufacture of automobiles and motorcycles, Heavy machinery, railway coaches, home appliances, steel, telecommunications, information technology, chemicals, pharmaceuticals, computers, engineering, and construction material. A major industrial agglomeration with about 9,000 industrial units, Lahore has shifted in recent decades from manufacturing to service industries. Some 42% of its workforce is employed in finance, banking, real estate, community, cultural, and social services. The city is Pakistan's largest software producing Centre and hosts a growing computer-assembly industry. Arfa Software Technology Park in Lahore is the biggest and most advanced IT park in the country.

6.4 QUALITY OF LIFE

6.4.1 Demographic Characteristics of the Project Area

- The current metro area population of Lahore in 2022 is 13,542,000, a 3.41% increase from 2021.
- The metro area population of Lahore in 2021 was 13,095,000, a 3.58% increase from 2020.
- The metro area population of Lahore in 2020 was 12,642,000, a 3.72% increase from 2019.
- The metro area population of Lahore in 2019 was 12,188,000, a 3.83% increase from 2018

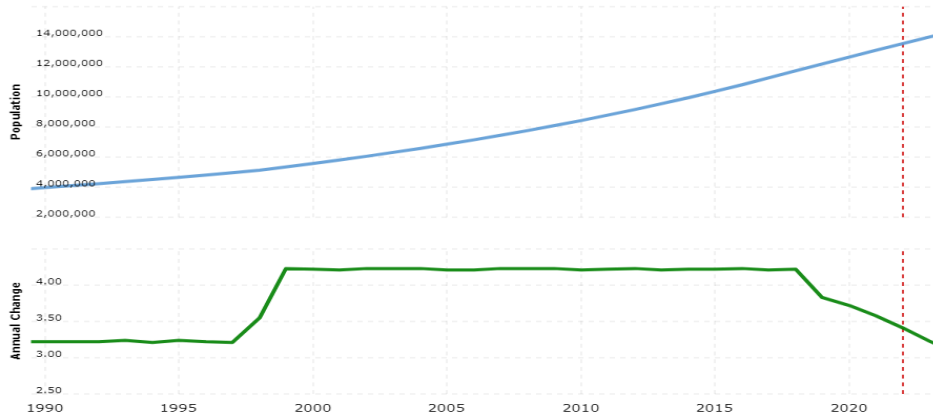


Figure 6-9 Graphical Representation of Intercensal Demographic Survey

Table 6-4 Intercensal Demographic Survey

Year	Population	Annual Change
1990	3970000	3.22
1991	4098000	3.22
1992	4230000	3.22
1993	4367000	3.24
1994	4507000	3.21
1995	4653000	3.24
1996	4803000	3.22
1997	4957000	3.21
1998	5133000	3.55
1999	5350000	4.23
2000	5576000	4.22
2001	5811000	4.21
2002	6057000	4.23
2003	6313000	4.23

Rehabilitation of Bund Road, Lahore

2004	6580000	4.23
2005	6857000	4.21
2006	7146000	4.21
2007	7448000	4.23
2008	7763000	4.23
2009	8091000	4.23
2010	8432000	4.21
2011	8788000	4.22
2012	9160000	4.23
2013	9546000	4.21
2014	9949000	4.22
2015	10369000	4.22
2016	10808000	4.23
2017	11263000	4.21
2018	11738000	4.22
2019	12188000	3.83
2020	12642000	3.72
2021	13095000	3.58
2022	13542000	3.41

6.4.2 Rural and Urban Distributions

The urban population was 5,209,088 or 82.4 percent of the total population of the Lahore district, which grew at an average rate of 3.3 percent during 1981-98. The growth decreased from 3.7 percent, which was observed during 1972-81. There are one Metropolitan Corporation, two Town Committees and one Cantonment in the District.

There were 261 Mauzas (the smallest revenue unit) in 1998. Of these 61 had a population over 5 thousand, another 61 had 2 to 5 thousand, 64 had one to two thousand, and 74 had under one thousand persons while one was uninhabited.

6.4.3 Religion

The population of the district is predominantly Muslims i.e. 93.9 percent. The next higher percentage is of Christians with 5.8 points followed by Ahmadis 0.2 percent. While other minorities like Hindu etc. are very small in number.

6.4.4 Ethnic Structure

The main castes and groups of the Lahore district are Arain, Jat, Rajput, Malik, Pathan, Mughal, Sheikh, Komboh and Gujjar. Besides, there are also village artisans, which include Lohars (blacksmiths), Tarkhan (carpenter), Kumhars (potters), Mochis (cobblers), Machhis (water-carrier), barbers and weavers etc.

6.4.5 Mother Tongue

The mother tongue refers to the language used for communication between parents and their children in any household. Punjabi is the predominant language being spoken by the majority (86.2 percent) of the population of the district followed by Urdu, Pushto, and Siraiki being spoken by 10.2, 1.9, and 0.4 percent. Sindhi is spoken by 0.1 percent.

6.4.6 Institutions

Lahore is the metropolitan city and a hub of various educational, academic and flourishing government institutes. In the vicinity of the project, there are many educational institutions like Government College University, University of Veterinary and Animal Sciences, University of the Punjab, College for Women University, Forman Christian Collage, National College of Arts, King Edward Medical University, Kinnaird College for women, Shadbagh Girls College and many more renowned institutions.



Figure 6-10: Educational Institutes in Lahore

6.4.7 Transportation

The city of Lahore is one of the most accessible cities of the Punjab Province. In addition to the historic Grand Trunk Road (G.T. Road), a motorway (M- 2) was completed in 1997 from Lahore to Islamabad. The government has built underpasses to ease congestion and prevent traffic jams, and according to official figures, Lahore transportation services have

improved to accommodate the growing number of visitors to the city. It is well connected by air to other countries as well as all major cities of Pakistan. Buses, trains, taxis, and rickshaws are the other means of transport available in Lahore.

6.4.8 Health Facilities

Ample medical and health facilities are available in the Lahore Metropolitan Corporation area and its suburbs. ShaukatKhanam Hospital is the latest addition to the medical care facilities in Lahore for the most dangerous disease in the country. i.e. Cancer. There are also other hospitals of voluntary organizations which provide health coverage to the general public. Among the prominent hospitals are General Hospital, Lady Willington Hospital, Mayo Hospital, Fatima Jinnah Hospital, The Children Hospital, Services Hospital, and Ganga Ram Hospital etc. Besides, a number of private medical practitioners, Hakims, and homeopathic doctors are also practicing in the city. Services Hospital is the nearest health care facility that is present in the vicinity of the project.



Figure 6-11: Hospitals in Lahore

6.4.9 Architecture Style

The most common places of interest in Lahore city are discussed as following;

a) Royal Fort Lahore

Royal Fort Lahore/Shahi Qila is located at an eminence in the north-west corner of the Walled City. The Citadel is spread over an area of 50 acres. Many visitors from the foreign and local tours of different educational institutions come to see this historical place every year. The front gate of the Fort is called the Alamgiri Gate of the Royal Fort.

b) Minar-e-Pakistan

About 59.5 meters tall monument, called Minar-e-Pakistan is situated near the Royal Fort in the spacious Iqbal Park (previously known as Minto Park), where the historical resolution for the creation of Pakistan was adopted on the 23rd March, 1940. Around



the minar, there are spacious parks with beautiful Cyprus trees and flowers all over.

c) Badshahi Mosque

The imperial or the Badshahi Mosque is across the courtyard from Alamgiri Gate of the Royal Fort. It has beautiful gateway and a courtyard that is said to be the largest mosque courtyard in the world for outdoor prayers.



d) Lahore Museum

Opposite the old Punjab University Hall, a Mughal style building on the Shahrah-e-Quaid-e-Azam, houses the Lahore Museum. The Museum contains some fine specimens of Mughal and Sikh doorways and wood work and has a big collection of paintings dating back to Indo-Pakistan, Mughal, Sikh and British times



It also has a collection of musical instruments, ancient jewelry, textile, pottery and armory. There are also relics from some Tibetan and Nepalese exhibits.

e) Shrine of Data Ganj Bakhsh

Close to the confluence of Lower mall and the Circular Road is the shrine of Data Sahib. Data Sahib was a great Sufi saint, which is well known work Kashf-ul-Mahjub has been translated from the original Persian version into Urdu and other several European languages and is considered a classic.



i) Shrine of Madhu Lal Hussain

This is the famous tomb in Lahore, where Mela Chiraghan is held on the last weekend of March and draws enormous crowds of devotees and others. The shrine is famous because of its antiquity and is revered by Muslims and Hindus alike.



Recreational/Entertainment Places

f) Shalimar Garden

About 5 kilometers east of Lahore is the famous, Shalimar Garden laid out by the Mughal Emperor Shah-Jehan in 1642 A.D.

The Garden is spread out in typical Mughal Style and surrounded by high walls with watched-towers at the four corners. It covers an area of about 42 acres. Many people from the entire city come to visit the park with their families at the weekend to spend their idle times.



j) Jallo Park

The Jallo Park is 28 kilometers from Lahore and located on the Lahore Branch Canal. Covering an area of 450 acres, it has expanses of lawns, a forest research centre, a children's park, zoo, small museum and gift shop inside.

7.0 ASSESSING IMPACTS

This chapter contains detailed environmental impact, its identification on the basis of timing, nature, duration, magnitude and significance.

7.1 IMPACTS ASSESSMENT

Environmental Impact Assessment (EIA) is a systematic and integrative process for considering possible impacts prior to a decision being taken on whether or not a proposal should be given approval to proceed. Table 7.1 below shows the impact classification criteria on the basis of its potential.

Table 7-1: Classifications of Impacts

IMPACT POTENTIAL	ABBREVIATION	IMPACT CRITERIA
Low Adverse	LA	Causing low environmental deterioration
Medium Adverse	MA	Causing ordinary environmental deterioration
High Adverse	HA	Causing extreme environmental deterioration
Not Applicable	NA	Not related to project activity
None or Insignificant	O	Causing no environmental deterioration
Low Beneficial	LB	Less positive environmental impacts
Medium Beneficial	MB	Ordinary positive environmental impacts
High Beneficial	HB	Extreme positive environmental impacts
Not Determinable	ND	Not present

Table 7-2 : Anticipated Impacts and their Magnitude of the Project

Environmental Components / Activities	Physical Environment											Biological Environment							Social Environment							
	Topography	Agricultural Lands	Soil (Erosion / Stability)	Cultural / Religious	Infrastructure	Mineral Resources	Land pollution	Surface water quality	Groundwater quality	Air quality	Noise	Aquatic Ecosystem	Wetland Ecosystem	Terrestrial Ecosystem	Habitat change	Animal Movement	Wildlife	Disease Vectors	Public Health / Safety	Land Use	Communication System	Employment	Community Stability	Benefit to Community	Traffic Management	
CONSTRUCTION PHASE																										
Construction camps, workshops etc.	O	O	LA	NA	LA	NA	LA	LA	LA	MA	MA	NA	NA	O	O	NA	NA	O	O	LA	LA	LB	O	LB	LB	
Transportation of construction materials	O	O	LA	NA	NA	NA	LA	NA	NA	LA	LA	NA	NA	O	O	O	NA	O	O	O	O	MB	LA	MB	LA	
Use of construction materials etc.	O	NA	LA	NA	O	NA	LA	LA	LA	LA	LA	NA	NA	O	O	O	NA	NA	LA	LA	LA	LB	LA	LB	LA	
Earthwork / concrete work operations	LA	NA	LA	NA	O	NA	LA	LA	LA	LA	LA	NA	NA	NA	O	NA	NA	NA	LA	LA	O	LB	LA	LB	LA	
Operation of concrete batching plants.	O	NA	LA	NA	O	NA	LA	LA	O	MA	MA	NA	NA	NA	O	O	NA	NA	LA	LA	O	LB	LA	LB	LA	

Environmental Components / Components Activities	Physical Environment											Biological Environment							Social Environment						
	Topography	Agricultural Lands	Soil (Erosion / Stability)	Cultural / Religious	Infrastructure	Mineral Resources	Land pollution	Surface water quality	Groundwater quality	Air quality	Noise	Aquatic Ecosystem	Wetland Ecosystem	Terrestrial Ecosystem	Habitat change	Animal Movement	Wildlife	Disease Vectors	Public Health / Safety	Land Use	Communication System	Employment	Community Stability	Benefit to Community	Traffic Management
Machinery and Equipment's work	O	NA	LA	NA	O	NA	LA	NA	NA	MA	MA	NA	NA	NA	NA	O	NA	LA	LA	LA	LA	LB	NA	LB	LA
Solid Waste	O	NA	LA	NA	O	NA	LA	LA	LA	LA	O	NA	NA	NA	NA	NA	NA	LA	LA	LA	O	LB	LB	O	O
Health and safety		NA	NA	NA	LA	NA	NA	O	O	NA	MB	NA	NA	NA	NA	MB	NA	HB	MB	O	MB	HB	MB	NA	
Material Storage	O	NA	LA	NA	O	NA	LA	LA	O	LA	O	NA	NA	NA	NA	O	NA	O	O	LA	NA	LB	NA	O	O
Movement of Traffic	O	NA	O	NA	O	NA	LA	LA	O	LA	LA	NA	NA	NA	NA	O	NA	O	O	LB	LB	MB	MB	HB	HB
Road Maintenance Works	O	NA	LA	NA	O	NA	LA	LA	LA	LA		NA	NA	NA	NA	O	NA	O	LA	LA	LA	MB	LA	LA	LA
Air Quality	O	NA	NA	NA	O	NA	NA	O	O	LB	O	NA	NA	NA	NA	O	NA	O	LB	LB	O	O	LB	LB	O

LA: Low Adverse
LB: Low Beneficial

MA: Medium Adverse
MB: Medium Beneficial

HA: High Adverse
HB: High Beneficial

NA: Not Applicable
ND: Not Determinable

O: None or Insignificant

7.2 MITIGATION ASSESSMENT

Mitigation refers to minimizing or avoiding the described impacts. Overall, mitigation measures are a response to the findings of impact assessment; they need to cover all the areas identified. The key focus of mitigation actions should be on:

- ❖ Preventive measures that avoid the occurrence of impacts and thus avoid harm or even produce positive outcomes.
- ❖ Measures that focus on limiting the severity and the duration of the impacts.
- ❖ Compensation mechanisms for those impacts that are unavoidable and cannot be reduced further.

7.3 PURPOSE OF MITIGATION AND IMPACT ASSESSMENT

The purpose of conducting an EIA is to clearly identify and understand (assess), and then prevent or minimize (mitigate) the adverse impacts of the planned project on the environment and people. Because the impacts of the project can change over time, the impacts need to be assessed and measured over the lifetime of the project – from its construction through to operations and after closing.

Impact assessment is indispensable in order to provide systematic and detailed descriptions of the probable impacts in comparison to the identified project alternatives. Mitigation measures are a critical part of the EIA process, as these actions aim to prevent adverse impacts from the planned project on the environment and people, ensuring that unavoidable impacts are maintained within acceptable levels

7.4 ENVIRONMENTAL MONITORING PLAN (EMP)

Environmental Monitoring is undertaken during project activities to ensure the effectiveness of the mitigation measures. In order to respond to the anticipated environmental concerns at an early stage and to determine the intensity of the impact, prediction is required. Specific monitoring programs are outlined below as well as responsibilities for the collection and analysis of data and the reporting requirements. Table given below is showing the environmental monitoring plan suggested for proposed project activity.

Table 7-3 : Environmental Monitoring Plan

ENVIRONMENTAL MONITORING PLAN (EMP)					
WHAT (Is the parameter to be observed)?	WHERE (Is the parameter to be monitored)?	HOW (Is the parameter to be monitored)?	WHEN (Is the parameter to be observed)?	WHY (Is the parameter being monitored)?	WHO (Is responsible for monitoring)?
CONSTRUCTION PHASE					
Ambient Air Monitoring	Underpass Construction Site	PM ₁₀ , SO _x as SO ₂ , NO _x as NO ₂ , CO	Quarterly	To meet the PEQSAA (Punjab Environmental Quality Standards for Ambient Air)	LDA through Approved Monitoring Agency
Ground & Drinking Water Quality	Underpass Construction Site	By analyzing pH, TDS, Chloride, Fluoride, Color, NO ₃ -, Selenium, Residual chlorine, Lead, Total hardness, Turbidity, Zinc, Manganese, Aluminum, Chromium, Cadmium, Boron, Barium, Antimony, Arsenic, Cyanide, Mercury, Nickel, Total Coliform, E.coli, Total count.	Quarterly	To meet the PEQS Drinking Water quality Guidelines	LDA through Approved Monitoring Agency
Noise Level	Underpass Construction Site	Using noise level meter (minimum dB and maximum dB)	Quarterly (During operation)	To meet the Noise Standards	LDA through Approved Monitoring Agency
Occupational health & safety	Underpass Construction Site	Proper provision of PPEs to workers	Daily	To avoid any risk to human health	HSE Officer
OPERATIONAL PHASE					

ENVIRONMENTAL MONITORING PLAN (EMP)					
WHAT (Is the parameter to be observed)?	WHERE (Is the parameter to be monitored)?	HOW (Is the parameter to be monitored)?	WHEN (Is the parameter to be observed)?	WHY (Is the parameter being monitored)?	WHO (Is responsible for monitoring)?
Ambient Air Monitoring	Underpass Construction Site	PM ₁₀ , SO _x as SO ₂ , NO _x as NO ₂ , CO	Quarterly (During operation)	To meet the PEQSAA (Punjab Environmental Quality Standards for Ambient Air) & WHO (World Health Organization)	LDA through Approved Monitoring Agency
Noise Level	Underpass Construction Site	Using noise level meter (minimum dB and maximum dB)	Quarterly (During operation)	To meet the Noise Standards	LDA through Approved Monitoring Agency
Water Quality	Underpass Construction Site	By analyzing pH, TDS, Chloride, Fluoride, Color, NO ₃ ⁻ , Selenium, Residual chlorine, Lead, Total hardness, Turbidity, Zinc, Manganese, Aluminum, Chromium, Cadmium, Boron, Barium, Antimony, Arsenic, Cyanide, Mercury, Nickel, Total Coliform, E.coli, Total count.	Quarterly (During operation) & End of summer before the onset of Monsoon every year.	To meet the PEQS Drinking Water quality Guidelines	LDA through Approved Monitoring Agency

8.0 SCREENING OF ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

8.1 GENERAL

The potential impacts of the proposed project on the area's geomorphology, surface and groundwater resources, air quality, biological resources, and socio-cultural environment have been discussed in the following sections. Where appropriate, mitigation measures have also been included to reduce the unacceptable impacts. Likely impacts that trigger the Environmental Management Plan (EMP), and accompanied mitigation measures have been identified in this EIA. The organizational structure and responsibilities of various functionaries towards EMP also have been highlighted, indicated generic environmental control measures that need to be applied during the possible implementation of EMP if and when required. The primary objectives are to:

Facilitate the implementation of the mitigation measures required by EPA.

- ❖ 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

Accordingly, mitigation measures have also been prepared to manage the environment and for sustainable development.

8.2 ENVIRONMENTAL PARAMETER INCLUDING LOCATION OF PROJECT

Environmental problems related to location of the project are mostly in the areas of physical setting, socioeconomic setting, ecological setting and special areas. The project involves rehabilitation of the existing road and construction of Underpass for the through traffic.

8.3 ENVIRONMENTAL PARAMETER REGARDING DESIGN

The design of project has sought to minimize any environmental potential impacts by ensuring that the project should be in according to the environmental standards. Local aesthetic value is another issue to be considered during project design.

8.4 IMPACT PHASES

This impact assessment and mitigating measures cover the entire cycle of the project activities, from pre-construction to construction, operation and maintenance. The coverage of each of project phases is defined as follows:

- ❖ Design Phase,
- ❖ Pre-construction Phase
- ❖ Construction Phase
- ❖ Operation Phase

8.5 TYPES OF IMPACTS

The types of impacts that may arise during Project works can be classified as follows:

Direct Impacts– i.e., those directly due to the Project itself such as the impacts to air quality resulting from construction activities, equipment and vehicles. Direct impacts also include the impact of construction expenditures in the local economy.

Indirect Impacts– i.e., those resulting from activities prompted by the Project, but not directly attributable to it. The use of rock and other construction materials, for example, has an indirect impact of increasing the demand for these materials.

Cumulative Impacts– i.e., impacts in conjunction with other activities. A single road improvement may not exert a significant environmental impact, but if some roads are developed in the same area developing a road network the cumulative or additive effect could be more significant.

Impacts in all three categories may be either:

Short-term– i.e., impacts which occur during construction and affect land use, air quality and other factors. Many of these impacts, however, will be short-term and without long lasting effects. Even the effects of some relatively significant impacts such as borrow pits, for example, may be eventually erased if appropriate mitigation actions are taken.

Many potential short-term negative impacts can be avoided or otherwise mitigated through proper engineering designs and by requiring Contractors to apply environmentally appropriate construction methods.

Long-term – i.e., construction impacts that could, for example, affect regional community health and safety if poor design practices are used.

Both short-term and long-term impacts may be either beneficial or adverse. Short term positive impacts will include, for example, the generation of employment opportunities during construction period. Long-term benefits will include enhanced development opportunities, improved transport services, easier access to commercial and service facilities; faster communications and commodity transport; improved access to markets and growth centers and increased services and commercial facilities.

8.6 POTENTIAL IMPACT SOURCES

Environment impacts are attributable to the project implementation and can broadly be classified into those taking place during construction and those occurring during operational phase. Some of these impacts can be anticipated and avoided through appropriate adjustments in the project design. Some can be mitigated by careful implementation of the project while other can be mitigate with by appropriately following the operational manual and an effective collaboration with local communities.

Construction related Impacts are heavily dependent on:

- ❖ The contractor's work practices, especially those related to storage of construction mater
- ❖ Project management's enforcement of correct construction practices and standards;

- ❖ An effective collaboration with local communities in evolving a workable Social framework.
- ❖ The quality of Monitoring and Reporting of EMP implementation

Operational impacts of the proposed project are associated with the movement of vehicular traffic on it and allied activities. These include air and noise pollution, safety hazards and other similar impacts.

For this Project, potential impacts are reviewed under construction and operational phases. The environment has been studied under the following sub-heads:

- ❖ Physical Environment
 - Land Resource
 - Water Resource
 - Air Quality
 - Noise Level
- ❖ Biological Environment
 - Flora
 - Fauna
 - Fish
 - Endangered Species
 - Cultural and Historical Sites
 - Socio-economic Environment

8.7 ENVIRONMENTAL IMPACTS AND THEIR MITIGATION MEASURES DURING CONSTRUCTION AND OPERATIONAL PHASE

Anticipated impacts during construction and operational phase is given in Table 8-1 and Table 8-2 similarly in details with discussion of suggested mitigation measures.

Table 8-1 : Anticipated Impacts and their Mitigation Measures during Construction Phase

ENVIRONMENT COMPONENT	ACTIVITIES AND POTENTIAL IMPACTS	MITIGATION MEASURES
TOPOGRAPHY	The main impact during the construction will be the clearing of ROW, cutting and filling of borrow pits including erosion of topsoil cover.	❖ To minimize erosion and avoid creating hazards for people Ditches or borrow pits that cannot be fully rehabilitated will be landscaped ❖ Land for temporary facilities like construction camp, storage areas etc. shall be brought back to its original land use. ❖ No waste dumping should take place in borrow areas ❖ Slope protection by providing frames, dry stone pitching, masonry retaining walls, planting of grass and trees. ❖ Side slopes of all cut and fill areas will be graded and covered with stone pitching, grass and shrub as per design specifications. ❖ Care should be taken that the slope gradient shall not be greater than 2:1. ❖ To avoid soil erosion the earth stock piles will be provided with gentle slopes.
		This impact is temporary and Moderate adverse in nature
SOIL	Soil erosion due to Construction activities, earthwork, and cut and fill, stock piles etc.	❖ 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 of as desired and the site will be restored back to its original conditions before handing over. ❖ Store and reuse topsoil. This requires that topsoil will be separated from subsoil during the initial excavation. The more fertile topsoil can later be deposited on the slopes to form a superficial layer conducive to seedling establishment.

ENVIRONMENT COMPONENT	ACTIVITIES AND POTENTIAL IMPACTS	MITIGATION MEASURES
		❖ Replanting cleared areas and slopes is the most effective action to be taken in reducing erosion and stability problems, It will be undertaken as early as possible in the construction process, before erosion becomes too advanced.
	Compaction of soil and impact on quarry haul roads due to movement of vehicles and equipment.	❖ Construction vehicles, machinery, and equipment to be stationed in the designated ROW to avoid compaction. ❖ Approach roads / haulage roads shall be designed along the barren and hard soil area to reduce the compaction. ❖ Transportation of quarry material to the dumping site through heavy vehicles shall be done through existing major roads to the extent possible to restrict wear and tear to the roads.
	Contamination of soil due to leakage / spillage of oil, bituminous and non-bituminous debris generated from demolition and road construction	❖ Construction vehicles and equipment will be maintained and refueled in such a fashion that oil / diesel spillage does not contaminate the soil. ❖ Fuel storage and refueling sites to be kept away from drainage channels. ❖ Unusable debris shall be dumped in ditches and low lying areas. ❖ To avoid soil contamination Oil Interceptors shall be provided at wash down and refueling areas. ❖ Waste oil and oil soaked cotton / cloth shall be stored in containers labeled. ❖ Non-bituminous wastes to be dumped in borrow pits with the concurrence of landowner and covered with a layer of topsoil conserved from opening the pit. ❖ Bituminous wastes will be disposed off in an identified approved dumping site.
This impact is temporary and moderate adverse in nature.		
AIR QUALITY	Dust Generation due to construction activities and transport, storage and	❖ Unloading of loose and fine materials through covered vehicles. ❖ Paved approach roads. ❖ Storage areas to be located downwind of the habitation area.

ENVIRONMENT COMPONENT	ACTIVITIES AND POTENTIAL IMPACTS	MITIGATION MEASURES
	handling of construction materials	❖ Water spraying on earthworks, unpaved haulage roads and other dust prone areas. ❖ Provision of PPEs to workers. ❖ Storage of construction materials to be carried out in accordance with the construction material storage and handling plan. ❖ Storage areas shall be at least 500m from communities.
	Emission of air pollutants (PM ₁₀ , PM _{2.5} , HC, SO ₂ , NO _x , CO etc.) from vehicles due to traffic congestion and use of equipment and machinery	❖ Regular maintenance of machinery and equipment. ❖ Batching, asphalt mixing plants and crushers at downwind (1km) direction from the nearest settlement. ❖ Regular Ambient air quality monitoring will be conduct. ❖ Construction traffic management plan (CTMP) will be followed. (Mention in details: Potential Environmental Enhancement Measures.)
	The overall impact on the quality of air during the construction phase will, however, be limited to the project's construction phase only	
NOISE	Noise from construction activities and operation of equipment and heavy machinery i.e. ❖ bulldozers, ❖ excavators, ❖ stabilizers, ❖ concrete mixing plant, ❖ pneumatic drills,	❖ All equipment to be timely serviced and properly maintained ❖ Construction equipment and machinery to be fitted with silencers and maintained properly. ❖ Confining noisy work to normal working hours in the day, wherever possible. ❖ Providing the construction workers with suitable hearing protection like ear cap, or earmuffs and training them in its use. ❖ Restricting construction vehicle movements during nighttime. ❖ Contractors shall comply with submitted work schedule, keeping noisy operations away from sensitive points; implement regular maintenance and repairs; and employ strict implementation of operation procedure.

ENVIRONMENT COMPONENT	ACTIVITIES AND POTENTIAL IMPACTS	MITIGATION MEASURES
	❖ stone crushers asphalt plants and other equipment's	
	This impact is temporary and minor adverse in nature.	
CONSTRUCTION CAMP	Due to the proposed camp sites, loss of vegetation and dissatisfaction of rehabilitation measures during and after completion of construction phase may occur.	❖ Camp site to be selected after careful reconnaissance so as to minimize the social and physical disruption to local communities and road users. ❖ Setting up of a complaint office for public complaints registration and advertisement of the grievance redress mechanism ❖ The contractor shall provide plan for removal & rehabilitation of site upon completion. ❖ 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 measure.
This impact is temporary and moderate adverse in nature.		
BORROW PIT	Borrow areas / open pits and its excavation activities may result in: ❖ land disputes, ❖ soil erosion, ❖ loss of potential cropland, ❖ loss of vegetation, ❖ landscape degradation, and damage to road embankments	❖ Non-productive, barren lands, upland shall be used for borrowing earth with the necessary permissions / consents. ❖ Depths of borrow pits to be regulated and sides not steeper than 25%. ❖ Topsoil to be stockpiled and protected for use at the rehabilitation stage ❖ 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. ❖ In case borrow pits fill with water, measures have to be taken to prevent the creation of mosquito-breeding sites.

ENVIRONMENT COMPONENT	ACTIVITIES AND POTENTIAL IMPACTS	MITIGATION MEASURES
		❖ A pit shall have a barrier controlling access and such barriers shall be clearly visible to prevent safety hazards to the public. ❖ The use of cable, chain or similar barrier will prohibit. ❖ The control barrier shall deny access when the pit is not in operation;
	This impact is permanent and moderate adverse in nature.	
WATER	Sourcing of water during Construction	❖ Arrangements shall be made by contractor that the water availability and supply to nearby communities remain unaffected. ❖ Water intensive activities not to be undertaken. ❖ Provision of water harvesting structure to augment groundwater condition in the area.
	Disposal of water during construction	❖ Provisions shall be made to connect roadside drains with existing nearby natural drains.
	Alteration in surface water hydrology	❖ Existing drainage system to be maintained and further enhanced. ❖ Provision shall be made for adequate size and number of cross drainage structures particularly in the areas where land is sloping towards road alignment.
	Siltation in water bodies due to construction activities / earthwork	❖ Embankment slopes to be modified suitably to restrict the soil debris entering water bodies. ❖ Provision of Silt fencing shall be made at water bodies. ❖ Silt / sediment will be collected and stockpiled for possible reuse as surfacing of slopes where they have to be vegetated. ❖ Earthworks and stone works to be prevented from impeding natural flow of rivers, streams and water canals or existing drainage system.
	Deterioration in Surface water quality due to:	❖ No vehicles or equipment should be parked or refueled near water-bodies, so as to avoid contamination from fuel and lubricants.

ENVIRONMENT COMPONENT	ACTIVITIES AND POTENTIAL IMPACTS	MITIGATION MEASURES
	❖ leakage from vehicles ❖ leakage from equipment ❖ Waste from construction camps.	❖ All chemicals and oil shall be stored away from water and concreted platform with catchment pit for spills collection. ❖ All equipment operators, drivers, and warehouse personnel will be trained in immediate response for spill containment and eventual clean-up. Readily available, simple to understand and preferably written in the local language emergency response procedure, including reporting, will be provided by the contractors. ❖ Construction camp to be sited away from water bodies. ❖ Wastes must be collected, stored and taken to approve disposal site only. ❖ Water quality shall be monitored.
This impact is temporary and moderate adverse in nature.		
CONSTRUCTION WASTE & DEBRIS	Selection of Dumping Sites	❖ Dumping sites will be selected away from residential areas and water bodies ❖ Dumping sites must be having adequate capacity equal to the amount of debris generated. ❖ Minimize the production of waste materials by 3R (Reduce, Recycle and Reuse) approach. ❖ Burning of solid waste will be prohibited. ❖ All personnel will Train and instruct in waste management practices and procedures as a component of the environmental induction process
	Reuse and disposal of construction and dismantled waste	❖ All excavated materials from roadway, shoulders, verges, drains, cross drainage will be used for backfilling embankments, filling pits, and landscaping. ❖ Unusable and non-bituminous debris materials will be suitably disposed off at pre-designated disposal locations, with approval of the concerned authority. ❖ The bituminous wastes shall be disposed in secure landfill sites only in environmentally accepted manner.

ENVIRONMENT COMPONENT	ACTIVITIES AND POTENTIAL IMPACTS	MITIGATION MEASURES
		❖ Unusable and surplus materials, as determined by the Project Engineer, will be removed and disposed off-site.
This impact is temporary and moderate adverse in nature.		
HEALTH & SAFETY OF WORKERS	Safety of Workers and accident risk from construction activities	❖ Safe work practices will be followed and applied by the contractor. ❖ At construction site fluorescent and retro refractory signage will be used. ❖ Training to workers on safety procedures and precautions. ❖ All regulations regarding safe scaffolding, ladders, working platforms, gangway, stairwells, excavations, trenches and safe means of entry and egress shall be complied with. ❖ Provision of PPEs to workers. ❖ Provision of a readily available first aid unit including an adequate supply of dressing materials.
This impact is temporary and minor adverse in nature		
SOCIAL ISSUES	Approach / hindrance problems for the local residents / business owners and movement of the people will be disturbed during construction activities.	❖ Maintaining regular communication with local communities and other stakeholders to minimize tensions arising from Project activities. ❖ Maintaining a grievance procedure to facilitate stakeholders in expressing concerns. ❖ Timely completion of the construction work and provision of alternate routes for the areas where the construction is being carried out.
	This impact is temporary and minor adverse in nature	
CONSERVATION OF RESOURCES AND	Construction will pose burden on the existing natural resources	❖ One strategy for conserving aggregate resources and reducing the demand for virgin aggregate is to recycle and reuse materials in road construction;

ENVIRONMENT COMPONENT	ACTIVITIES AND POTENTIAL IMPACTS	MITIGATION MEASURES
ENVIRONMENTAL SUSTAINABILITY		❖ Reuse of materials, such as concrete and asphalt, reduces the need for concrete and asphalt manufacturing, reduce greenhouse gas (GHG) emissions, and reduces waste disposal costs and emissions; ❖ Use of solar panels and LED lights in the construction camps instead of using diesel operated generators and normal bulbs. ❖ Waste minimization strategies will be developed and followed. ❖ To reduce the level of energy consumption, warm-mix asphalt (WMA) will be used to replace hot-mix asphalt (HMA). Besides the fact that WMA is produced at a lower temperature, it also induces great benefits such as an improvement of working conditions (less exposure to heat and fumes) and asphalt compaction, reduction of paving cost and longer hauling.
This will be a permanent negative impact.		
SITE RESTORATION AND REHABILITATION	Clean-up Operations, Restoration and Rehabilitation	❖ Contractor will prepare site restoration plans, which will be approved by the 'Engineer'. ❖ The clean-up and restoration operations are to be implemented by the contractor prior to demobilization ❖ All construction zones including culverts, road-side areas, camps, hot mix plant sites, crushers, batching plant sites and any other area used / affected by the project will be left clean and tidy, to the satisfaction of the Environmental officer. ❖ All the opened borrow areas will be rehabilitated and 'Engineer' will certify.
		This will be a permanent negative impact.

Table 8-2 : Anticipated Impacts and Their Mitigation Measures during Operational Phase

ENVIRONMENT COMPONENT	ACTIVITIES AND POTENTIAL IMPACTS	MITIGATION MEASURES
AIR QUALITY	Air quality will improve due to smooth flow of traffic	During operational stage, the overall air quality will improve due to smooth flow of Traffic, however following mitigation measures are recommended to be adopted for minimum deterioration of air quality: ❖ Vehicles with excessive smoke emissions shall not be allowed to enter the project area ❖ Permissible limits of air pollution (as specified in the guidelines) will be monitored on regular basis and any deviation shall be taken care of; ❖ Signs for sensitive zones to disallow the use of pressure horns. ❖ To improve air quality roadside tree plantation will be done.
This impact is permanent and minor adverse in nature.		
NOISE	Noise level will decrease because of smooth traffic flow	To avoid any noise pollution following mitigation measures should be taken into account: ❖ Ban on use of pressure horns; ❖ Proper implementation of inspection and maintenance program for vehicles. ❖ Strict check on use of proper silencers especially for motorcycles.
This impact is permanent and minor adverse in nature.		
LAND AND SOIL	Soil erosion at embankment during heavy rainfall	❖ Periodic checking to be carried to assess the effectiveness of the stabilization measure ❖ Necessary measures to be followed wherever there are failures.
	This impact is temporary and minor adverse in nature.	

ENVIRONMENT COMPONENT	ACTIVITIES AND POTENTIAL IMPACTS	MITIGATION MEASURES
WATER	No major adverse impact on surface and groundwater, however Water logging may be caused due to blockage of drains	❖ Regular visual checks and cleaning of drains shall be done along the alignment to ensure that flow of water is maintained through cross drains and other channels. ❖ To avoid exception of some occasional oil spills due to any road accident emergency plan will be followed.
This impact is temporary and minor adverse in nature.		
MAINTENANCE OF RIGHT OF WAY & SAFETY	Accident risks associated with traffic movement	❖ All safety features provided in the main approach roads such as guide rails, speed bumps, will be maintained and kept in good condition. ❖ Traffic control measures, including speed limits, will be forced strictly. ❖ Further encroachment of squatters within the ROW will be prevented. ❖ Monitor / ensure that all safety provisions included in design and construction phase are properly maintained.
This impact is temporary and minor adverse in nature.		
ROAD MAINTENANCE WORK	Lack of maintenance during operational phase can cause harm	❖ Implementation of HSE Plans during the maintenance period. ❖ Strict implementation of PPEs. ❖ Use of high quality equipment and material by the contractor ❖ Continuous improvements in the emergency plans. ❖ Placement of sign boards for traffic diversions and proper implementation of traffic diversion plans. ❖ Selection of suitable sites for contractor camps and implementation of all the related important protocols for the management of camp activities in order to avoid environmental and HSE issues.

ENVIRONMENT COMPONENT	ACTIVITIES AND POTENTIAL IMPACTS	MITIGATION MEASURES
		❖ Conservation practices that limit particulate matter emissions will be incorporated into long-term maintenance plans.
This impact is temporary and minor adverse in nature.		

8.8 POTENTIAL ENVIRONMENTAL ENHANCEMENT MEASURES

Following potential environmental enhancement measures will be taken to protect the environment of the project area, workers and road users.

8.8.1 Construction Traffic Management Plan (CTMP)

An appropriate systematic traffic management system is essential for safety and smooth traffic flows on roads, making a maximum usage of road facilities to enlarge the current road capacities.

- (a) To achieve smooth traffic flow
- (b) To reduce traffic accidents, and
- (c) To create pedestrian –friendly facilities

This TMP addresses the following Key Issues:

- ❖ Safety and amenity of road users and the public;
- ❖ Site security, site access and signage;
- ❖ Project identification, including advertising and site signage;
- ❖ Traffic and road user delay and inconvenience management;
- ❖ Speed limit signage;
- ❖ Traffic transfer (switch) arrangements and procedures;
- ❖ Maintenance during Construction;
- ❖ Traffic and Safety Management Responsibilities;
- ❖ Construction staging including detailing the intersection layout and capacities for each and every construction stage;
- ❖ Emergency and Incident Response Plans

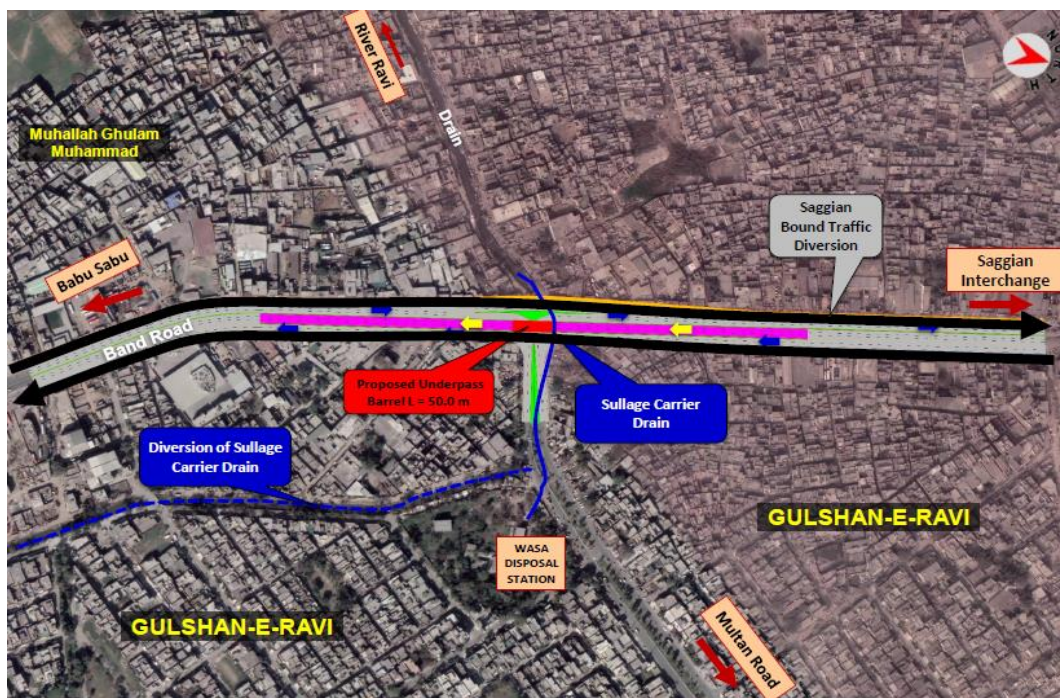


Figure 8-1 Availability of Traffic Diversion

Table 8-3 below shows the risks to be dealt with during the design and construction stage of the Project that may affect safety.

Table 8-3: Construction Traffic Management Plan

RISKS	POTENTIAL CONSEQUENCES	PROPOSED RISK TREATMENT
Construction methods may cause disruption to traffic	Traffic delays causing frustration to drivers	❖ Consider methods of construction at an early stage during the design to reflect community needs and reduce delay times therefore minimizing the impact on traffic
Traffic management– inadequate anticipation and communication of issues	Potential community issues causing dissatisfaction and frustration	❖ Determine traffic routes and engage with community to refine details. ❖ Confirm pre–existing conditions. ❖ Consider the need for night assessment. ❖ Identify any short–term corrective actions.
Severe delays to traffic perceived by the community as a direct result of the construction activities.	Community dissatisfaction, claims for time delays.	❖ Establish good public relations from the outset. ❖ Erect Early Warning information signs through Variable Message Signs (VMS). ❖ Early engagement of ascertain needs and potential effects of changed access.
Major Traffic Incident.	Local traffic disrupted upsetting locals	❖ Regular checking of Traffic Management Plan implementation. ❖ Have procedures in place for rapid recovery, Keep locals informed.
Access to site for deliveries	Traffic disruption or interference	❖ Development of this Plan in conjunction with Community Communication Strategy – access points will be high risk locations and will need detailed consideration.

RISKS	POTENTIAL CONSEQUENCES	PROPOSED RISK TREATMENT
		❖ Simplification of traffic staging will simplify access arrangements or minimize impacts ❖ Signage and pre-delivery notifications for delivery routes to be clear and simple as per the VMP
Traffic Speed	Works in multiple areas across the Project may result in intermittent speed changes that may frustrate road users	❖ Traffic to generally be reduced to 80kph speeds within construction zone. Construction zone to be full length of the Project
Pedestrian access	Potential disruption to progress causing pedestrians to not comply with pedestrian provisions	❖ Liaise closely with the relevant bodies from an early stage to ensure pedestrian access provisions are adequately addressed, well established and maintained
Lowering speeds, when it is perceived unnecessary	Poor public opinion and safety for workers if motorists start ignoring limits	❖ Appropriate design of traffic protection measures, intersections, alignments etc. to allow consistent speed limits, i.e., 80km / h where-ever possible.
Too many changed configurations	Unfamiliarity causing potential confusion of road users that may cause traffic incidents	❖ Keep motorists on existing alignment for as long as possible. Effective use of TMP for advanced notification and clear direction during any traffic flow adjustments

RISKS	POTENTIAL CONSEQUENCES	PROPOSED RISK TREATMENT
Inadequate provisions for break-downs during construction	Traffic delay	❖ Design temporary break down bays. Consider temporary verges where possible during design of traffic staging
Dangerous entry and exits to sites and properties	Traffic Incident	❖ Ensure that entries and exits are designed to cater for expected traffic volumes and with respect to sight distances, acceleration and deceleration provision and clear advanced warning signage
Seasonal traffic variations not allowed	High volumes during holidays and weekends	❖ Consider seasonal volumes in programming works. Keep TMP informed and up to date. Be aware of reporting and notification requirements
Reduced allowable movements	Traffic delay, confusion to commuters that may lead to an incident	❖ Implement effective community engagement strategies that will consider businesses, property owner's requirements
Damage to local roads due to heavy vehicle movements	Vehicle damage and potential incidents.	❖ Allow for heavy vehicle movements in traffic staging and planning ensuring existing, temporary alignment and pavements are suitable during the construction period.

8.8.2 Labor Camps

Although a majority of the labor force will come from local sources, they will get picked up and dropped by contractor transport. Some unskilled, most semiskilled and skilled workers may have to be brought in by contractor from far off towns who will live in camps. Being located near the work base, the camps will make the work access easy to the camp dwellers. Like camp, the work base can also be 500 m away from the nearest habitation, water resources and sensitive receptors

8.8.3 Machinery Maintenance and Equipment Yards

Near the work base a machinery and equipment yard will be provided. The yard will have enough storage and haulage space with ample moving and working space. The yard will be walled and will have a gate provided with ample security staff.

8.8.4 Material Depots

Near the work base a material depot will be required for storing construction material. It will have temporary sheds for storing cement, steel and asphalt and open space for storing stones, shingles and bricks. The material depots will be walled and gate will be provided with ample security. A store keeper will keep account of incoming and outgoing material.

8.8.5 Machinery Repair Workshops& Asphalt Plant

With a large number of vehicles and other similar machinery a repair workshop is essential. The contractor may establish his own workshop. The asphalt plant shall be at least one kilometer away from the any population dwellings, water resources and sensitive receptors.

8.8.6 Healthcare

With a large number of labor and employees working in the project of underpass construction, small accidents are expected to take place on all construction sites. A dispensary will be set by the contractor. For major cases the patients will be shifted to the District Hospital under a pre-coordinated arrangement.

8.8.7 Work Uniform and Health Safety Equipment

Road construction is a special job and the labor working on such work requires special protective uniforms and special HSE measures. It will be ensured that the labor engaged in breaking of stones, handling bricks, mixing concrete or mixing and laying asphalt will have long boots, overall dresses, goggles, gloves, ear mufflers, Safety Jackets, safety hats etc. As an overall HSE measure all construction workers and anyone going into the construction area will use necessary PPEs.

8.8.8 Signage

During construction suitable signboards and traffic signs will be displayed on construction site in particular and on the entire road length in general. This will help in forestalling any possible accidents.



Figure 8-2: Road Safety Signs

8.8.9 Lighting and Illumination

Suitable lighting arrangement will be made by the contractor over all work base, work sites, camp site, machinery yard and material depots. This can help the contractor for extended working hours as well as security. If local electric supply is not available, electricity generators will have to be arranged on all spots where lighting is required.

8.8.10 Environmental Training

Capacity building can be achieved through on-the-job training, short-courses, training workshops, lectures, educational visits and seminars. Such interactions include leading team members of LDA, EPA, consultants, construction managers / supervisors and other related agencies on road related environmental issues.

8.8.11 Awareness Raising

Awareness about roads related current and potential environmental threats for the public at large and roadside dwellers, in particular, requires due attention; the aspect neglected in the past. Enhanced education in road related environmental issues and awareness raising can be achieved through campaigns by; Visual graphics, Print media, Seminars & workshops.

9.0 ENVIRONMENT MANAGEMENT & MONITORING PLAN

9.1 ENVIRONMENTAL MANAGEMENT AND MONITORING PROGRAM

This section provides brief description of environmental issues, mitigation measures to eliminate and / or reduce environmental and social impacts to an acceptable level, institutional arrangement for the implementation of the mitigation measures and also carrying out environmental monitoring for air quality, water quality and noise pollution related parameter.

9.2 ENVIRONMENTAL MANAGEMENT PLAN

This EMP describes the mitigation and management measures to address the environmental issues during construction, its regular operation.

9.3 OBJECTIVES OF ENVIRONMENTAL MANAGEMENT PLAN

9.3.1 General Objectives

The objectives of the EMP are as follow:

- ❖ Identify and assess environmental status and trend continuously;
- ❖ Act as an early warning system, by identifying any sudden environmental deterioration that needs to be countered.
- ❖ Afford effective environmental surveillance and to provide reliable information upon which continued environmental management of the project can be updated and refined.
- ❖ To outline functions and responsibilities of responsible persons.
- ❖ To state standards and guidelines, which are required to be achieved in term of environmental legislation.
- ❖ To outline mitigation measures and environmental specifications which are required to be implementation for all phase of the project in order to minimize the extant of environmental impacts and to manage environmental impact associated with the proposed project.
- ❖ To prevent long term or permanent environmental degradation
- ❖ To identify training requirement at various levels.

9.3.2 Objectives during Pre–Construction and Construction Stages

These are to:

- ❖ Monitor actual impacts on physical, biological and socio–economic & human resources.
- ❖ Provide early warning to the project management whether intensity of an impact is severer than the one predicted.
- ❖ Suggest mitigation measures for the impacts which had not been anticipated in the EIA.
- ❖ Suggest mitigation measures for the impacts whose intensity is severer than those predicted during the EIA.
- ❖ Furnish feedbacks for correction of any deficiencies / improper situations.

- ❖ Ensure compliance with the administrative and legal framework.
- ❖ Ensure fulfillment of the obligations required under National Environmental Quality Standards (NEQS).
- ❖ Restore / rehabilitate construction camps and workshop sites.
- ❖ Ensure proper disposal of excavated soil and excess construction materials.
- ❖ Monitor rehabilitation of the borrow areas / pits.
- ❖ Ensure specified construction of project infrastructure.
- ❖ Monitor a-forestation along roads.

9.3.3 Objectives during Operation and Maintenance (O&M) Stage

These are to:

- ❖ Monitor effectiveness of mitigation measures.
- ❖ Evaluate effectiveness of the EIA in the backdrop of projected levels of impacts.
- ❖ Suggest modifications / improvements in construction procedures.
- ❖ Determine survival rate of tree plantation along the roads.

9.4 INSTITUTIONAL CAPACITY

Project Proponent, (LDA) will be responsible for Monitoring and Evaluation, but Environment consultant (of the proponent) will responsible to monitor EMP implementation in the field and reporting to the Project Proponent. The Project Proponent will integrate monitoring reports in the main monthly reports of the project. District Office of the EPA (Lahore) at the project area will monitor the overall activity at the site.

9.5 ORGANIZATIONAL STRUCTURE: ROLES & RESPONSIBILITIES

9.5.1 Primary Responsibilities

Project Manager of proposed project will be responsible on the LDA behalf to carry the primary responsibilities and local legislations in overall duration of project.

9.5.2 Operation Management & Control

Conducting the development activities in an environmentally sound manner will be the responsibility of the Project Manager.

9.6 PERFORMANCE INDICATORS

Following are the performance indicators:

- ❖ Decreased Vehicle Operating Costs.
- ❖ Control of air and noise pollution.
- ❖ Improved flow of traffic.
- ❖ Alleviation of poverty.

9.7 COMMUNITY AND WORKER HEALTH & SAFETY

The objective of environmental health and safety is to provide workers with safe and healthy working conditions and prevent accidents, injuries, and disease. It also covers the establishment of preventive and emergency preparedness and response measures to avoid,

and where avoidance is not possible, to minimize, adverse impacts and risks to the health and safety of local communities. It is therefore a combination of occupational health and safety of staff / workers at the subcomponent facilities and community health and safety of people living nearby or potentially affected by failures or poor operation of facilities.

Safety risks are mainly related to the construction phase. Residents, particularly children, are at risk during project construction. In linear construction activities such as road construction and pipe network construction which typically occur in areas frequented by the public, physical and educational measures to protect residents from risks are needed.

Safety measures for construction staff and public will include the following responsibilities of the Contractor:

- (i) Providing safe and convenient passages for the public;
- (ii) Providing construction workers sufficient personal protection equipment such as hard hats, earpiece, safety shoes, and others;
- (iii) providing seminars on safety issues to local public, particularly school students;
- (iv) Installing warning signs where potential dangers are present;

Ensuring construction staff are on duty on or near heavy movement of construction vehicles, or heavy construction vehicle traffic through the villages to ensure safety; and Setting up traffic signs at and near construction sites. Health risks are primarily related to increased transit population during construction (construction workers) and operation (visitors) in the regions. The increased mobile population could potentially bring and spread infectious diseases in the Project area. Workers could spread diseases such as hepatitis to local residents as well as among themselves. Measures for protecting community health include:

- (i) Providing disease prevention and control training to construction workers, particular epidemic diseases such as hepatitis B prior to the start of construction. Leaflets, education seminars will be organized, in association with the local government and communities, to increase the awareness and knowledge;
- (ii) Providing posters in and around the construction sites for disease control, for not only construction workers but also villagers and others in the areas;
- (iii) Providing periodical health checks to construction workers to ensure their health and wellbeing.

9.8 INSTITUTIONAL MONITORING ARRANGEMENTS

9.8.1 Establishment of Environmental Monitoring Cell

The monitoring and evaluation will be carried out during construction and operation of the Project. There is thus a need of establishing a well-structured Environmental Monitoring Cell (EMC) for the Project. Keeping in mind the financial constraints, the EMC personnel will be taken from the existing establishment.

9.8.2 Training of Monitoring Team

For capacity building of LDA staff, there is a dire necessity of environmental training, where a general training vacuum has been felt at all levels. Without appropriate trainings there are apprehensions that EMP cannot be implemented in letter and spirit. The following training activities have been proposed for wider dissemination of benefits to larger number of stakeholders:

Following three different types of training workshops are proposed, each having its own function, level of participants and a particular segment of stakeholders, including their sensitization in environmental affairs of roads.

- (a) Advanced Environmental Training Workshops
- (b) Environmental Mitigation & Monitoring Workshops
- (c) Community Consultative Workshops.

9.9 ENVIRONMENTAL MANAGEMENT PLAN DURING CONSTRUCTION AND OPERATIONAL PHASE

Table 9-1 shows the planned Environmental Management Plan (EMP) for the project Rehabilitation of Bund Road from Babu Sabu Interchange to Ring Road and construction of Underpass at Gulshan-E -Ravi T Junction, District Lahore during construction and operational phase respectively. This EMP shows the goal of each effect that why we are moderating the undertaking predicting impacts. The individual responsible to actualize and screen the EMP is also discussed in the Table 9-1 and Table 9-2 below. Details of anticipated impact mitigation are discussed in Chapter No: 8 of this EIA Report titled Screening of Environmental Impacts & Mitigation Measures.

Table 9-1 : Environmental Management Plan during Construction Phase

Impact	Objectives	Mitigation	Responsibility	
			Implementation	Monitoring
Topography	To ensure minimum changes in topography of the project area.	❖ Project design should consider aesthetic concerns.	Construction Contractor	Project Manager Construction Contractor
Air Quality	Ensure that the pollution level does not exceed the limit	❖ Regular monitoring of vehicular emissions ❖ All vehicles, machinery, equipment and generators used during construction activities shall 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 will be strictly banned. ❖ To avoid dust from construction activity Storage of construction materials to be carried out in accordance with the construction material storage and handling plan and storage areas shall be no less than 500m from communities.	Construction Contractor	Project Manager Construction Contractor Approved Monitoring Authority
Land Acquisition	To minimize land acquisition.	❖ Careful alignment selection by the designer to minimize the impact.	Land Acquisition	To minimize land acquisition.
Noise	To minimize noise level	❖ 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.	Construction Contractor	Project Manager Construction Contractor

Impact	Objectives	Mitigation	Responsibility	
			Implementation	Monitoring
		❖ Confine excessively noisy work to normal working hours in the day, as far as possible. ❖ During construction suitable hearing protection like ear cap or earmuffs will provide to workers. ❖ Preferably, restrict construction vehicles movement during nighttime ❖ Contractors shall comply with submitted work schedule, keeping noisy operations away from sensitive points; implement regular maintenance and repairs; and employ strict implementation of operation procedures;		Approved Monitoring Authority
Construction Camps	To minimize loss of assets and vegetation / trees due to construction of construction camps.	❖ The contractor shall provide plan for removal & rehabilitation of site upon completion; ❖ 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 ambient noise environment.	Construction Contractor	Project Manager Construction Contractor

Impact	Objectives	Mitigation	Responsibility	
			Implementation	Monitoring
		❖ Do not leave equipment idling unnecessary;		
Ecology	To avoid / minimize tree cutting.	❖ Incorporate technical design measures to minimize removal of trees, if possible such as change in alignment. ❖ Disallow introduction of exotic species with known environmental setbacks.	Construction Contractor	Project Manager Construction Contractor
Social Disturbance	To minimize the entry / exit problems of the locals in the Project Area.	❖ Inform residents of the area about detail of work, likely disturbances, and their duration and to whom they should address their complaints. ❖ Establishing good community relationship so that any disruption can be resolved with due consideration of community ❖ Mitigation measures should include provision of pedestrian overhead bridges in the design to minimize the impact.	Construction Contractor	Project Manager Construction Contractor
Public Utilities	To avoid disturbance to the public.	❖ Incorporate technical design features to minimize effect on public utilities. ❖ All public utilities will need to be relocated well before the commencement of construction work.	Construction Contractor	Project Manager Construction Contractor
Water Resources	To avoid / minimize the contamination of surface and ground water bodies.	❖ Provision of septic tanks in the design to treat the wastewater;	Construction Contractor	Project Manager Construction Contractor

Impact	Objectives	Mitigation	Responsibility	
			Implementation	Monitoring
				Approved monitoring agency
Health and safety of workers	To minimize health risks	❖ Provide basic medical training to specified work staff and basic medical service and supplies to workers; ❖ Work safety measures and good workmanship practices are to be followed by the contractor to ensure no health risks for laborers; ❖ Protection devices (ear muffs) shall 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 laborers 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, off work sites;	Construction Contractor HSE Officer	Project Manager Construction Contractor HSE Officer

Impact	Objectives	Mitigation	Responsibility	
			Implementation	Monitoring
		❖ Adequate signage, lightning devices, barriers, yellow tape and persons with flags during construction to manage traffic on Road.		
Borrow Areas	To avoid land disputes and to minimize soil erosion	❖ No excavations are allowed within distance of 500 m to RoW; ❖ 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 bor row pits fill with water, measures have to be taken to prevent the creation of mosquito–breeding sites.	Construction Contractor	Project Manager Construction Contractor
Impacts of Heavy Vehicles	The working of heavy vehicles on the existing road network may result in air pollution	❖ Materials having potential to produce dust shall not be loaded to a level higher than the side and tail boards and shall be covered with clean tarpaulin in good condition. ❖ Noise mufflers shall be installed and maintained in good condition on all motorized equipment under the control of the contractor	Construction Contractor	Project Manager Construction Contractor
Traffic Management	To minimize traffic problems in the Project Area.	❖ Proper traffic management plan shall implemented to avoid traffic jams / public inconvenience.	Construction Contractor	Project Manager Construction Contractor

Impact	Objectives	Mitigation	Responsibility	
			Implementation	Monitoring
Maintenance of Construction Equipment	Improper maintenance of construction equipment may lead to safety and environmental hazards	❖ Place substantial blocking under any chain–hoist suspended or jack supported equipment under which people must work. ❖ All work areas shall be provided with proper ventilation. ❖ Secure unbolted heavy parts or engines if necessary to leave the work.	Construction Contractor	Project Manager Construction Contractor
Waste	To minimize odor, spreading of diseases and clogging of canal and drain.	❖ Waste management plan shall be implemented including provision of waste bins, defining collection frequencies, allocating personnel and defining safe disposal options.	Construction Contractor	Project Manager Construction Contractor

Table 9-2 : Environmental Management Plan during Operational Phase

Impact	Objectives	Mitigation	Responsibility	
			Implementation	Monitoring
Air Quality	Ensure that the pollution level does not exceed the limit.	❖ Regular monitoring of vehicular emissions. ❖ Impose fine on vehicles emitting gaseous emissions beyond the prescribed limit.	LDA Project Manager	Project Manager Approved Monitoring Authority
Noise	To minimize noise levels	❖ Ban use of pressure horns ❖ Proper implementation of inspection and maintenance program for vehicle ❖ Strict check on use of proper silencers especially for motor cycles	LDA Project Manager	Project Manager Approved Monitoring Authority
Land and Soil	To avoid soil erosion	❖ Periodic checking to be carried to assess the effectiveness of the stabilization measures viz. turfing, stone pitching, river training structures etc. ❖ Necessary measures to be followed wherever there are failures	LDA Project Manager	Project Manager Approved Monitoring Authority
Water Quality	To avoid blockage of drains (water logging)	❖ Monitoring of water borne diseases due to stagnant water bodies	LDA Project Manager	Project Manager Approved Monitoring Authority
Safety	To avoid chances of accidents	❖ Safety measures shall provide in case of emergency	LDA Project Manager	Project Manager Project HSE Officer

Impact	Objectives	Mitigation	Responsibility	
			Implementation	Monitoring
		❖ Social awareness will be addressed among people how to avoid any accidents with fast moving vehicles.		
Road Maintenance work	To control HSE and environmental related issues.	❖ 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. ❖ Implementation of HSE Plans during the maintenance period. ❖ Strict implementation of PPEs. ❖ Use of high quality equipment and material by the contractor. ❖ Continuous improvements in the emergency plans. ❖ Placement of sign boards for traffic diversions and proper implementation of traffic diversion plans.	LDA Project Manager	Project Manager Project HSE Officer

9.10 EQUIPMENT MAINTENANCE DETAIL

Equipment shall be inspected, tested and maintained by qualified trained personnel. If any equipment is not in good operating condition, it should be repaired immediately. Authorized dealers will be responsible for maintenance of equipment's. Equipment procedures and maintenance guidelines shall be kept in a central location for quick reference when needed

9.11 ENVIRONMENT MANAGEMENT COST

The total cost for the environmental management is estimated as 10 Million Pak Rupees. Details are given below in the Table 9-3:

Table 9-3 : Environment Management Cost

Environmental Component	Quantity	Amount PKR
Contractor Environmental Specialist	3	1.3
Air and Water Quality & Noise Monitoring	8	2.8
Health and Safety Measures and Provision of PPEs	Lumpsum	3.1
Roadside Tree Plantations of Endemic / Local Species	Lumpsum	2.8
TOTAL		10 Million

10.0 INVOLVEMENT OF STAKEHOLDERS / PUBLIC CONSULTATION

10.1 GENERAL

Stakeholder consultation is a mean of involving all primary and secondary stakeholders in the project's decision-making process in order to address their concerns, improve project design, and give the project legitimacy. Stakeholder consultation, if conducted in a participatory and objective manner, is a means of enhancing project sustainability. Community input (both of knowledge and values) on socioeconomic and environmental issues can greatly enhance the quality of decision-making. Stakeholder consultation was therefore conducted in the project area not only to satisfy the legal requirements of the EIA process in Pakistan but also to improve and enhance the social and environmental design of the project.

The following chapter includes the detailed information of the process and parties that depicts the involvement and consultation of the important stakeholders that is conducted by the Sustainable Environment Consultant. The consultation is carried out to resolve any kind of issues that involved and can be potentially affected by the proposed project. The activity plays an important role in the decision making and the keeps in view the concerns of stakeholders. The parties that are involved in the process are as follows:

- Local government
- Local community
- Affected community (directly and indirectly)
- General public
- Service providers
- Proponents

10.2 PROPONENT'S ENVIRONMENT MANAGEMENT TEAM

All possible impacts and mitigation measure related to the project were discussed with the proponent (LDA) and management. Proponent assured to take all suggested mitigation measures to control any discrepancy arose by the project construction, land acquisition and to make the protect environment friendly.

10.3 THE RESPONSIBILITY AUTHORITY

Lahore Development Authority shall be the responsible authority to take all measures prior to start the project construction activity.

10.4 OTHER DEPARTMENTS AND AGENCIES

For the impact analysis detailed with the management, local community, educational institutes, shopkeepers. All issues were discussed related to implementation of the project. Scoping sessions, focused group discussion and way side consultations were held with the relevant stakeholders in the area. Following Departments were also consulted

- EPA

- TEPA
- WASA
- Civil defense
- Rescue 1122

10.5 ENVIRONMENTAL PRACTITIONERS AND EXPERTS

During visit to the project site, discussion with stakeholders and consulted with the local people of nearby areas to evaluate the project socio-economic impacts. People of the area belong to different professions like mostly belong to employment, own businesses, doctors, some in abroad, teaching, etc. women were also consulted for their point of view regarding the betterment of the area by this project, some of them communicated but according to social value of the area they mostly hesitate to communicate comfortably and get pictured. People provide the massive information about the project and have positive remarks regarding the project development.

10.6 AFFECTED AND WIDER COMMUNITY

A large number of community and local businesses will be affected due to construction of proposed project. Team has consulted with the inhabitants or neighbouring areas. The remarks of people are positive regarding the project and people foresee positive impacts like smooth flow of traffic, business, development of the area etc.

10.7 PUBLIC CONSULTATION:

During the field work public consultation were carried out by the team members of Integrated Environment Consultant (IEC) to brief the people of nearby areas about the Project. The participants included residents, workers, students and other concerned. Majority people are having positive comments/concerns regarding the Project.

CONCLUSION AND RECOMMENDATIONS

Primary and secondary data were used to assess the environmental impacts of the project road, which were assessed in a comprehensive manner. This EIA Report provided a picture of all potential environmental impacts associated with the Project, and makes suitable recommendations for mitigation measures.

The roadway is mostly following the existing alignments, being the best option from the environmental, legal, engineering and socioeconomic points of view. Environmental impacts associated with the Project need to be properly mitigated through the existing institutional arrangements, which need to be augmented for optimum utilization of available resources.

Bulk of environmental impacts will take place during the construction phase. Implementation of mitigation measures during this period will be assigned to the contractors. However, traditionally contractors have little perception and understanding of environmental problems. Hence, the required environmental mitigation must be clearly described in the contract documents, and an environmental supervising consultant must monitor implementation mechanism. This Report, including the EMP, should be used as a basis for an environmental compliance program.

The EIA Report has thoroughly assessed all the potential environmental impacts associated with the Project. The environmental impacts identified by the study are manageable, which will be mitigated by LDA and contractor at various stages, as suggested in the Report. On the basis of the findings of the EIA, it is concluded that Rehabilitation of Bund Road from Babu Sabu Interchange to Ring Road and Provision of Underpass at Gulshan-E -Ravi T Junction will not pose any adverse impact on the local population and the environment. Therefore, it is recommended that the competent authority may please be issues Environmental Approval for the operation of this project.

REFERENCES

Listed below are some of the documents, reports and other references consulted during the preparation of this Report:

- ❖ Information and data provided by project proponents;
- ❖ Project Pre-Feasibility Study Report;
- ❖ Technical Design Data related to the project.
- ❖ Information gathered through discussions with the project related persons of the project proponent;
- ❖ Information collected from the Technical documents of various suppliers of machinery / equipment.
- ❖ The Punjab Environmental Protection Act 1997 (Amended 2012) covers aspects related to:
 - The protection, conservation, rehabilitation and improvement of the environment and the prevention, control of pollution and promotion of sustainable development;
 - Establishing complete regulatory and monitoring bodies, policies, rules, regulations and Pakistan Environmental Quality Standards; and
 - To ensure enforcement, the act establishes regulating bodies i.e. Punjab Environmental Protection Council (PEPC) and responsible bodies i.e. Punjab Environmental Protection Agency (PEPA) at Provincial Level.
- ❖ Environment related Laws in Pakistan;
- ❖ Government of Pakistan, Pakistan Environmental Protection Agency, Policy and Procedures for Filing, Review and Approval of Environmental Assessment, 2000;
- ❖ Google earth, maps.
- ❖ Guidelines for Public Consultations – These guidelines cover:
 - Consultation, involvement and participation of Stakeholders
 - Techniques for public consultation (principles, levels of involvements, tools, building trust)
 - Effective public consultation (planning, stages of EIA where consultation is appropriate)
 - Consensus building and dispute resolution.
- ❖ Work Place Safety and Health Act 2011
- ❖ Pakistan Penal Code, 1860
- ❖ Land Acquisition Act (LAA) of 1894

GLOSSARY

Air Quality	Measurement of the pollutants in the air; a description of healthiness and safety of the atmosphere.
Consultation	Consultation refers to two-way transfer of information or joint discussion between project staff and the affected population. Systematic consultation implies a sustained and rigorous sharing of ideas. Bank experience shows that consultation often yields the best resettlement alternatives, fruitful procedures for continued participation, and independent information on actual conditions for implementation.
Contractor	A person or firm that undertakes a contract to provide materials or labor to perform a service or do a job.
Disclosure	The action of making new or secret information known
Environmental Management	Attempt to control human impact on and interaction with the environment in order to preserve natural resources
Effluent	Wastewater – treated or untreated – that flows out of a treatment plant, sewer, or industrial outfall. Generally refers to wastes discharged into surface waters
Electrical conductivity	Electrical Conductivity is an indirect measure for finding the total dissolved solids in a water body
Evaluation	The making of a judgment about the amount, number, or value of something; assessment.
Flyover	A bridge carrying one road over another.
Geology	A science that studies rocks, layers of soil, etc., in order to learn about the history of the Earth and its life
Ground Water	Aquifers currently being used as a source of drinking water or those capable of supplying a public water system. They have a total dissolved solid content of 10,000 milligrams per liter or less, and are not "exempted aquifers."
Hazardous	Substance or material, which could adversely affect the safety of the public, handlers or carriers during transportation
Impact	Effect on someone or something
Jurisdiction	The extent of the power to make legal decisions and judgments.
Land Acquisition	The process whereby a person is compelled by a public agency to cede all or part of the land a person owns or possesses, to the

	ownership and possession of that agency, for public purpose in return for compensation.
Mitigation	The action of reducing the severity, seriousness, or painfulness of something
Monitoring	Supervising activities in progress to ensure they are on-course and on-schedule in meeting the objectives and performance targets
Occupational Health	Maintenance of the highest degree of physical, mental and social well-being of workers in all occupations by preventing departures from health, controlling risks and the adaptation of work to people, and people to their jobs
pH	pH is a measure of how acidic / basic water is.
Project Area	The area specified by the funding and / or implementing agency according to the Official Gazette Notification and includes the areas within the administrative limits of the Federal or a Provincial Government.
Project Manager	The person in overall charge of the planning and execution of a particular project.
Proponent	A person who advocates a theory, proposal, or course of action.
Rehabilitation	Include all compensatory measures to re-establish; at least lost incomes, livelihoods, living and social systems. It does not include the payment of compensation for required assets.
Resettlement	Means all measures taken to mitigate any and all adverse impacts, resulting due to execution of a project on the livelihood of the project affected persons, their property, and includes compensation, relocation and rehabilitation.
Road	A road is a thoroughfare, route, or way on land between two places that has been paved or otherwise improved to allow travel by foot or some form of conveyance, including a motor vehicle etc.
ROW	A right-of-way (ROW) is a right to make a way over a piece of land, usually to and from another piece of land.
Scope	The extent of the area or subject matter that something deals with or to which it is relevant
Social Environment	It includes the culture that the individual was educated or lives in, and the people and institutions with whom they interact.
Stakeholders	Include affected persons and communities, proponents, private and public businesses, NGOs, host communities and EPA.

Topography	Details of the surface features of land. It includes the mountains, hills, creeks, and other bumps and lumps on a particular hunk of earth.
Turbidity	Turbidity is the amount of particulate matter that is suspended in water.
Underpass	A road or pedestrian tunnel passing under a road or railway