Initial Environmental Examination Report

Project Number: 46526-007
Loan Number: 3562-PAK
Date: April 2021

Punjab Intermediate Cities Improvement Investment Project

IEE for Upgradation of Road Works in Sahiwal

Prepared by Project Management Unit of PICIIP, Government of Punjab, Pakistan

Punjab Intermediate Cities Improvement Investment Program (PICIIP)

Sahiwal Component

TA 8683 (PAK)

Initial Environmental Examination

UPGRADATION OF ROAD WORKS IN SAHIWAL

April 2021

Prepared by PMU - PICIIP for the Asian Development Bank (ADB)

CURRENCY EQUIVALENTS

As of April 21st,2021 Currency Unit – Pak Rupees (Pak Rs.)
Pak Rs 1.00 = $ 0.00595 US$1.00 = Pak Rs. 155

CONVERSIONS

1 meter = 3.28 feet

1 hectare = 2.47 acre

Acronyms

ADB	Asian Development Bank
CIU	City Implementation Unit
CDIA	Cities Development Initiative for Asia
PICIIP	Punjab Intermediate Cities Improvement Investment Program
PMU	Project Management Unit
SPS	Safeguard Policy Statement
EA	Executing Agency
EIA	Environment Impact Assessment
EPA	Environmental Protection Agency
ESCF	Environment Screening and Categorization Form
EMP	Environmental Management Plan
IA	Implementing Agency
GoP	Government of Pakistan
IEE	Initial Environmental Examination
LAA	Land Acquisition Act (of 1984)
LARP	Land Acquisition and Resettlement Plan
Leq	Equivalent sound pressure level
NEQS	National Environmental Quality Standards
O&M	Operation & Maintenance
PC	Public consultation
PEPA	Punjab Environmental Protection Agency
PEPAct	Pakistan Environment Protection Act 1997
RP	Resettlement Plan
REA	Rapid Environmental Assessment

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EXECUTIVE SUMMARY

1. This is the Initial Environmental Examination report (IEE) for the upgradation of road works in Sahiwal, Punjab province of Pakistan. This work comes under the urban mobility and transportation component of the Punjab Intermediate Cities Improvement Investment Program (PICIIP) and an update to the umbrella IEE assessment[1] prepared in July 2017, which covered all urban mobility, transportation and land use planning works to be conducted in Sahiwal city. This IEE document focuses solely on the scope of works of the upgradation of the road network works in Sahiwal and assesses any potentially significant impacts and proposes required mitigation measures, which shall be implemented by the Contractor and monitored by the PMU and ADB using the EMP.

2. Extensive due diligence visits were conducted to the project sites and project areas for the proposed works in Sahiwal city from July to August, 2020 to examine the project area and to re-assess the baseline in order to evaluate whether there are any key receptors that will need to be considered during the project works to prevent any long term and irreversible impacts.

3. As a divisional headquarters, Sahiwal has gained its importance. There is rapid growth in population, traffic and commercialization over the city. Being divisional headquarters, business opportunities have increased, and every street is going to be commercialized causing congestion problems. There are few roads of the city that are parallel to the Main G.T Road i-e Buhtoo Nager road, Girls College Road, Fateh Share Road etc. passing the city and connecting the High street. High street is the main road of the city that connects G.T directly. In order to travel towards Multan or Lahore, the local communities mainly use High street road to exit the city and to reach the G.T Road.

4. The scope of work includes rehabilitation and up-gradation of following roads in Sahiwal:

   - Construction of fateh sher road from high street road to old civil line road Sahiwal (1.4 km);
   - Construction of main market road from garvi wala pull to fateh sher road Sahiwal (0.7 km)
   - Construction of mall mandi chowk to main market road Sahiwal (0.62 km)

5. These works will be conducted in the north eastern direction of Sahiwal city, with the works being carried out in highly urbanized areas with considerable

commercial activity taking place throughout the day. The environment is urbanized and highly disturbed and thus the baseline levels for ambient noise as well as ambient air quality are high and exceeding the applicable limits. The rationale for selecting only one monitoring location is due to the close proximity of work of all sites, which essentially fall under same air shed with identical scope of work and nature. That is the reason only one air quality monitoring was considered to be representative of the entire air shed in the project area.

6. The $PM_{2.5}$ and PM_{10} levels have been assessed to be exceeding the applicable guidelines while night time noise levels are exceeding the applicable guidelines. Thus, the Contractor will be required to minimize the exceedances in noise levels as well as air quality emissions during the construction activities to minimize any potential impacts in this already disturbed environment.

7. In recent years, the water table has been dropping at a rate of one foot per year. This is because of pumping, and decreased rainfall and recharge. It is not clear whether the aquifer is being overexploited but, in view of the wide dispersal of the tube wells, this is unlikely at the present level of abstraction.

8. No impact on vegetation is expected since cutting of trees on the project site will not be permitted. There are only minor shrubs and bushes that will be cleared up, if felt necessary, during the site preparation stage of the project.

9. This IEE report highlights all potential environmental impacts associated with the project and recommends mitigation measures. Any environmental impacts associated with the project need to be properly mitigated, through the existing institutional arrangements described in this report.

10. The activities to be conducted under the project were screened for potential impacts at the design/pre-construction, construction and operation phases. This ‘activity wise’ screening enabled to obtain a clear picture of the expected level of impacts resulting from the different activities and helped identify required mitigation measures to mitigate them.

11. The screening matrices for the key issues that have been identified during the different project development stages are provided in the Tables ES-1, ES-2 and ES-3 below.

Table ES-1: 'Activity Wise' Screening of Possible Impacts During Design/Pre-Construction Phase

S/No.	Potential Impact	Likelihood (Certain, Likely, Unlikely, Rare)	Consequence (Catastrophic, Major, Moderate, Minor)	Risk Level (Significant, Medium, Low)	Residual Impact (Significant, Medium, Low)
1	Lack of integration of IEE/EMP requirements into Construction bid documents	Likely	Moderate	Medium	Low
2	Material Haul Routes	Likely	Moderate	Medium	Low
3	Improper location of worker camps leading to improper disposal of solid waste and sewage and privacy issues for residents in project area.	Likely	Moderate	Medium	Low
4	Contractor's Environmental Safeguards Capacity	Likely	Moderate	Medium	Low
5	Natural Hazard Risks (Flooding, Earthquakes etc.)	Unlikely	Moderate	Low	Low

Critical Risk Level

Significant Risk Level

Medium Risk Level

Low Risk Level

Table ES-2: Screening of Possible Impacts During Construction Phase

S/No.	Potential Impact	Likelihood (Certain, Likely, Unlikely, Rare)	Consequence (Catastrophic, Major, Moderate, Minor)	Risk Level (Significant, Medium, Low)	Residual Impact (Significant, Medium, Low)
1	Degradation of air quality due to construction works	Certain	Major	Significant	Low
2	Potential accidents and injuries to communities in project area during construction works	Likely	Major	Medium	Low
3	Injuries to workers from lack of necessary training and/or not using PPEs etc.	Likely	Major	Medium	Low
4	High noise levels from construction activities	Likely	Major	Medium	Low
5	Untreated disposal of effluent from worker camps and batching plant(s)	Likely	Moderate	Medium	Low
6	Soil Contamination	Likely	Moderate	Medium	Low
7	Employment Conflicts	Likely	Moderate	Medium	Low
8	Communicable diseases incl. COVID-19	Likely	Major	Medium	Low
9	Water contamination	Unlikely	Moderate	Low	Low
10	Vegetation and Wildlife Loss	Unlikely	Moderate	Low	Low
11	Historical/Archaeological Sites	Unlikely	Low	Low	Low

Critical Risk Level

Significant Risk Level

Medium Risk Level

Low Risk Level

Table ES-3: Screening of Possible Impacts during Operation Phase

S/No.	Potential Impact	Likelihood (Certain, Likely, Unlikely, Rare)	Consequence (Catastrophic, Major, Moderate, Minor)	Risk Level (Significant, Medium, Low)
1	Noise levels	Unlikely	Moderate	Low
2	Air Quality	Unlikely	Moderate	Low
3	Reduced Travel Times	Positive impacts expected		
4	Road Safety	Positive impacts expected		
5	Socioeconomic Impacts	Positive impacts expected		

Critical Risk Level

Significant Risk Level

Medium Risk Level

Low Risk Level

Positive Impacts

12. Since the major project works, namely upgradation of the roads' network will be conducted in urbanized areas of Sahiwal city, there are considerable occupational and community health and safety risks for the receptors in the immediate vicinity of the work sites, consisting of hospitals, schools etc. The need for engaging a competent and experienced Contractor with a good record and prior experience of conducting such works shall be critical to avoid any mishaps relating to community and worker safety since HSE measures will need to be implemented in a highly effective manner through this activity.

13. Considering the urbanized environment of the project area, effective traffic management shall need to be ensured to ensure smooth movement of the construction machinery and equipment, during removal of debris and while transporting materials to and from site in order to prevent any accidents or mishaps and to ensure community and worker safety.

14. Urban flood can possibly happen, particularly during the monsoon season, due to inadequate storm and sewer system within the city. Heavy storm induced urban flood happens to a small degree in Sahiwal. Floods of Sahiwal in the past were triggered by extreme rainfall events. The project area is located in the seismic Zone '2B' and thus there is limited risk to the project related to seismic events. In order to cater to any extreme weather events, drainage systems will be incorporated into the roads' design.

15. There is no possibility of water contamination since the project corridors do not contain any water bodies. In addition, the proposed works only consist of rehabilitation works with no possibility of any water supply lines being ruptured.

16. No other infrastructure works are planned to be conducted in the project area where these project works shall be conducted. Thus, no cumulative impacts are expected.

17. The potential impact of development of the proposed roads in the project area has been examined, which indicated that the existing and planned infrastructure such as water supply, wastewater collection and treatment, municipal solid waste collection and disposal would be adequate to accommodate any potential population intake as a result of the proposed roads development. Impacts on the environment from air emissions, traffic and community noise, and treated effluent discharge have also been assessed and have found to be acceptable and within the carrying capacities of the environmental media. Thus, negative indirect and induced impacts from the proposed road works are not expected.

18. Detailed and extensive consultations with different key stakeholders have been conducted to date, consisting of the local communities and local businesses located in the project area, different public sector line departments etc. and their comments/concerns/suggestions were obtained. Due to the COVID-19 pandemic, the social team followed the ADB SOP's related with social distancing etc. to avoid / minimize any exposure risks.

19. The consultations with females were conducted through informal meetings due to social and culture norms that did not allow the social team to obtain pictoral evidence. But their consent and reservations were recorded.

20. Furthermore, during the major activities of project, short term and site-specific impacts during the construction works due to high dust emissions and exhaust from construction machinery along with high noise levels from operation of

different heavy machinery and vehicles are expected but will be managed through implementation of required mitigation measures.

21. All works will be conducted on publicly owned land and thus no land acquisition and/or resettlement will be required in any part of Sahiwal city.

22. The implementation of the existing EMP in its true letter and spirit shall ensure any potential impacts are managed and no long-term significant impacts take place during the construction works in Sahiwal city.

23. During the operation phase of the proposed project works, only positive impacts are expected through reduced travel times and improved road safety as a result of these road upgradation works.

24. Based on the screening conducted for the project works, the proposed scope of works was categorized as Category ‘B’ according to ADB SPS 2009.

1 Introduction

1.1 Overview

25. The Asian Development Bank (ADB) and the Cities Development Initiative for Asia (CDIA) are partnering with the Government of Punjab Province (GoPP), to undertake the Punjab Intermediate Cities Improvement Program (PICIIP).

26. The PICIIP aims to improve the quality of urban services available in selected cities in Punjab Province (city populations between 250,000 and 1,000,000). Urban infrastructure development is an important component of the PICIIP. The duration of the program will be six years. Funding will be accessed in phases. The PICIIP's overall budget is US$500 million, to be disbursed in phases.

27. The first phase will fund investments in the intermediate cities of Sialkot and Sahiwal. Major projects planned for Sahiwal city are water supply improvement; sewerage and drainage improvement, sewage treatment plant, green spaces development and transport routes improvement.

28. This IEE document focuses solely on the scope of works of the upgradation of roads in Sahiwal and assesses any potentially significant impacts and proposes required mitigation measures, which shall be implemented by the Contractor and monitored by the PMU and ADB using the EMP.

29. This work comes under the urban mobility and transportation component of the PICIIP.

1.2 Purpose, Scope and Context of IEE Study

30. As a divisional headquarters, Sahiwal has gained its importance. There is rapid growth in population, traffic and commercialization over the city. Being divisional headquarters, business opportunities have increased, and every street is going to be commercialized causing congestion problems.

31. There are few roads of the city that are parallel to the Main G.T Road i-e Buhtoo Nager road, Girls College Road, Fateh Share Road etc. passing the city and connecting the High street. High street is the main road of the city that connects G.T directly. To travel either Multan or Lahore local people mainly use High street road to exit the city for G.T Road.

32. The proposed model roads are situated in north eastern direction of Sahiwal city. The total length of these three (03) roads which need to be upgraded is approximately 2.6 km with these roads serving about 35-40% population of the area. Majority of population use the 'High street' road, which increases the traffic congestion during peak hours. The aim of upgrading these proposed roads will serve as an alternative route for the existing population to use these roads without disturbing the traffic on 'High street' road.

33. The proposed scope of works is to restore and improve the following network of roads in Sahiwal city,

I. Construction of fateh sher road from high street road to old civil line road Sahiwal (1.4km).
II. Construction of main market road from garvi wala pull to fateh sher road Sahiwal (0.7km)
III. Construction of mall mandi chowk to main market road Sahiwal (0.62km)

34. A summary of upgradation works is provided below:

Fateh sher road from high street road to old civil line road Sahiwal

Sr. No	Description	Details
1.	Road Length	1.14 km
2.	No. of Lanes	2 (Either side)
3.	Lane Width	22ft each
4.	Bicycle lane	5ft (Either side)
5.	Parking Lane	9ft (Either side)
6.	Median	4ft

Main market road from garvi wala pull to fateh sher road Sahiwal

Sr.	Description	Details
1.	Road Length	0.7 km
2.	No. of Lanes	2 (Either side)
3.	Lane Width	9ft

Mall mandi chowk to main market road Sahiwal (Part-1)

Sr.	Description	Details
1.	Road Length	0.4 km
2.	No. of Lanes	1
3.	Lane Width	20ft

Mall mandi chowk to main market road Sahiwal (Part-2)

Sr.	Description	Details
1.	Road Length	0.22 km
2.	No. of Lanes	2
3.	Lane Width	12ft

Pavement Structure

Fateh sher road from high street road to old civil line road Sahiwal

Asphaltic Wearing Course	**2 inches**
Asphaltic Base Course	**2 inches**
Water Bound Macadam	**8 Inch**
Sub base	**8 Inch**

Main market road from garvi wala pull to fateh sher road Sahiwal

Asphaltic Wearing Course	**2 inches**
Asphaltic Base Course	**2 inches**
Water Bound Macadam	**8 Inch**
Sub base	**8 Inch**

Mall mandi chowk to main market road Sahiwal

Asphaltic Wearing Course	**2 inches**

Asphaltic Base Course	**2 inches**
Water Bound Macadam	**8 Inch**
Sub base	**8 Inch**

Subgrade CBR 7%

35. The proposed locations for conducting these works are shown in **Figures 1.1** to **1.3** below**.**

36. According to ADB's Safeguard Policy Statement (SPS) 2009, a Rapid Environmental Assessment (REA) Checklist was prepared for the proposed Upgradation of Roads works. The Pakistan Environmental Protection Agency's "Guidelines for the Preparation and Review of Environmental Reports (2000)" were also consulted. Based on the limited scope of the works and Site-Specific Environmental impacts that will be mitigated and managed through implementation of EMP, therefore, this sub-project has been classified as Category 'B'.

Figure 1-1: Location of Sahiwal City in District Sahiwal

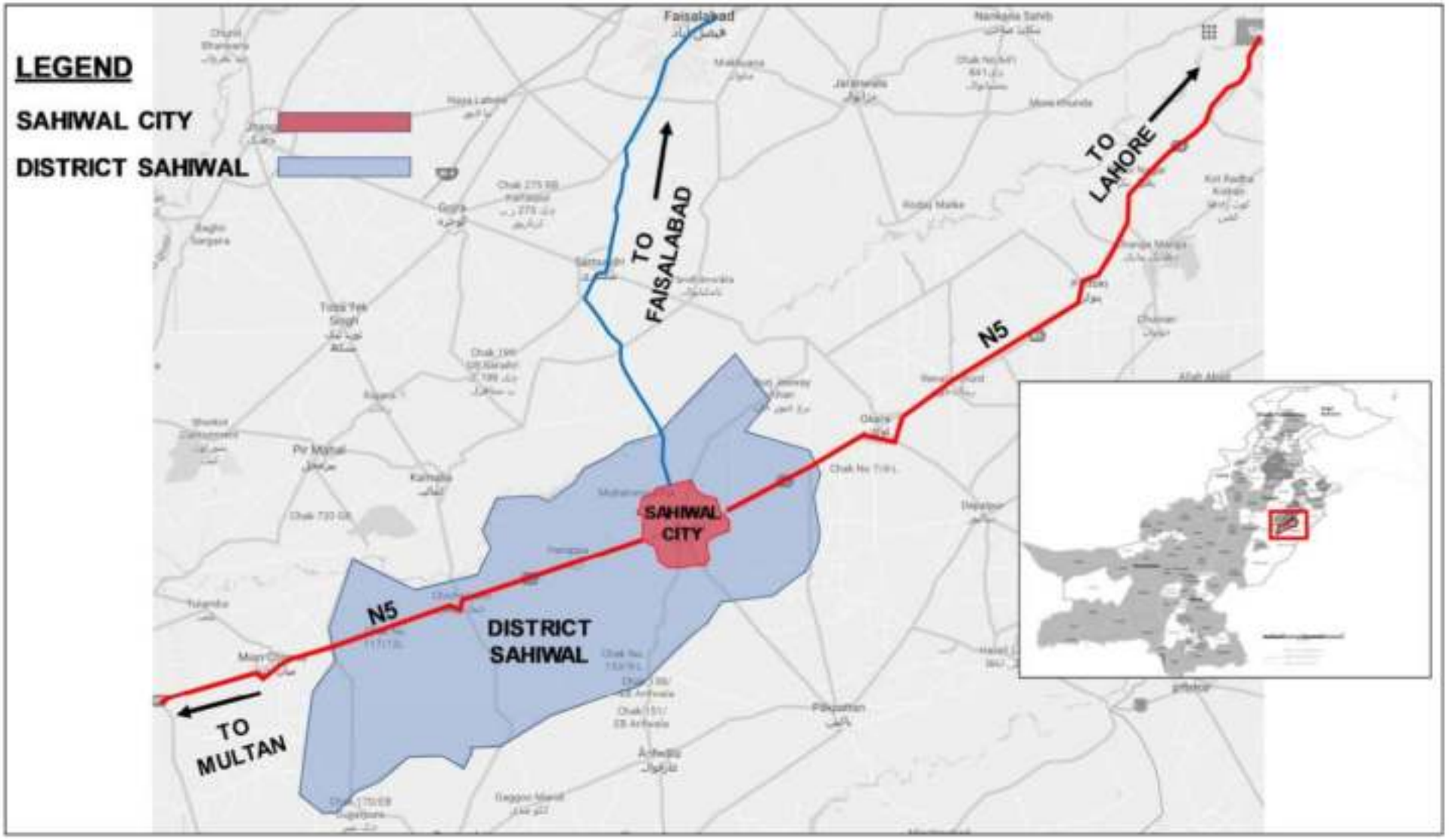


Figure 1-2: Location of Proposed Roads

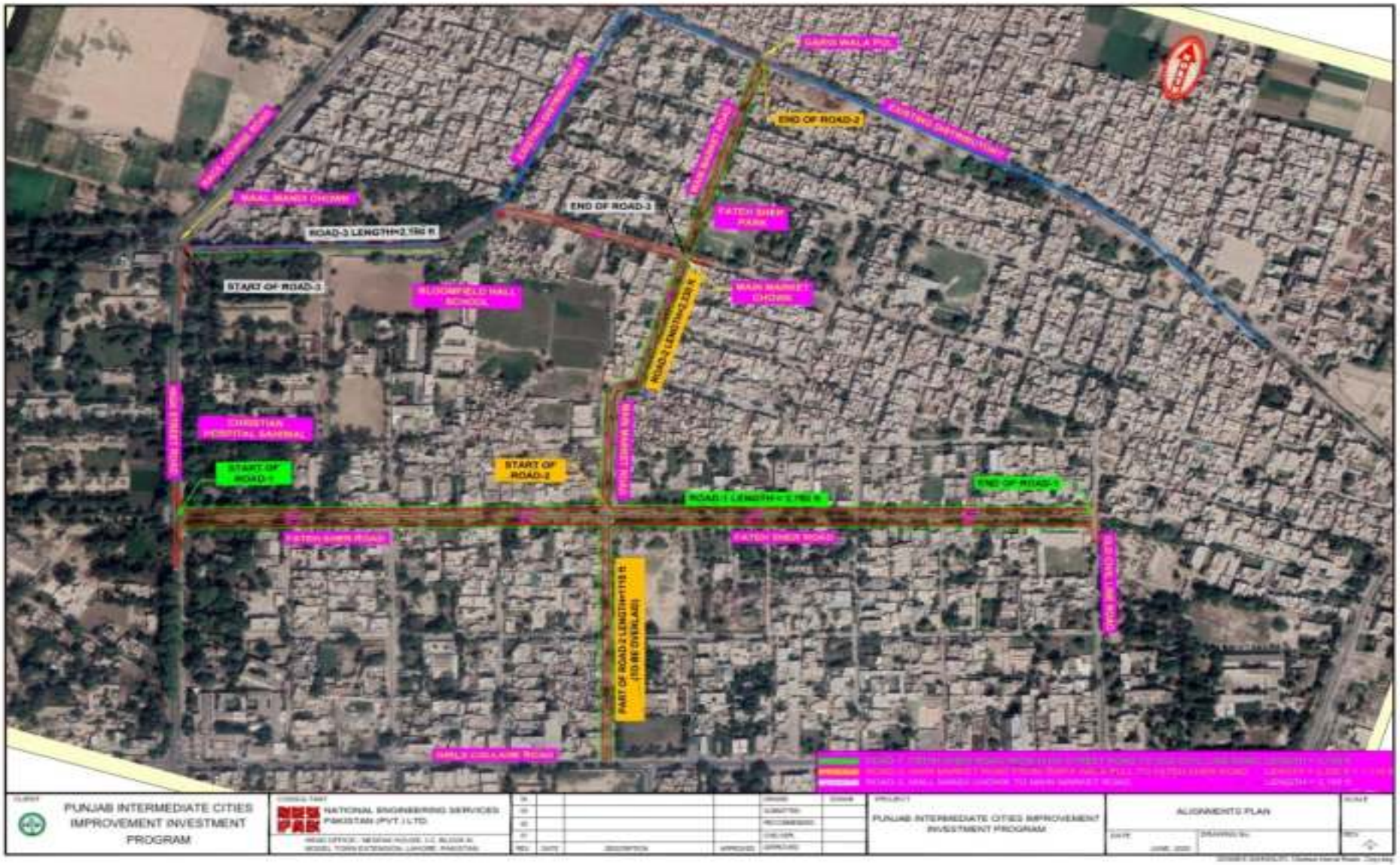
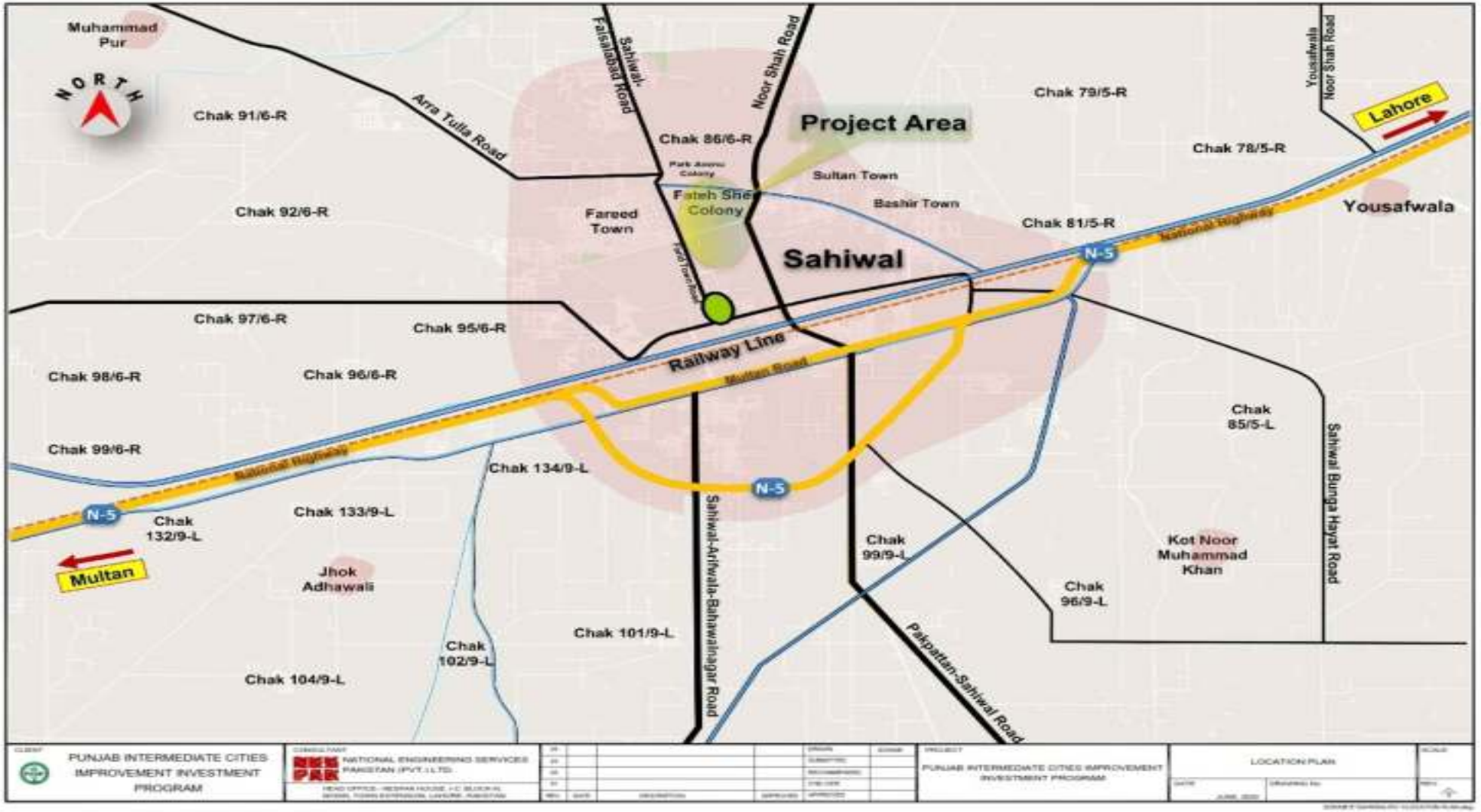


Figure 1-3: Another Location Map of Project Area



2 Policy and Legal Framework

2.1 General

37. This section provides an overview of the policy framework and national legislation that applies to the proposed upgradation of roads project in Sahiwal. The project will comply with all national legislation relating to the environment in Pakistan and will obtain all the regulatory clearances required from the financing agency, ADB.

2.2 National Policy and Legal Framework

38. The Pakistan National Conservation Strategy (NCS) that was approved by the federal cabinet in March 1992 is the principal policy document on environmental issues in the country (EUAD/IUCN, 1992). The NCS outlines the country's primary approach towards encouraging sustainable development, conserving natural resources, and improving efficiency in the use and management of resources. The NCS has 68 specific programs in 14 core areas in which policy intervention is considered crucial for the preservation of Pakistan's natural and physical environment. The core areas that are relevant in the context of the proposed Upgradation of Roads Project are pollution prevention and abatement and increasing energy efficiency while conserving biodiversity.

39. Prior to the adoption of the 18th Constitutional Amendment, the Pakistan Environmental Protection Act (PEPA) 1997 was the governing law for environmental conservation in the country. Under PEPA 1997, the Pakistan Environmental Protection Council (PEPC) and Pak EPA were primarily responsible for administering PEPA 1997. Post the adoption of the 18th Constitutional Amendment in 2011, the subject of environment was devolved, and the provinces have been empowered for environmental protection and conservation.

2.3 Regulations for Environmental Assessment, Pakistan EPA

40. Under Section 12 (and subsequent amendment) of the PEPA (1997), a project falling under any category specified in Schedule I of the IEE/EIA Regulations (SRO 339 (I0/2000), requires the proponent of the project to file an IEE with the concerned provincial EPA. Projects falling under any category specified in Schedule II require the proponent to file an EIA with the provincial agency, which is responsible for its review and accordance of approval or request any additional information deemed necessary.

2.4 Regulatory Clearances, Punjab EPA

41. In accordance with provincial regulatory requirements, an IEE/EIA satisfying the requirements of the Punjab Environmental Protection Act (2012) is to be submitted to Punjab environmental protection agency (PEPA) for review and approval, and subsequent issuance of NOC before the commencement of construction.

2.5 Guidelines for Environmental Assessment, Pakistan EPA

42. The Pak-EPA has published a set of environmental guidelines for conducting environmental assessments and the environmental management of different types of development projects. The guidelines that are relevant to the proposed sub-project are listed below:

- Guidelines for the Preparation and Review of Environmental Reports, Pakistan, EPA 1997.
- Guidelines for Public Consultations; Pakistan EPA May 1997.

2.6 National Environmental Quality Standards (NEQS) 2000

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

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

44. These standards apply to the gaseous emissions and liquid effluents discharged by construction machinery.

2.7 Other Environment Related Legislations

45. The national laws and regulations are provided in **Table 2.1** below.

Table 2-1: Environmental Guidelines and Regulations

Legislation/Guideline	Description
National Environmental Policy (2005) (NEP)	NEP is the primary policy of Government of Pakistan addressing environmental issues. The broad Goal of NEP is, "to protect, conserve and restore Pakistan's environment in order to improve the quality of life of the citizens through sustainable development". The NEP identifies a set of sectoral and cross-sectoral guidelines to achieve its goal of sustainable development. It also suggests various policy instruments to overcome the environmental problems throughout the country.
The Forest Act (1927)	The Act empowers the provincial forest departments to declare any forest area as reserved or protected. It empowers the provincial forest departments to prohibit the clearing of forest for cultivation, grazing, hunting, removing forest produce, quarrying and felling, lopping and topping of trees, branches in reserved and protected forests. No protected forest is situated in the project area for the Road works.
Punjab Wildlife Protection Ordinance, 1972	It empowers the government to declare certain areas reserved for the protection of wildlife and control activities within in these areas. It also provides protection to endangered species of wildlife. As no activities are planned in these areas, no provision of this law is applicable to the proposed Road works.
The Antiquities Act (1975)	It ensures the protection of Pakistan's cultural resources. The Act defines "antiquities" as ancient products of human activity, historical sites, or sites of anthropological or cultural interest, national monuments, etc. The Act is designed to protect these antiquities from destruction, theft, negligence, unlawful excavation, trade, and export. The law prohibits new construction in the proximity of a protected antiquity and empowers the GOP to prohibit excavation in any area that may contain articles of archaeological significance. Under the Act, the subproject proponents are obligated to ensure that no activity is undertaken in the proximity of a protected antiquity, report to the Department of Archaeology, GOP, any archaeological discovery made during the course of the project.
Pakistan Penal Code (1860)	It authorizes fines, imprisonment or both for voluntary corruption or fouling of public springs or reservoirs so as to make them less fit for ordinary use.
NATIONAL ENVIRONMENTAL AND CONSERVATION STRATEGIES	
National Conservation Strategy	Before the approval of NEP, the National Conservation Strategy (NCS) was considered as the Government's primary policy document on national environmental issues. At the moment, this strategy just exists as a national conservation program. The NCS identifies 14 core areas including conservation of biodiversity, pollution prevention and abatement, soil and water conservation and preservation of cultural heritage and recommends immediate attention to these core areas.
Biodiversity Action Plan	The plan recog``nizes IEE/EIA as an effective tool for identifying and assessing the effects of a proposed operation on biodiversity.
INTERNATIONAL CONVENTIONS	
The Convention on Conservation of Migratory Species of Wild Animals (1981.21)	The Convention requires countries to take action to avoid endangering migratory species. The term "migratory species" refers to the species of wild animals, a significant proportion of whose members cyclically and predictably cross one or more national

Legislation/Guideline	Description
	jurisdictional boundaries. The parties are also required to promote or cooperate with other countries in matters of research on migratory species. There are no endangered species of plant life or animal life in the vicinity of the proposed project areas for the Road works.
Convention on International Trade in Endangered Species of Wild Fauna and Flora (1973)	The convention requires Pakistan to impose strict regulation (including penalization, confiscation of the specimen) regarding trade of all species threatened with extinction or that may become so, in order not to endanger their survival further.
International Union for Conservation of Nature and Natural Resources Red List (2000)	Lists wildlife species experiencing various levels of threats internationally. Some of the species indicated in the IUCN red list are also present in the wetlands of Pakistan.

2.8 ADB's Safeguard Policy Statement (SPS), 2009

46. The ADB's SPS 2009 requires that environmental considerations be incorporated into ADB funded projects to ensure that the project will have minimal environmental impacts and be environmentally sound. Occupational health & safety of the local population should also be addressed as well as the project workers as stated in SPS. A Grievance Redress Mechanism (GRM) to receive application and facilitate resolution of affected peoples' concerns, complaints, and grievances about the project's environmental performance is also established.

47. All loans and investments are subject to categorization to determine environmental assessment requirements. Categorization is to be undertaken using Rapid Environmental Assessment (REA) checklists, consisting of questions relating to (i) the sensitivity and vulnerability of environmental resources in project area, and (ii) the potential for the project to cause significant adverse environmental impacts. Projects are classified into one of the following environmental categories:

48. **Category A**: A proposed project is classified as category A if it is likely to have significant adverse environmental impacts that are irreversible, diverse or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An environmental impact assessment (EIA) is required.

49. **Category B**: A proposed project is classified as category B if its potential adverse environmental impacts are less adverse than those of category A projects. These impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed more readily than for category A projects. An initial environmental examination (IEE) is required.

50. **Category C**: A proposed project is classified as category C if it is likely to have minimal or no adverse environmental impacts. No environmental assessment is required although environmental implications need to be reviewed.

51. **Category FI**: A proposed project is classified as category FI if it involves investment of ADB funds to or through a financial intermediary (FI).

2.9 ADB's Access to Information Policy (AIP) 2018

52. ADB's new Access to Information Policy (AIP), reflects the ADB's ongoing commitment to transparency, accountability, and participation by stakeholders. The policy contains principles and exceptions to information sharing with external stakeholders, led by a new overarching principle of "clear, timely, and appropriate disclosure."

2.10 ADB's Accountability Mechanism Policy 2012

53. The objectives of the Accountability Mechanism is providing an independent and effective forum for people adversely affected by ADB-assisted projects to voice their concerns and seek solutions to their problems, and to request compliance review of the alleged noncompliance by ADB with its operational policies and procedures that may have caused, or is likely to cause, them direct and material harm. The Accountability Mechanism is a "last resort" mechanism.

2.11 Implications of ADB's safeguard policies on proposed project

54. The objectives of ADB's safeguards are to:

- avoid adverse impacts of projects on the environment and affected people, where possible;
- minimize, mitigate, and/or compensate for adverse project impacts on the environment and affected people when avoidance is not possible; and
- help borrowers/clients to strengthen their safeguard systems.

55. ADB's SPS sets out the policy objectives, scope and triggers, and principles for three key safeguard areas:

- environmental safeguards,
- involuntary resettlement safeguards, and
- Indigenous Peoples safeguards.

56. The objective of the environmental safeguards is to ensure the environmental soundness and sustainability of projects and to support the integration of environmental considerations into the project decision-making process. ADB's policy principles are summarized in **Table 2.2** below.

Table 2-2: ADB Policy Principles

	Policy principle	Summary
1	Screening and categorization	Screening process initiated early to determine the appropriate extent and type of environmental assessment.
2	Environmental assessment	Conduct an environmental assessment to identify potential impacts and risks in the context of the project's area of influence.
3	Alternatives	Examine alternatives to the project's location, design, technology, and components and their potential environmental and social impacts, including no project alternative.
4	Impact mitigation	Avoid, and where avoidance is not possible, minimize, mitigate, and/or offset adverse impacts and enhance positive impacts. Prepare an environmental management plan (EMP).
5	Public consultations	Carry out meaningful consultation with affected people and facilitate their informed participation. Involve stakeholders early in the project preparation process and ensure that their views and concerns are made known to and understood by decision makers and taken into account. Continue consultations with stakeholders throughout project implementation. Establish a grievance redress mechanism.
6	Disclosure of environmental assessment	Disclose a draft environmental assessment in a timely manner, in an accessible place and in a form and language(s) understandable to stakeholders. Disclose the final environmental assessment to stakeholders.
7	Environmental management plan	Implement the EMP and monitor its effectiveness. Document monitoring results, and disclose monitoring reports.
8	Biodiversity	Do not implement project activities in areas of critical

		habitats.
9	Pollution prevention	Apply pollution prevention and control technologies and practices consistent with international good practices. Adopt cleaner production processes and good energy efficiency practices. Avoid pollution, or, when avoidance is not possible, minimize or control the intensity or load of pollutant emissions and discharges. Avoid the use of hazardous materials subject to international bans or phaseouts.
10	Occupational health and safety Community safety.	Provide workers with safe and healthy working conditions and prevent accidents, injuries, and disease. Establish 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
11	Physical cultural resources	Conserve physical cultural resources and avoid destroying or damaging them. Provide for the use of "chance find" procedures.

2.12 IFC Sector Specific Guidelines on Road Construction

57. The relevant clause applicable to roads construction is as follows:

58. 'Environmental issues during the construction and operation of roads are similar to those of other large infrastructure projects involving significant earth moving and civil works and their prevention and control recommendations are presented in the General EHS Guidelines. These impacts include, among others, construction site waste generation; soil erosion and sediment control from materials sourcing areas and site preparation activities; fugitive dust and other emissions (e.g. from vehicle traffic, land clearing and movement, and materials stockpiles); noise from heavy equipment and truck traffic; and potential hazardous materials and oil spills associated with heavy equipment operation and fuelling activities.''

59. World Bank Environmental Health and Safety (EHS) Standards-ADB advocates adherence to environmental standards set out in the World Bank Group Environmental, Health and Safety Guidelines (EHS Guidelines) of which the following are most applicable to these road improvement project:

- air emissions related to vehicular traffic
- ambient air quality

- surface water quality
- ambient noise levels.

ADB's SPS requires that the most stringent standards be applied (within reasonable practicality). The PEQS are listed beside WHO/IFC standards. The most stringent standards will be applied to the road projects and are highlighted in green in each table. Noise level guidelines for noise levels measured outdoors are given in **Table 2.5**. Noise impacts should not exceed the levels highlighted in green in **Table 2.5** or result in a maximum increase in background levels of 3dB at the nearest sensitive receptor as defined in IFC' OHS guidelines.

60. Air quality guidelines issued by the IFC and based on WHO standards (**Table 2.4**) apply, in this case to emissions from traffic on the roads and its growth over time. Beyond traffic, air pollutants are also emitted through construction work and decommissioning of the construction stage, and the operating life of the new rail line. In the case of this project, sources of pollution to air mobile sources, namely motor vehicles. Guideline standards for for specific air pollutants (**Table 2.4**) were derived from World Health Organization (WHO) and PEQS guidelines.

61. Construction and operating period air quality in the project corridor should not exceed the levels highlighted in green in **Table 2.4**.

62. To conclude, the standards to be applied will be those highlighted in green. Any mitigative measures will be related to the increase due to construction or to increased traffic due to the road improvements

2.13 Comparison of International and Local Environmental Legislations

63. The ADB SPS requires application of pollution prevention and control technologies and practices consistent with international good practice, as reflected in internationally recognized standards. The SPS states that when host country regulations differ from these standards, the EA will achieve whichever is more stringent.

64. In order to select the most stringent standards applicable, a mix of local (NEQS) and international (IFC) regulations have been selected. The IFC Environmental, Health, and Safety (EHS) Guidelines, General EHS Guidelines: Environmental, Noise Management has noise level guidelines for daytime and nighttime, which are applicable. It shall be ensured that all necessary noise mitigation measures are implemented to minimize the noise levels in the project area.

65. The **Table 2.3** presents IFC workplace noise standards that are applicable to the construction workers. It should also be noted that IFC EHS guidelines advise that where existing ambient noise levels already exceed thresholds, the project should not result in an increase of more than 3 dB over existing ambient noise at the nearest receptor location off-site.

66. A comparison of applicable local and international guidelines for ambient air quality has been provided in **Table 2.4** below. In the case of most pollutants, the NEQS standards for ambient air quality are more stringent in comparison to USEPA and WHO/IFC standards. The applicable and most stringent parameters for each respective pollutant are highlighted in green.

67. Similar to the standards for air quality, the comparison of noise standards provided in **Table 2.5** clearly shows that NEQS standards for noise are more stringent in comparison to the IFC standards. The only exception is the daytime noise level standard for Industrial areas where the IFC standard is more stringent (70 dB(A)) in comparison to NEQS (75 dB(A)) and so for this particular parameter, the IFC standard will be used. Apart from this one exception, the NEQS standards have been used for the proposed Upgradation of Roads project.

68. As far as regulations regarding other environmental parameters are concerned such as acceptable effluent disposal parameters, the local regulations i.e. NEQS take precedence over any other international regulations such as IFC.

Table 2-3: IFC Work Environment Noise limits

Type of Work, workplace	IFC General EHS Guidelines
Heavy Industry (no demand for oral communication)	85 Equivalent level L_{eq},8h
Light industry (decreasing demand for oral communication)	50-65 Equivalent level L_{eq},8h

Table 2-4: Comparison of International and local Air Quality Standards*

Pollutants	USEPA		WHO/IFC		Pak. NEQS	
	Avg. Time	Standard	Avg. Time	Standard	Avg. Time	Standard
SO_2	3 hrs 1 hr	0.5 ppm 75 ppb	24 hr 10 min	20 ug/m^3 500 ug/m^3	Annual Mean 24 hrs	80 ug/m^3 120 ug/m^3
CO	8 hrs 1 hr	9 ppm (11 mg/m^3) 35 ppm (43 mg/m^3)	-	-	8 hrs 1 hr	5 mg/m^3 10 mg/m^3
NO_2	Annual Mean 1 hr	100 ug/m^3 (53 ppb) 100 ppb	1 yr 1 hr	40 ug/m^3 200 ug/m^3	Annual Mean 24 hrs	40 ug/m^3 80 ug/m^3
O_3	8 hrs	0.07ppm (148 ug/m^3)	8 hrs	100 ug/m^3	1 hr	130 ug/m^3
TSP	-	-	-	-	Annual Mean 24 hrs	360 ug/m^3 500 ug/m^3
PM_{10}	24 hrs	150 ug/m^3	1 yr	20 ug/m^3	Annual Mean	120 ug/m^3

			24 hr	50 ug/m^3	24 hrs	150 ug/m^3
$PM_{2.5}$	Annual Mean 24 hrs	15 ug/m^3 35 ug/m^3	1 yr 24 hr	10 ug/m^3 25 ug/m^3	Annual Average 24 hrs 1 hr	15 ug/m^3 35 ug/m^3 15 ug/m^3

*: The standards highlighted in green for each respective pollutant are the most stringent based on a comparison between local and international regulations and thus shall be applicable for the proposed project.

* In instances where the airshed is significantly degraded and the pollutant levels are already exceeding the ambient pollutant concentrations provided in the table above, it shall be ensured that the project activities cause as small an increase in pollution levels as feasible, and amounts to a fraction of the applicable short term and annual average air quality guidelines or standards as established in the project specific environmental assessment.

Table 2-5: Comparison of International and Local Noise Standards

Category of Area/Zone	Limit in dB(A) Leq			
	NEQS		WHO/IFC	
	Day Time 06:00 – 22:00	Night Time 22:00-06:00	Day Time 07:00 – 22:00	Night Time 22:00-07:00
Residential area (A)	55	45	55	45
Commercial area (B)	65	55	70	70
Industrial area (C)	75	65	70	70
Silence zone (D)	50	45	55	45

*: The standards highlighted in green for each respective Area/Zone are the most stringent based on a comparison between local and international regulations and thus shall be applicable for the proposed project.

* In instances where baseline noise levels are already exceeding the standards above, it will need to be ensured that the project activities do not cause an increment of more than 3 dB(A) from the baseline noise levels.

Table 2-6: Environmental Quality Standards for Municipal & Liquid Industrial Effluents (mg/l - unless otherwise specified)[1]

S/No.	Parameter	PEQS Standards (Wastewater discharge Into Inland Waters)	FAO Guidelines for Threshold Levels of Trace Elements for Agriculture Use[2]	EU Council Directive, 91/271/EEC, Urban Wastewater Discharge directive[3]
1	Temperature or Temperature Increase	≤3°C	-	-
2	pH Value	6-9	-	-
3	BOD at 20°C	80	-	25
4	COD	150	-	125
5	TSS	200	-	35
6	TDS	3500	-	-
7	Grease and Oil	10	-	-
8	Phenolic compounds (as phenol)	0.1	-	-
9	Chloride	1000	-	-
10	Fluoride	10	1.0	-
11	Cyanide	1.0	-	-

[1] https://epd.punjab.gov.pk/system/files/Punjab%20Environmental%20Quality%20Standards%20for%20Muncipal%20And%20Liquid%20Industrial%20Effluents%20final_0.pdf

[2] http://www.fao.org/3/T0551E/t0551e04.htm

[3] https://www.adb.org/sites/default/files/project-document/60815/42408-033-aze-iee-05.pdf

12	An-ionic detergents	20	-	-
13	Sulfate	600	-	-
14	Sulfide	1.0	-	-
15	Ammonia	40	-	-
16	Pesticides	0.15	-	-
17	Cadmium	0.1	0.01	-
18	Chromium (trivalent and hexavalent)	1.0	0.1	-
19	Copper	1.0	0.2	-
20	Lead	0.5	5.0	-
21	Mercury	0.01	-	-
22	Selenium	0.5	0.02	-
23	Nickel	1.0	0.2	-
24	Silver	1.0	-	-
25	Total Toxic Metals	2.0	-	-
26	Zinc	5.0	2.0	-
27	Arsenic	1.0	0.1	-
28	Barium	1.5	-	-
29	Iron	8.0	5.0	-

30	Manganese	1.5	0.2	-
31	Boron	6.0	-	-
32	Chlorine	1.0	-	-

1

3 Project Description

3.1 Project Description

69. The specific information on the proposed upgradation of roads project in Sahiwal) are provided below.

70. The sensitive receptor map for the proposed upgradation of roads project is provided as **Figure 3.1** below and the list of sensitive receptors and their respective distances from the project site is provided as **Table 3.1** below**.**

71. The proposed model roads are situated in north eastern direction of Sahiwal city. The total length of these three (03) roads which need to be upgraded is approximately 2.6 km. Roads serve 35-40% population of the area. Majority of population use the 'High street' road that increase traffic congestion in peak hours. 'High street' and 'Girls college' road are well developed roads and all roads that are marked on satellite imagery are commercialized by Municipal Corporation (MC) in 2009-2012. The aim of these proposed roads may be an alternative route for the existing population to use these roads without disturbing 'High street' traffic.

3.2 Scope of Upgradtion of Roads Project Work

72. The general step wise sequence of activities to be conducted is described below. It shall be ensured that staging of activities takes place to manage any potential impacts, including traffic management issues.

- **Road Works**

i. Cutting and removing trees (if necessary and unavoidable) within a distance of 100 ft. (30 m) and upto 2½ ft. (760 mm) in girth. to provide clear access to the construction site.

ii. Earthwork excavation in open cutting upto 5'-0" (1.5 m depth for storm water channels, drains, sullage dransin open areas, roads, streets, lanes, including under pinning of walls and shoring to protect existing works, shuttering and timbering the trenches, dressed to designed level and dimensions, trimming, removal of surface water from trenches, back filing and surplus excavated materi a disposed off and dressed with in 50ft (15m Lead)

iii. Earthwork in ordinary soil for embankments, lead upto 100ft (30m), including ploughing and mixing with blade grade or disc harrow or other suitable equipment, and compaction by mechanical means at optimum moisture

content and dressing to designed section, complete in all respects, 95% to 100% maximum modified AASHO dry density.

iv. Remove and dispose of existing bituminous surfacing. Unsuitable or contaminated base and sub-base material is also to be removed and transported to an approved disposal site.

v. Compaction of earthwork with power road roller, including ploughing, mixing, moistening earth to optimum moisture content in layers

vi. Providing and laying subbase course of crushed stone aggregate of approved quality and grade, including placing, mixing, spreading and compaction of subbase material to required depth, camber, grade to achieve 100% maximum modified AASHO dry density

vii. Providing and laying base course (WBM) of crushed stone aggregate of approved quality and grade, and supply and spreading of stone screening, including placing, mixing, spreading and compaction of base course (WBM) material to required depth, camber and grade to achieve 100% maximum modified AASHO dry density

viii. Providing and laying bituminous priming coat, using 10 lbs. kerosene oil and 10 lbs. binder per 100 Sft. or 0.5 Kg kerosene and 0.5 Kg binder per square metre.

ix. Providing and laying plant premixed bituminous carpet, base course including compaction and finishing to required camber, grade and density. 4% Bitumen (Including carriage of crushed stone aggregate/bajri

x. Providing and laying Tuff pavers, having 7000 PSI, crushing strength of approved manufacturer, over 2" to 3" sand cushion i /c grouting with sand in joints i/c finishing to require slope.

xi. Dismantling and removing road pavement, etc., including screening and stacking of by products upto one chain lead (30 metre).

xii. Providing and laying road edging of 3" (75 mm) wide and 9" (225 mm) deep brick on end, complete in all respects.

xiii. Painting Traffic Lanes 5" wide (125mm), (1.5 mm thick), with thermoplastic (TP) Paint including Glass Beads, complete in all respect.

xiv. Road Lights & Accessories for Flood Light Installation

- **Alongside Storm Drainage Work**

i. Earthwork in excavation of drains, irrigation channels through excavator / drag lines in all kind of soil and conditions (dry, wet slush, and under water) including its disposal and preparation of working pad for operation of machinery.

ii. Laying of reinforced cement concrete (including prestressed concrete), using coarse sand and screened graded and washed aggregate, in required shape and design, including forms, moulds, shuttering, lifting, compacting, curing, rendering and finishing exposed surface

iii. Fabrication of mild steel reinforcement for cement concrete, including cutting, bending, laying in position, making joints and fastenings, including cost of binding wire and labour charges for binding of steel reinforcement

iv. Brick work in foundation and plinth

v. Laying of expansion joint of neoprine strip 4"x¼" (100 mmx 6 mm) and plastic bitumen

vi. Providing and fixing,6"(150mm) thick R.C.C manhole cover 550mm (22") i/c C.I frame weighing 37.324 Kg

3.3 Project Need

73. The construction of project roads will provide improved and efficient transportation services to the people of the area and those travelling in Sahiwal city. The construction of roads will encourage communities to move toward project area. Migration of communities would lead to development of infrastructure like hospital, market, educational centers and business centers. The project will add to the overall social development of the area. The infrastructure of road related and other business activities will get a boost thereby resulting in employment opportunities and numerous social benefits for the people.

74. Thus, the proposed scope of works needs to be implemented on an urgent basis with the population and traffic projections over different time periods.

3.4 Project Components

75. The components of the proposed project include repairs, installation of electrical lightining system and strom drainage of the following roads:

I. Construction of Fateh Sher Road from High Street Road to Old Civil Line Road, Sahiwal (3708 ft)

II. Construction of Main Market Road from Garvi Wala bridge to Fateh Sher Road, Sahiwal (2330 ft)

III. Construction of Mall Mandi Chowk to Main Market Road, Sahiwal (2160 ft).

Figure 3-1: Road Work Plan

3.5 Project Construction Schedule

76. The project construction phase is expected to last for a total of three months with the activity expected to commence in the first quarter of 2021 and completed in three months' time.

3.6 Construction Camps and Work Force

77. The construction activity has to span over approximately three months. There shall be a number of contracts for a variety of works. The selected Contractor shall have the option to select suitable site(s) located near the project sites to establish his labor camps. If private land is selected, the Contractor shall enter into contract with the private owner.

78. Essential for the work bases is easy approach, availability of a suitable place for temporary storage of material and availability of water for construction in the vicinity. Presence of shade from trees close to the work bases can add to the comfort of the labor while taking rest during the hot season.

79. The location of storage materials and camps will be critical. Since the project contractor(s) will be responsible for identifying the suitable locations for storage and labor camps from the private sector, thus there will need to be clear guidelines for this process, which will need to be closely monitored by the implementing agency. As far as possible, the project design team shall be assigned the task to identify the suitable location(s) for storage of materials since inappropriate storage of materials may result disruption of the traffic movement.

3.7 Machinery Requirement

80. For storing materials, stocking equipment and parking machinery and vehicles, the Contractor shall require open and accessible sites close to the labor camps. The Contractor, at his own expense, but keeping in view his contractual obligations to honor the applicable national and international guidelines regarding level of pollution, shall make the arrangements.

3.8 Climate Risks from Project

81. The excavation of construction material, vehicles, camps, asphalt and batching plant is likely to generate dust and exhaust emissions such as Carbon Monoxide (CO), Carbon Dioxide (CO_2), Sulphur Oxides and Nitrogen Oxides. During these activities, local air quality may decline as a result of gaseous and particulate emissions from vehicle movements on and off site. Movement of the machinery and soil excavation will release particulate matter and fugitive dust which will deteriorate ambient air quality in the project site vicinity. The construction work is not likely to impact the climate of the area; however, it is likely to cause GHG emissions from above mentioned sources.

82. Urban flood can possibly happen, particularly during the monsoon season, due to inadequate storm and sewer system within the city. Heavy storm induced urban flood happens to a small degree in Sahiwal. Floods of Sahiwal in the past were triggered by extreme rainfall events.

83. The climate change will impact on the intensity of rainfall of various durations. Extreme event analysis requires long term (normally longer than 30 years) observed data. However, except daily data, no long-term sub-daily rainfall data was

available for Sahiwal. The climate change impact on extreme rainfall events was thus carried out for the daily data based on the GCM daily outputs ensemble. The climate change impacts for other durations were then derived based on a statistical relationship built on the observation of a given duration to daily data.

84. The construction work is not likely to impact the climate of the area; however, it is likely to cause GHG emissions from above mentioned sources.

85. No climate data was available for Sahiwal, so its storm capacity was evaluated using the average rainfall data from Lahore and Multan. Based on CRVA engineer's calculation, the estimated baseline 5 ARI maximum hourly rainfall (18.56 mm) produces 1494 MGD of storm water. The present absorption capacity of the drain system is 114 MGD. The CRVA engineer report indicated that would cause 0.3 meter deep flood water level in for certain period until water recedes at downstream points. On average, climate change will enhance the storm intensity by about 14% (range from 10% to 25%) by 2050; and by 22% (range from 14% to 49%) by 2100. Even though serious flood rarely takes place in Sahiwal, the short-period urban water ponding may become a serious issue for Sahiwal.[4]

3.9 Sensitive Receptors

86. Upgradation of road works in Sahiwal is divided into following three sections:

- Mall Mandi Chowk to Main Market Road
- Main Market Road from Garvi Wala Bridge to Fateh Sher Road
- Fateh Sher Road from High Street Road to Civil Line Road.

87. The sensitive receptors details are given in the table below.

Table 3-1:Sensitive Receptors Fateh Sher Roads Sahiwal

Sr No	Type of Sensitive Receptor	Name	Coordinates	Distance from Road (Meter)
1	Education	The Educator Boys Campus	30°40'22.2"N 73°06'19.9"E	3 m
2		The Educator Girls Campus	30°40'25.3"N 73°06'26.1"E	2 m
3		Govt Girls Islamia High School	30°40'34.7"N 73°06'17.7"E	5 m
4		Bloom Field Hall School	30°40'36.1"N 73°06'22.5"E	10 m
5		Tariq Bin Ziyad School & College	30°40'38.8"N 73°06'29.4"E	6 m
6		Multan Law College	30°40'30.6"N 73°06'31.9"E	12 m

[4] ADB, *Climate Risk and Vulnerability Assessment (CRVA), Pre-Feasibility for Sialkot and Sahiwal Cities*, December 2015.

7		The Educator Boys High School	30°40'31.7"N 73°06'53.8"E	4 m
8	Health	Winson Hair Clinic	30°40'23.3"N 73°06'19.6"E	3 m
9		Laser Eye Clinic	30°40'24.1"N 73°06'22.2"E	2 m
10		Care Health Pharmacy	30°40'23.4"N 73°06'24.0"E	2 m
11		Dr Anwar ul Haq Shaikh Clinic	30°40'31.0"N 73°06'50.3"E	4 m
12		Aasher Hospital	30°40'38.9"N 73°06'27.8"E	7 m
13		Langrial Hospital	30°40'38.9"N 73°06'26.9"E	6 m
14	Public Buildings	Sahiwal Chamber of Commerce	30°40'25.0"N 73°06'30.2"E	8 m
15		PTCL Exchange	30°40'27.0"N 73°06'38.9"E	10 m
16		Excise and Taxation Office	30°40'29.0"N 73°06'44.3"E	4 m
17		E Sahulat Office	30°40'28.3"N 73°06'37.2"E	2 m
18	Religious	Masjid Khair ul Bashar	30°40'32.8"N 73°06'54.5"E	1 m
19		Ayub Masjid	30°40'35.2"N 73°06'33.6"E	1 m
20		Masjid Ibrahim	30°40'33.3"N 73°06'32.2"E	7 m

Figure 3-2: Sensitive Receptor Map of Upgradation of Road Works

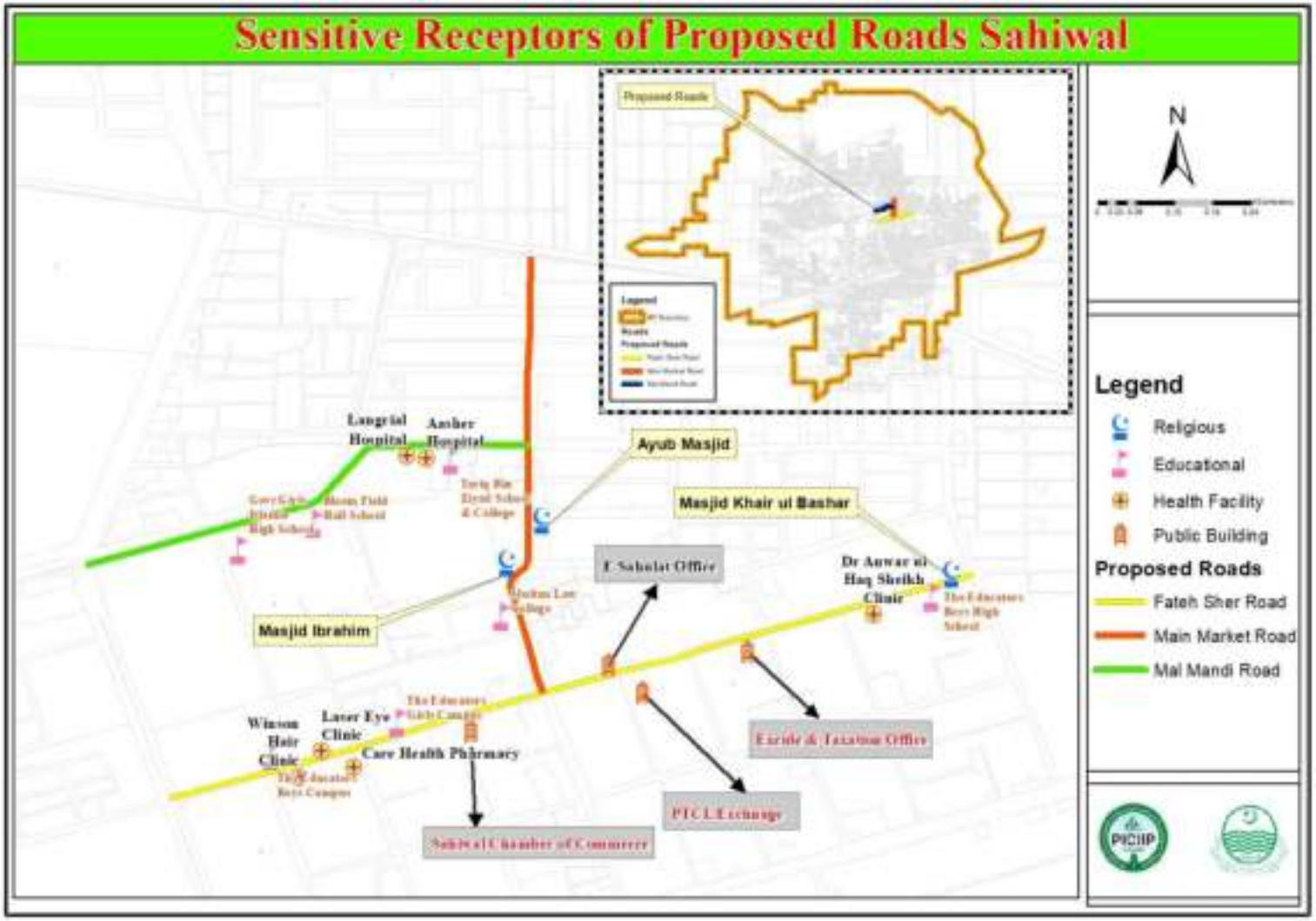


Figure 3-3: Sensitive Receptors on Proposed Roads in Sahiwal on Google image

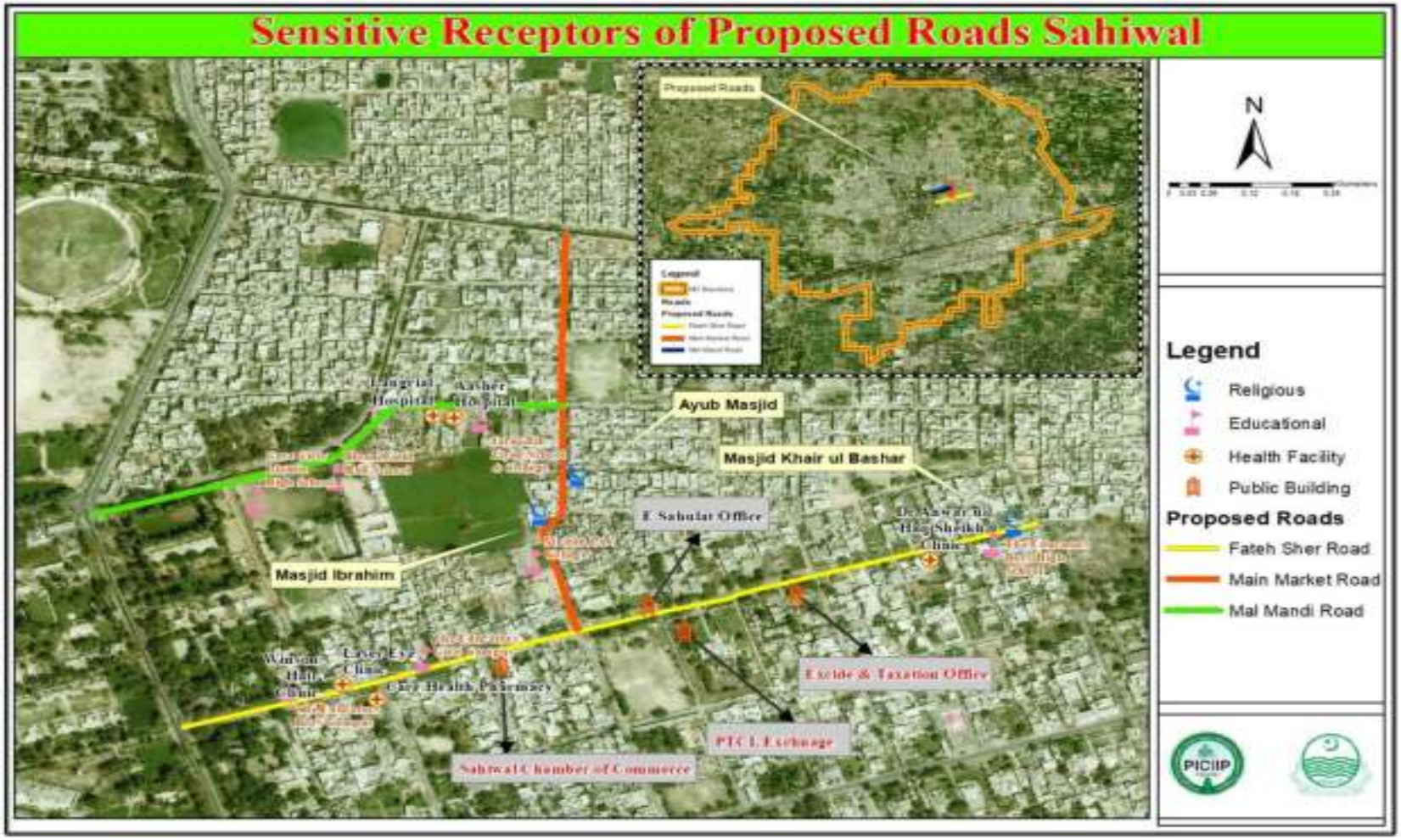


Figure 3-4: Proposed Project Roads Sites

Figure 3-5: Layout Plan of MALL MANDI CHOWK to MAIN MARKET ROAD

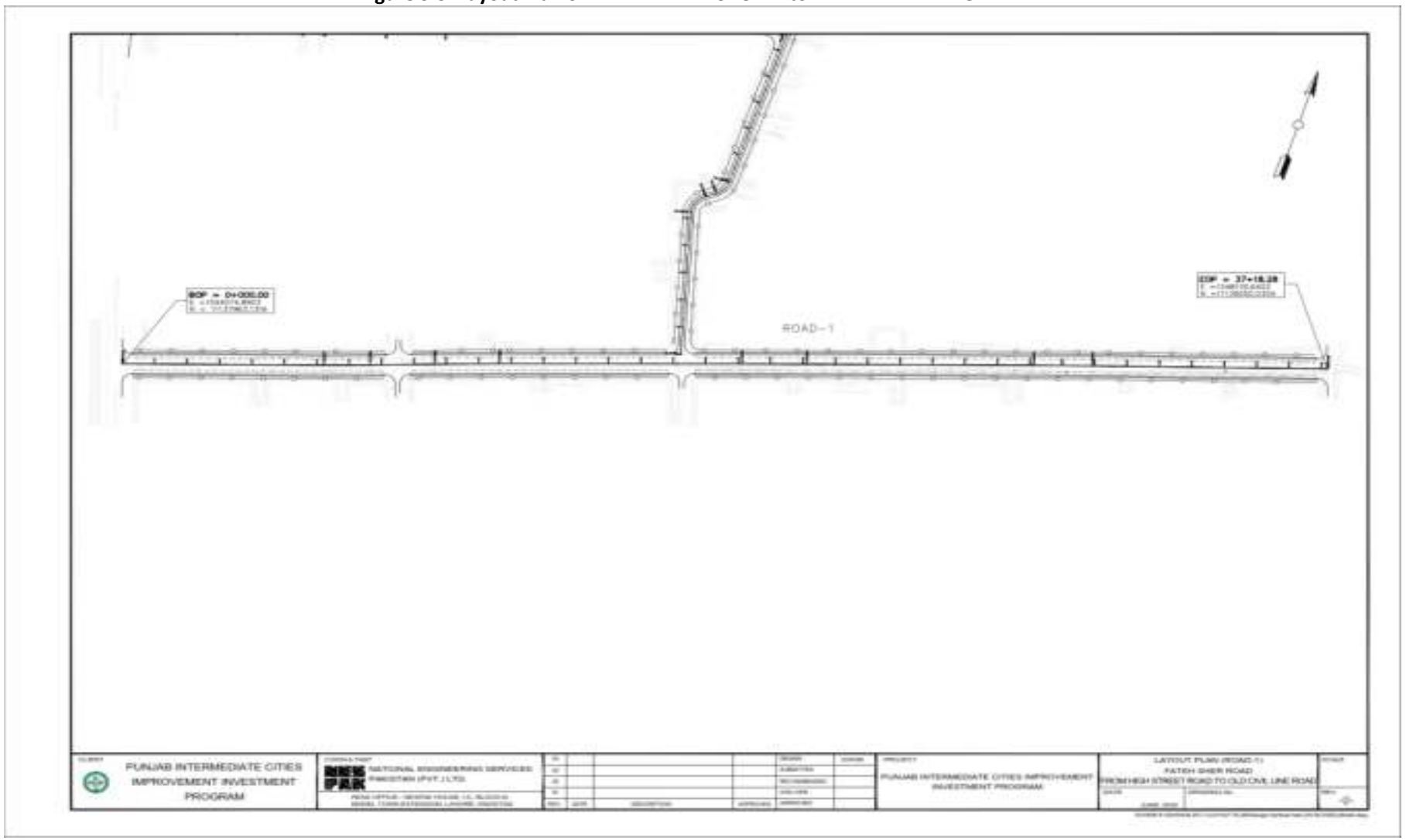


Figure 3-6: Layout Plan of R MAIN MARKET ROAD from Garvi Wala Bridge to FATEH SHER ROAD

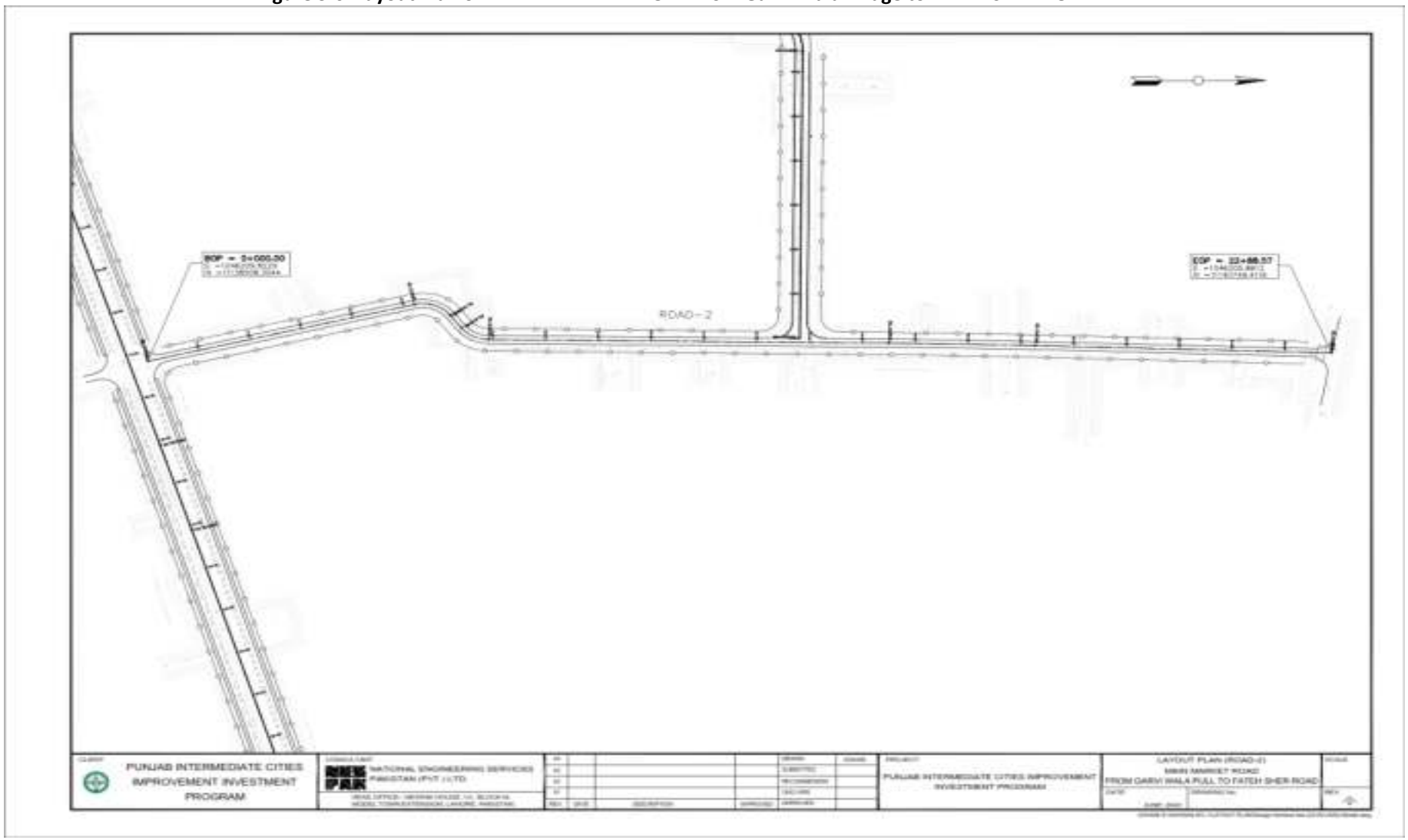
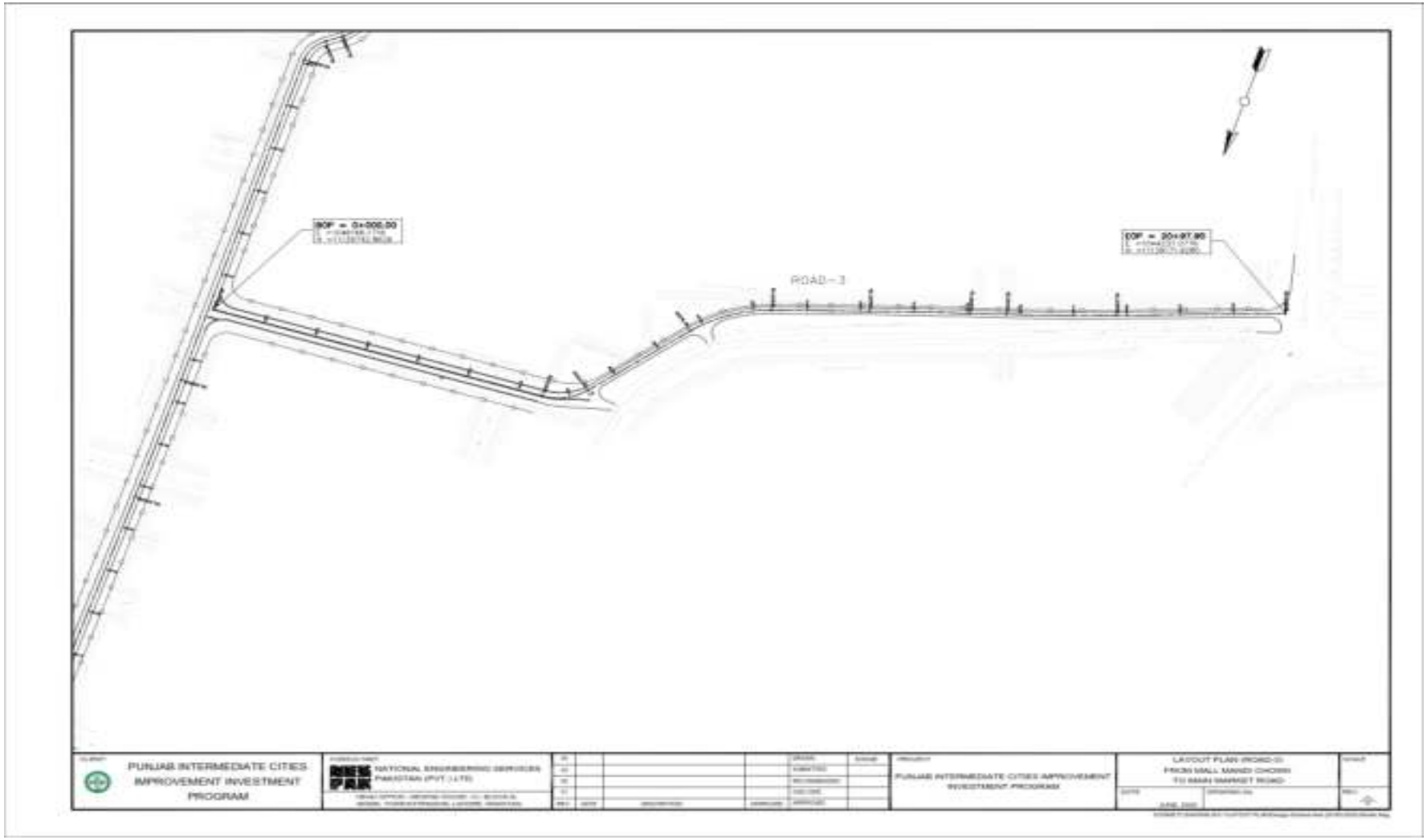


Figure 3-7: Layout Plan of Road FATEH SHER ROAD from HIGH STREET ROAD to CIVIL LINE ROAD



4 Description of Environment

88. This chapter describes the baseline environmental and social conditions of the project area for the proposed upgradation of road works. The project area's environmental conditions will describe the various resources which could be affected by the economic development that takes place i.e. physical resources (atmospheric conditions e.g. ambient air quality and climate, topography and soils, surface water and groundwater quality), ecological resources (fisheries, wildlife, forests, rare and endangered species, protected areas etc.) and social resources.

4.1 Physical Resources

4.1.1 Sahiwal City Geography

89. In 2014, the estimated population in Sahiwal district was 2.37 million, out of which an estimated 1 million (42 percent) was urban while at an average provincial fertility rate of 1.93 percent, the district's projected population till 2035 is 3.5 million.

90. Sahiwal town is situated about 29 km from the left bank of the river Ravi, 187 km west of Lahore and 200 km east of Multan. The Grand Trunk Road and the main railway line pass through the town; they also connect Peshawar and Lahore with Karachi. The Lower Bari Doab Canal separates the town into two parts. Its approximate height is 152 m above sea level. Sahiwal lies at 30°39'52.16" N latitude and 73°6'30.54" E longitude.

91. Geologically, the area does not have any outstanding features. Saltpeter, which is made from saline earth called kallar, is found when the water table is high. In the east of the town, there can be found common salt mixed with a lesser quantity of sulfate of soda and a very small quantity of lime and magnesium salt.

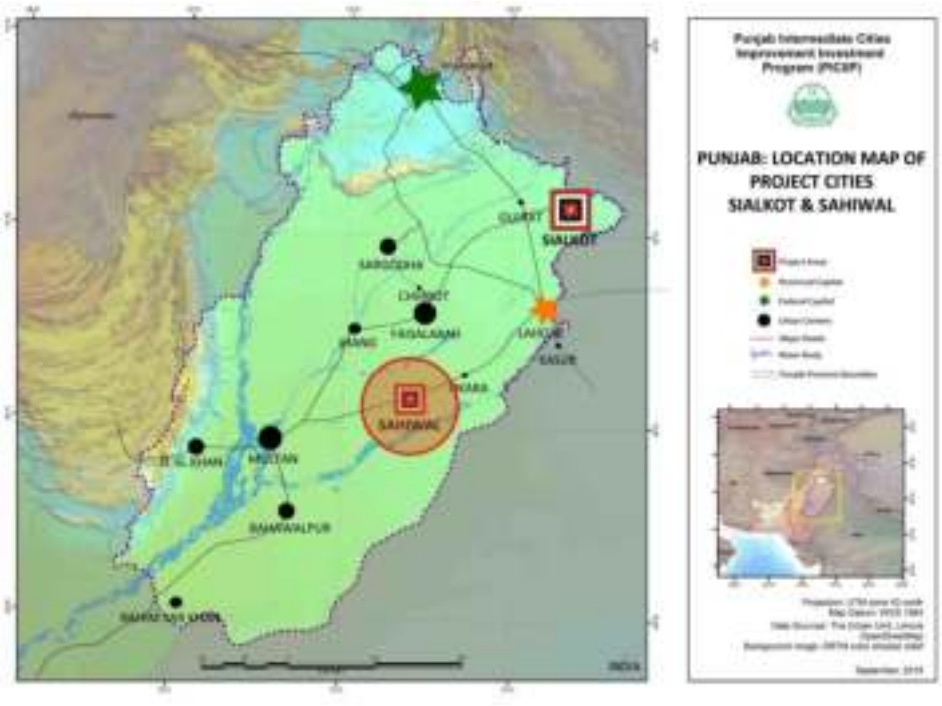
92. The topography of Sahiwal consists of a flat semi-arid plain that is fertilized using its extensive irrigation canal. The Lower Bari Doab is the main source of irrigation in the area and it is fed by a link from the Chenab river. From a topographical point of view, the semi-arid plain is remarkably homogeneous. The only noticeable relief is that of the flood plain bluffs and the belts of ravines and land that were formed by gully erosion along the Lower Bari Doab and its distributaries. Generally, the natural slope runs northeast to southwest. On the whole, the area is flat.

4.1.2 Natural and Climate Conditions of Sahiwal

93. In general, Sahiwal has the same basic natural and climatic conditions that prevail in Punjab. The climate in most of the area is arid to semi-arid, characterized by four district seasons in a year: winter from mid-November to February; spring from mid-March and April; summer from May to mid-September; and autumn from mid-September to mid-November.

94. Punjab's terrain is one of relatively low-lying plains, with several rivers that traverse the area from the northeast to the southwest and feed into the Indus river. The Ravi river is closest to Sahiwal, but it is still a distance of nearly 20 km. There is no history of the city being threatened by floods. The most challenging weather phenomenon in Sahiwal is the winds called 'Loo', which blow during the day in the predominately hot and dry summer.

Figure 4-1: Location Map of Sahiwal



95. The dust from the dry parched earth rises, the air becomes laden with it, and out-door work is difficult. Trees shed their leaves to avoid the loss of moisture and where there is no canal or well, the countryside presents a very dreary aspect. Occasionally, the hot weather is broken by thunderstorms and dust storms. The heavy rainfall, which the thunderstorms bring, and light rain, which follows the dust storm, produces a slight decrease in temperature. This temporary relief from the excessive heat is welcomed.

96. June is the hottest month with a mean daily maximum temperature of 42.4°C. January is the coldest month with the mean daily minimum temperature of 4.4°C. The **Table 4.1** shows the mean daily maximum and minimum temperatures of Sahiwal district.

4.1.3 Rainfall

97. Average annual rainfall ranges between 97 mm and 261 mm. The maximum rainfall (about 60 percent of the total annual rainfall) occurs during the monsoon season (July, August and September), while the period of minimum rainfall or drier period is October and November. The **Table 4.2** shows the mean monthly rainfall data for Sahiwal district.

4.1.4 Humidity

98. July, August and September are the most humid months in the area. May and June are the least humid. The **Table 4.1** shows the average monthly relative humidity in Sahiwal district.

Table 4-1: Mean Monthly Maximum and Minimum Temperature of Sahiwal district

Month	Mean Monthly Maximum (°C)	Mean Monthly Minimum Temperature (°C)
January	19.7	5.4
February	22.8	8.4
March	28.3	13.5
April	35.2	19.2
May	40.4	24.4
June	41.4	27.7
July	38.4	28.1
August	37.8	27.2
September	36.2	24.4
October	34.6	18.1
November	28.6	10.8
December	22.4	6.4

Annual	**32.2**	**17.8**

Table 4-2: Meteorological Data, Mean Monthly Precipitation of Sahiwal district

Month	Mean Monthly Precipitation (mm)
January	12.0
February	12.0
March	17.0
April	6.0
May	7.0
June	23.0
July	74.0
August	75.0
September	25.0
October	1.0
November	2.0
December	7.0
Annual	**261.0**

4.1.5 Wind Direction

99. Sahiwal is situated in southwest Punjab and is influenced by monsoon winds throughout the year. In winter, the wind blows from the north and heads east. In summer, the wind direction is southwest. However, these wind directions are usually disturbed by cyclones, which cause the temperature to drop and low-pressure systems to set in. This situation prevails in autumn. The Wind rose for Sahiwal is provided as **Figure 4.2** below.

4.1.6 Ambient Air Quality

100. Ambient air quality was continuously monitored for 24 hours at Fateh Sher Road, Sahiwal. The pollutant concentration parameters being exceeded are $PM_{2.5}$ and PM_{10}.

101. The rationale behind selecting only one monitoring location is due to the close proximity of the work sites, which essentially fall under the same air shed in the

project area. A representative monitoring location was selected for the sampling that is a central point of all three proposed project roads.

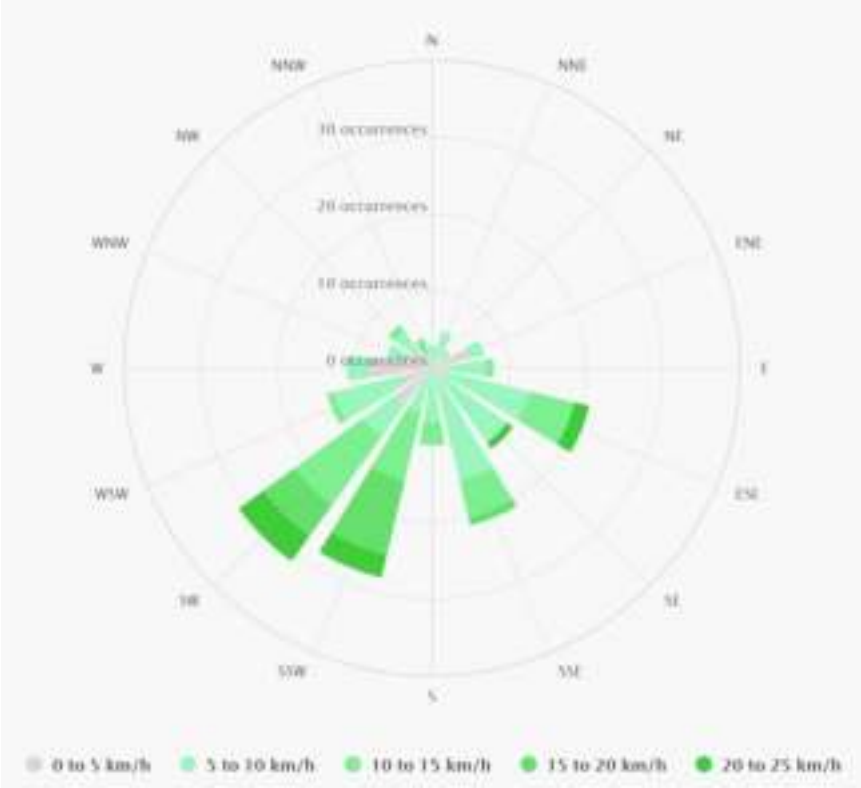
102. The ambient air quality in the project areas is presented as **Annexure H.** All the results are within the permissble levels.

4.1.7 Noise Levels

103. The ambient noise levels were also monitored at Fateh Sher Road. The results of the noise monitoring are provided in **Table 4.5** below. As can be observed, the daytime noise levels of 62 dB are within the permissible level of 65 dB while the night time reading of 57 is exceeding the permissible limit of 55 dB. The project corridors are commercial areas and thus the noise guidelines for commercial areas have been used for comparison against the baseline noise levels.

104. The three project corridors are all identical in terms of sensitivity and the nature of traffic and noise producing sources, both during the day and night times. Due to this reason, only one location was monitored since it was considered representative for all three project corridors. The detailed noise level results are provided as **Annexure H.**

Figure 4-2: Wind Rose for Sahiwal[5]



[5] https://www.meteoblue.com/en/weather/archive/windrose/sahiwal_pakistan_1166548

Figure 4-3: Map of Monitoring Location

Table 4-3: Comparison of ambient air quality results versus applicable Air Quality standards

Monitoring Location	Parameter	NO (ug/m^3)	NO_2 (ug/m^3)	CO (ug/m^3)	SO_2 (ug/m^3)	NOx (ug/m^3)	$PM_{2.5}$ (ug/m^3)	PM_{10} (ug/m^3)	TSP (ug/m^3)
Applicable Guideline (ug/m^3) for 24 hrs		-	**80**	-	**20**	-	**25**	**50**	**500**
Fateh Sher Road	**Average**	10.3	16	1.3	11	28.7	29.4	123	336

'Exceeding' applicable guidelines for acceptable pollutant levels **'Within' applicable guidelines for acceptable pollutant levels**

Table 4-4: Ambient Noise Monitoring Results (24 hrs) in Project Area

Monitoring Location	Parameter	Noise Reading Results	Noise Guideline (Commercial Area)	Compliance Status for Commercial Areas
Day Time Readings (0600 to 2200)			**Day time**	
Fateh Sher Road	dB(A) Leq	**62**	65	
Nighttime Readings (2200 to 0600)			**Night time**	
Fateh Sher Road	dB(A) Leq	**57**	55	
Average Noise Levels (24-hour average)	dB(A) Leq	**59.5**		

Exceedance from applicable guidelines

'Within' applicable guidelines

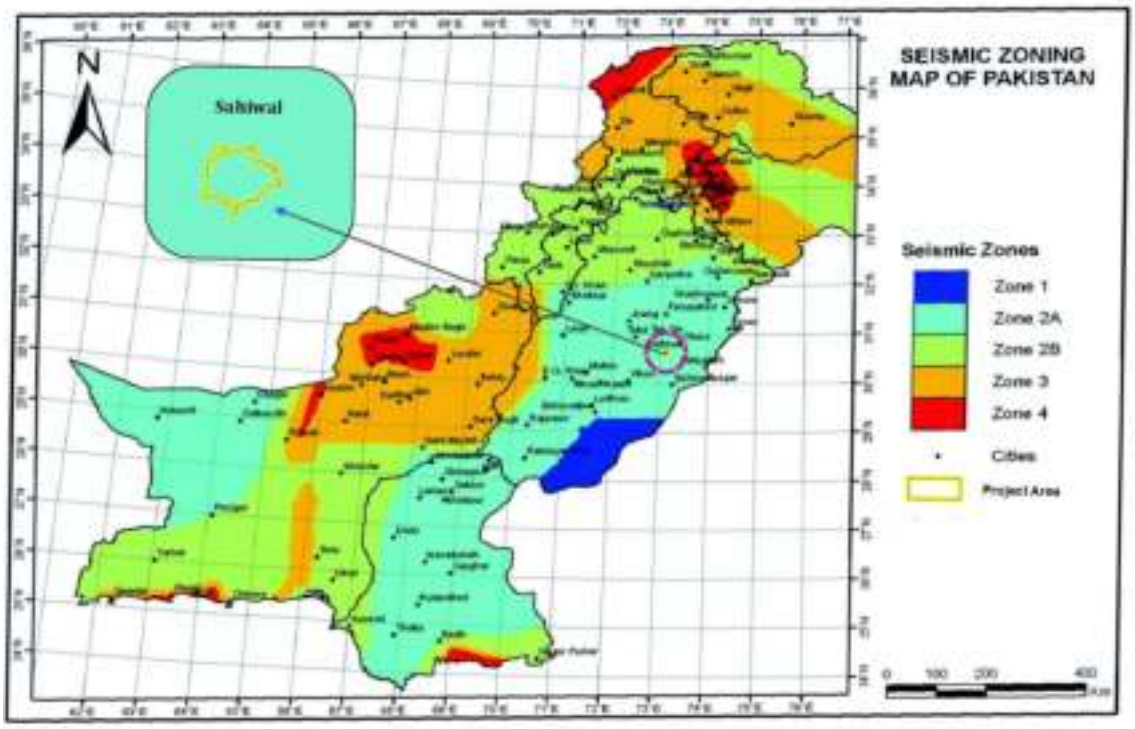
Table 4-5: Meteorological Data, Mean Monthly Relative Humidity

Month	Mean Monthly Relative Humidity (%)
January	62.3
February	56.3
March	51.6
April	40.0
May	33.2
June	39.9
July	56.0
August	59.7
September	56.3
October	51.6
November	61.4
December	66.6
Annual	**52.9**

4.1.8 Seismicity

105. Pakistan lies in a seismically active zone. Seismic observations indicate that hundreds of shocks occur in the region every year. According to the seismic zoning map of Pakistan, included in Pakistan Building Code Seismic Provisions (2007), the project area falls under seismic zone 2A, with a peak horizontal ground acceleration of from 0.08 to 0.16. The seismic zoning map of Pakistan is given as **Figure-4.3** below.

Figure 4-4: Seismic Zoning Map of Pakistan



4.1.9 Groundwater

106. Groundwater is the sole source of potable water exploited in Sahiwal. The water table averages about 12 to 15 m below ground level and the upper levels produce limited quantities of mineralized water. At a depth of between 137 and 152 meters, greater quantities of good quality groundwater are available and this is where the city‘s supplies are abstracted from. In recent years, the water table has been dropping at a rate of 0.30 meter per year. This is because of pumping, and decreased rainfall and recharge. It is not clear whether the aquifer is being overexploited but, in view of the wide dispersal of the tube wells, this is unlikely at the present level of abstraction.

107. In recent years, the water table has been dropping at a rate of one foot per year. This is due to pumping and decreased rainfall and recharge. It is not clear whether the aquifer is being overexploited but, in view of the wide dispersal of the tube wells, this is unlikely at the present level of abstraction.

Table 4-6: Groundwater Quality Analysis

Parameters	Value	Standards
pH	7.98 – 8.20	6.5 – 8.5
Turbidity, NTU	0.4 – 9.5	< 5
Total Dissolved Solids (TDs), mg/l	175 - 610	< 1,000
Fluoride, mg/l	0.06 – 0.49	≤ 1.5
Nitrate, mg/l	0.9 – 2.1	≤ 50
Arsenic, mg/l	0.025	≤ 0.05
Total Coliform, MPN/100 ml	5.1 – 16	Nil
Fecal Coliform, MPN/100 ml	5.1 -12	Nil

Source: PICIIP Feasibility Study Report, 2016

4.2 Ecological Resources

4.2.1 Flora of the Area

108. In Sahiwal district, the most important species of trees are Kikar (*Acacia Arabica*); Shisham or Tahli (*Delbergia sissoo*); Beri (*Zizyphus jujube*); Toot (*Morus alba*); Sharin (*Albizzia lebbek*); Dherek (*Melia azeharach*); Phulai (*Acacia modesta*); Pipal (*Ficus religiosa*); and Bohr (Ficus *bengalansis*), which are planted for shade. The trees in Rakhs mainly consist of three species: Jand (*Prosopis spicigera*); Karir (*Capparis aphylla*); and Wan (*Salvadora oleoides*). Occasionally, Rero (*Acacia ieucophhloea*) and Farash (*Tamarix articulata*) are also found. The Pilchhi (*Tamarix dioica*) is found on moist sandy soils along riverbanks and is used for wicker work, and basket making, etc. Mesquite bushes and some Eucalyptus trees grow wild in the areas along the canals, roads and barren land, but natural forest cover has been significantly reduced.[6]

109. Sahiwal is a green and fertile town with 11,522 forested acres. The area's main crops are wheat, cotton, sugarcane, maize, sorghum forage and rice. Main fruits grown are citrus, mangoes and guava.

110. Sahiwal district of Indus basin plain, falls under Tropical Thorn forest type and has a hot semi-arid climate intermediating between Desert climate and Humid climate in ecological characteristics with agricultural potential. The climate tends to have hot, sometimes extremely hot, summers and mild warm winters. The soil and climatic characteristics support short or scrubby vegetation which can be termed as open and

[6] https://www.urbanunit.gov.pk/Upload/ProjectDocument/PASDP%20Sahiwal.pdf

pronouncedly of xerophytic nature in which thorny leguminous species predominate. However, commonly found vegetation (Trees, Shrubs, Grasses) of project as well as study area include species given in the **Tables 4.7** to **4.9** below.

Table 4-7: Name of Trees

S. No.	Common Name	Scientific Name	IUCN Status
1	Kikar	*Acacia nilotica*	NA
2	Shisham	*Dalbergia sisso*	NA
3	Simal	*Bombax ceiba,*	NA
4	Sufeda	*Eucalyptus species*	NA
5	Frash	*Tamarix articulate*	NA
6	Neem	*Azedarachta indica*	NA
7	Jaman	*Syzygium cumini*	NA
8	Bakain	*Melia azedarach*	NA
9	Ber	*Zyziphus mauritiana*	NA
10	Toot	*Morus alba*	NA
11	Lasura	*Cordia myxa*	NA
12.	Sukh Chaen	*Pongamia glabra*	LC
13.	Mesquite	*Prosopis juliflora*	NA
14.	Date Palm	*Phoenix dactylifera*	NA

NA= Not Assessed LC= Least Concern

Table 4-8: Name of Shrubs and Herbs

S. No.	Common Name	Scientific Name	IUCN Status
1	Akk	*Calotropis procera*	NA
2.	Phog	*Calligonum polygonoides*	NA
3	Jantar	*Sesbania aculeate*	NA
4	Bathu	*Chenopodium botrys*	NA
5	Lana	*Suaeda fruticosa*	NA
6	Arind	*Ricinus communis*	NA
7	Piazi	*Asphodelus tenuifolius*	NA

NA= Not Assessed

Table 4-9: Name of Grasses

S. No.	Common Name	Scientific Name	IUCN Status
1	Khabbal	*Cynodon dactylon*	NA
2	Dab	*Desmotachya bipinnata*	NA
3	Khawi	*Cymbopogan jwarancusa*	NA
4	Kana	*Saccharum munja*	NA
5	Gorkha	*Elionorus hirsutus*	NA
6	Kai	*Saccharum spontaneum*	LC

NA= Not Assessed, LC= Least Concern

111. No impact on vegetation is expected since cutting of trees on the project site will not be permitted. There are only minor shrubs and bushes that will be cleared up, if felt necessary, during the site preparation stage of the project.

112. **Existing Trees in Project Area:** The project area is flat agricultural land which supports trees of various species on the boundary of agricultural fields as well as individually scattered growth. Trees (girth 61 cm and above) and pole crop (girth 20 to 58 cm) standing within the project area were enumerated along with their kind of species. The details of trees present in the project area is given in **Table-4.10** below.

113. It should be mentioned that no trees are located within the construction Right of Way (RoW), while the trees observed in the project area in **Table 4.10** below will not require removal during the construction works.

Table 4-10: Species Wise Tree Distribution

Sr. No.	Species	No. of Trees		
		Poles (girth 20 to 58 cm)	Trees (girth 61 cm and above)	Total
1	Kikar	5	12	17
2	Shisham	8	10	18
3	Toot	7	13	20
4	Miscellaneous	5	7	12
	Total	**25**	**42**	**67**

Miscellaneous includes Sukh Chaen, Lasura, Jaman, Neem, Date Palm

4.2.2 Fauna of the Area

114. The common fauna found in Sahiwal city include the jackal; jungle cat; Bengal fox; small Indian mongoose; shrew; hog deer; ravine deer; black buck; blue bull; wild hare; and rodent pests, including porcupine; fruit bats; and wild boar. The avifauna that has survived the modified habitat include doves; black partridge; cuckoos; koel; woodpeckers; parakeets; bulbuls; babblers; black drongo; bee eaters; finches; owls; hawks; and house sparrow. The reptilian species of this modified habitat include krait; cobra; saw scaled viper; rat snake; and monitor lizard.

115. In these modified habitats, due to the extensive use of pesticides in these areas, the winter bird species from the Himalayas have been reduced, since these species feed on the insects. These birds play an important role in controlling insects, particularly in the forests.

116. Scavengers, such as, jackals are attracted to garbage dumps and human faeces for food. House sparrows breed in houses. Bank mynas and cattle egrets feed on grasshoppers that are present in the rangelands that also support cattle and buffalos.

Banyan and peepal trees still grow in the villages. Green pigeons and barbets feed in these trees.

117. Some of the oldest trees still stand in the old British-era colonies. Some rare species of birds, such as hornbills, green pigeons, and barbets still live on these trees. Large populations of pigeon breed in urban houses. Kites, crows, mynas, house sparrows and alexandrine parakeets breed in urban areas. Shisham and acacia trees are usually planted along the roads and canals. Doves mainly breed on these types of trees.

118. The extent of fauna presence is related to the availability of vegetative cover in an area. Since the project area is basically agricultural supporting chunk of land without any dense forested area nearby, it lacks richness in natural fauna. No conspicuous wildlife was observed in the area during field visit However, mammals and birds reported in the project area, are given in **Tables 4.11** to **4.14** below[7].

Table 4-11: Names of Mammals

S. No.	Common Name	Scientific Name	IUCN Status
1	Jackal	*Canis aureus*	LC
2	Fox	*Vulpus bengalensis*	NA
3	Porcupine	*Hystrix indica*	LC
4	Squirrel with strips	*Funambulus pennanti*	NA
5	Mouse	*Mus musculus*	LC
6	Mongoose	*Herpestes auropunctatus*	NA
7	Indian Hare	*Lepus nigricollis*	LC

NA= Not Assessed, LC= Least Concern

Table 4-12: Names of Reptiles

S. No.	Common Name	Scientific Name	IUCN Status
1	Cobra	*Naja naja*	NA
2	Spiny tailed Lizard	*Uromastyx hardwickii*	NA
3	Fringed Toed Lizard	*Acanthodactylus cantoris*	LC
4	Indian Krait	*Bungarus caeruleus*	NA

Table 4-13: Names of Amphibians

S. No.	Common Name	Scientific Name	IUCN Status
1	Common Frog	*Rana tigrina*	LC
2	Common Toad	*Bufo bufo*	LC

[7] https://www.urbanunit.gov.pk/Upload/ProjectDocument/PASDP%20Sahiwal.pdf

119. The area is comparatively dry and does not support wide variety of birds. The common species found in the project area are enlisted in **Table-4.13**.

Table 4-14: Names of Birds

S. No.	Common Name	Scientific Name	IUCN Status
1	House Sparrow	*Passer domesticus*	LC
2	Mynah	*Acridotheres tristis*	LC
3	House Crow	*Corvus splendens*	LC
4	Pigeon	*Columba livia*	LC
5	Koel	*Eudynamys scolopacea*	LC
6	Red-Wattled Lapwing	*Vanellus indicus*	LC
7	Gray Partridge	*Francolinus Pondicerianus*	LC
8	Quail	*Coturnix coturnix*	LC
9	Red Vented Bulbul	*Pycnonotus cafer humayuni*	NA
10	Little Bittern	*Ixobrychus minutus*	LC
11	Hoopoe	*Upupa epops*	LC
12	Ring Necked Dove	*Streptopelia decaocto*	LC
13	Little Egret	*Egretta garzetta*	LC

120. On account of anthropogenic interventions mainly agriculture, no habitat is left to support much of wildlife in the project area. None of the existing species of plants or animals, therefore, are of endangered category.

4.2.3 Protected areas / National Sanctuaries

121. In Pakistan, there are several areas where land is devoted to the preservation of biodiversity, through the dedication of national parks and wildlife sanctuaries. There is no protected area or national sanctuary near the area where works will take place on the sub-project.

4.3 Socio-Economic Development

122. Before the introduction of the canal system, Sahiwal was an area of barren land. However, owing to irrigation, it has become very fertile. The real achievement occurred when the Lower Bari Doab canal was constructed in 1913. Later, the Deepalpur and

Pakpattan canals brought almost the entire district under irrigation. Now, the district is one of the most fertile areas of the province and a leading grower of cotton.

123. In the early days, the town had been declared a congested area. Due to an influx of refugees from India and also to recent industrialization, it has attracted a considerable number of people. Consequently, two new sub-towns have cropped up beside the old part of the town.

124. There is a new Abadi on the eastern side of the old town and a modern satellite town, known as Farid Town, on the northwestern corner. At the time of its establishment, the area of the original town of Sahiwal was small. However, it grew with the passage of the time, and is now its total area is about 19 square kilometers. The city's major growth took place during the post-1947 period. However, the trend of this growth, even during this period, has largely been in a northerly direction. The city could not grow to the south, perhaps due to the obstruction of Railway line, and the Lower Bari Doab Canal and its distributaries. The city has also spread out toward the east in what appears to have been the result of forced development.

125. Due to this industrial development and the land's fertility, the city began to flourish and emerged as a place that attracted in-migration. In short, Sahiwal became a place where people wanted to reside. During the decades of 1911-1921, and 1921-1931, the city attracted the highest ever percentage of people. During these decades, the population growth rate was 79.7 percent and 79.3 percent, respectively.

126. The city also became important from a business point of view. It is situated at the point from where all types of communication are available to connect it and its people with the rest of the province and with the larger country as well. A great change has occurred in its economic structure, as it transitioned from an agricultural to an industrial economy. The town is now a commercial one, with a shopping center that caters to both the town people and also to those living in nearby localities.

4.3.1 Land Use and Settlements Pattern

127. Land use includes residential, commercial, industrial, recreational, and institutional activities, among others. A suitable arrangement of the physical elements of land use ensures that a town offers convenience, health and a better quality of life. The city comprises buildings, transportation channels, utilities, social services, and also vacant land, which may be used for agricultural purposes.

128. In August 1972, the Punjab's Housing and Physical Planning Department began a land-use study of Sahiwal city, which it completed in September the same year. Out of the

total area surveyed, the largest portion of the city consisted of undeveloped area that accounted for 41.70 percent of the total area surveyed. The scattered pockets of development exist within the built-up areas and also in open strips of land that were situated between various built-up belts of development that ultimately abutted the agricultural land around the city. Since the undeveloped area made up a substantial percentage of the city's surveyed area, it was considered desirable to not take this percentage into account when calculating the percentage of area given to various land uses in the city. Consequently, the survey only included the built up area, revealing that 31.31 percent was for residential use. The transportation system was second largest user of land, occupying 18.58 percent of the total built up area. Other uses include, industry (occupying 3.85 percent); open spaces (8.54 percent); commerce (1.76 percent), and health (0.74 percent). Other important users of land are canals, distributaries, transport terminals, and Government buildings, which occupy 9.64%, 7.07% and 5.28% of the built-up area, respectively.

129. As for the land use pattern, originally the city was designed to be a planned colony town, covering an area of only about 307 acres (1,242,429 m^2). The city was designed with the oval as the main focal point. The road network radiated from its center toward a city space that consisted of a mixture of residential and commercial uses. Major bazaars and residences were established in the small streets that ran off the major arteries. Functions, such as administration, education, and transportation, were situated around the commercial and residential parts of the old town. After independence, the city further developed and emerged into a major administrative industrial and commercial town. Since no comprehensive plan was devised, land in the town was given to various uses, irrespective of its suitability. These uses were mostly based on expediency rather than the principals of the land development. Consequently, the present-day city is a mixture of various and, quite often, incompatible uses. Except for the new planned colony, there has been an intensive mixing of land use, particularly among small-scale cotton factories, etc. However, for an overall pattern of land use, the city can be divided into following major zones:

Zone of Central Commercial Activities

130. This is limited to the old city and is surrounded by High Street, Railway Road, Hall Road, Masood Shaheed Road, the Deepalpur Bazar, and the few scattered roads that join this area. Development in this area of is of a ribbon type, along with its major bazaars, i.e., Pakpattan, Saddar, Deepalpur Sori Galli, and Sua Bazars, and is further extended up to Jinnah Chowk. The development of the commercial activities within this area is mainly due to historical reasons rather than to any planned effort.

131. A variety of commercial activities take place here, namely wholesale, and large specialized retail, etc., which cater to the needs of the entire city and the surrounding rural and urban areas that are concentrated in this zone. The shops usually have residential quarters, either attached to or above them, where the owner might be living. There is hardly any exception to this practice. The areas between the main streets form pockets that are filled with residential uses but, even here, it is common to see small shopping facilities scattered here and there. These bazars have developed, over the years, into their present form and will also retain this form in the future.

Zone of Mixed Land

132. The vegetable and fruit markets are also located in this area. They cause the usual nuisance to the residents and make it unattractive for living. The other uses are for restaurants, hotels, bus stands, and commercial offices. Among these, the bus stands, which cater to the needs of the city and the adjoining chaks (villages), create hindrances and chaos in the area.

Zone of Industrial Complexes

133. This zone as unlike those in the other cities of the Punjab and is located on and across the Lahore Multan Quetta (LMQ) road. The majority of the large industrial units are found in this zone, however, a few small units are also scattered throughout the city. The reasons for setting up large-scale industry here, between the railway line and the LMQ road and across the LMQ Road, are neither deliberate nor due to any planning criteria. It is the result of the cheap rates for the land and the cheap communications that serve it. However, this development is also ribbon-like, similar to the development along the LMQ road, starting from chowk Pakpattan up to the Arifwala Chowk, and further up to new powerhouse and the grid station. The presence of a 9L water distributary has further helped this area develop for industrial purposes.

Zone of Administrative and Educational Buildings

134. This zone comprises the civil lines areas, the canal colony, the Government Boys College complex and the hospital. It further extends up to the Batala School and the Government Girls College. From its beginning, the civil-lines area is at the center of the administrative functions of the city, the district and the region. It extends up to the Boy's Degree College, and the canal colony, and covers a substantial part of the built up area of the entire city. In addition to being the center of administrative functions (almost all of the government offices are situated in this area), the city's main open spaces are situated in this zone, i.e., the stadium and the racecourse.

Zone of Planned Colonies

135. The zone of the planned colonies comprises the area of the satellite town known as “Farid Town.” Its land-use character is very distinct and different from the old city. Comparatively, its residential density is very low. Both the planned colony and the canal colony were situated in their present locations due to the availability of government land.

136. To sum up, the land use of the city, as a whole, can be described as having developed out of sprawl and without any preconceived plan that could have coordinated the land of one area with that of another or with the transportation system. The result is the prevalence of chaos and unpleasant living conditions. The **Table 4.16** presents the areas and proportions of various land uses in Sahiwal:

Table 4-15: Land Use Distribution in Sahiwal

#	Land Use	Area		% of Total Area
		Acre	Sq. Km.	
1	Residential	1,143.14	4.63	36.1
2	Commercial	139.97	0.57	4.4
3	Agricultural	520.35	2.11	16.4
4	Public Buildings	357.86	1.45	11.3
5	Religious	23.32	0.09	0.7
6	Education	416.14	1.68	13.1
7	Health	18.72	0.08	0.6
8	Industry	55.97	0.23	1.8
9	Graveyard	53.34	0.22	1.7
10	Parks/Open Spaces	160.46	0.65	5.1
11	Vacant Area	175.70	0.71	5.6
12	Mixed Land use	99.97	0.40	3.2
Total Area		**3,164.94**	**12.81**	**100**

Source: Urban Unit data

4.3.2 Agriculture and Livestock

137. Agriculture is by far the main economic activity in the project area. The main crops, during Rabi, are wheat, gram, rapeseed, mustard, barley and oil seeds. During Kharif, crops include cotton, jawar, sugarcane, bajra, maize, and rice. In addition, there are subsidiary crops known as Zaid Rabi, such as Kharbooza, tobacco and potatoes, and also Zaid Kharif crops, such as potatoes and chilies. The main fruits grown are oranges, watermelon, muskmelon, guava, citrus, falsa, jaman, and pomegranate. When cultivation began, the inhabitants ate pilu and bair, the only wild fruits that grows, intermittently, in the region. With the introduction of canal irrigation,

other fruits are now being grown on a commercial basis. However, wheat, cotton, sugarcane and rice remain the major crops[8].

138. Main Crops: Sugarcane, wheat, rice, maize and cotton are the main crops grown in the area. Besides guar seed, bajra, moong, mash, masoor, jawar, oil seeds are also grown in minor quantities in Sahiwal area. Average yield of important crops in the area of study is given below in **Table 4.15**.

Table 4-16: Average Yield of Agricultural Crops

Sr. No.	Crop Name	Average Yield/Acre (kg)
1	Cotton	1,000
2	Sugarcane	20,600
3	Maize (Spring)	3,400
4	Maize (Autumn)	2,800
5	Rice	800
6	Wheat	1,400
7	Potato	9,600

139. The vegetables are grown in abundance, as the water and soil are suitable for cultivation. Crops include potatoes, carrots, ladyfingers, chilies, onions and cauliflower. Bitter gourd, turmeric and garlic are also grown to meet public demand. Other vegetables include radish, tinda (apple gourd), and bringal.

140. Fruits: Citrus, guavas and mangoes are the main fruits grown in the district. Besides, pomegranate, litchi, falsa and banana are also raised on minor scale.

141. Livestock breeding is one of the main pursuits and means of livelihood among the rural and urban population in the project site. Common livestock are sheep, goats and cows, which serve as an important source of income.

142. Fisheries: Fishery sector is not rich in district Sahiwal on account of precious fertile land for agriculture production. Not much variety of fish is found in the LBDC and other nearby water bodies, except Gulfam fish (*Cyprinus carpio*), which is basically cold-water species, but has adapted to harsh conditions. However, dependency of local people on fish as economic activity is very limited, because of the non-existence of large fish farms in the area.

4.3.3 Power

143. As with the rest of the country, Sahiwal does not have an adequate, reliable and uninterrupted 24/7 power supply. Interruptions are frequent, forcing industries, other

[8] https://www.urbanunit.gov.pk/Upload/ProjectDocument/PASDP%20Sahiwal.pdf

businesses, and many of the residents who can afford it to rely on back-up diesel generators and uninterrupted power supply systems. These are costly, environmentally degrading and generally a poor second option. Power generation and primary distribution are generally beyond a single urban center's capacity, so it is necessary to rely on provincial and national government support. Any city with reliable power enjoys an immediate competitive advantage. Solar options for institutional and residential use are increasing in popularity, but the technology has not reached the stage where it can provide the major energy source for heavier industry.

4.3.4 Industrial Activity

144. There are three industrial sites in Sahiwal district, and more than 200 industries. There is also a small industrial estate, developed by the Punjab Small Industrial Corporation. It consists of 188 plots situated on about 52 acres land. Sahiwal is famous for its cotton ginning and pressing, its tannery, textiles, leather products, garments, pharmaceuticals, flourmills, and food industry. Sahiwal is also one of Pakistan's major multi-crop areas, and many pesticide companies do business here. Major industries include, Mitchell's Fruit Farms Limited; Engro Foods Limited; Beakers Land and Sweets Factory; Ittefaq Sugar Mills Limited; Baba Farid Sugar Mills Limited; Lackson Tobacco, Philip Morris Tobacco; Fauji Fertilizer Company; Habib Oil Mill; and Aziz Leather Craft, etc.

145. Most of the larger industries, such as Engro Food, Philips Morris Tobacco, dairy product plants, and other agro-based industries are situated along Multan Road, south of the canals, and along the ribbon developments outside the municipal limits.

146. The business community of Sahiwal district earnestly felt the need to establish a Chamber of Commerce & Industry, in Sahiwal. A group of traders and Industrialists succeeded in obtaining a license from the Government of Pakistan's Ministry of Commerce. After incorporation with Security Exchange Commission of Pakistan, under Companies Ordinance 1984, the Chamber became affiliated with the Federaton of Pakistan Chambers of Commerce & Industry.

147. The primary objective in establishing the Sahiwal Chamber of Commerce & Industry (SLCCI) was to provide businessmen in the area with an opportunity to strengthen the economic growth of Sahiwal, in particular, and the country, in general. Industry growth will certainly reduce unemployment in the area.

148. The prime objective of the SLCCI is to serve its members to their utmost satisfaction. The SLCCI acts as a bridge between the government and the business

community. It plays an important role in policy formulation by maintaining a constant interaction with the relevant authorities.

4.3.5 Water Supply Service

149. The water supply is obtained from ground water and 46 tube wells. The water supply network covers 90 percent of the town and serves 90 percent of the total population. The distribution system consists of eight overhead reservoirs with a 450,000-gallon capacity. The distribution consists of a looped network made of different types of materials, including asbestos concrete, PVC, MS, and duct Iron pipes. Pipe sizes vary from 76 to 305 mm in diameter.

4.3.6 Sewerage System Service

150. The sewerage and drainage system covers 90 percent of the total area of Sahiwal through a 40 km sewerage network. Wastewater is disposed of in a nearby sewer system, which pollutes the surrounding environment and causes waterborne diseases. The residential areas are rapidly expanding to the north side of the town, and slower expansion is taking place toward the east, reducing the coverage of the facility to between approximately 20 and 30 percent.

151. Municipal wastewater is being used for irrigation purposes, according to farmers' demand, and the remaining wastewater is disposed of into rivers through drains and nullahs.

4.3.7 Solid Waste Management

152. The solid waste generation from Sahiwal city is overwhelmingly domestic and primarily organic in composition. Some industrial solid waste varies in different parts of the city. The main problems with refuse collection and disposal are old machinery, polythene bags, anti-social habits, lack of supervision, and the encroachment of open sewers.

153. Currently, there is no proper system of waste disposal in Sahiwal. Collected waste is dumped at designated dump sites, at Ratti Tibbi, without any environmental safeguards, such as segregating infectious hazardous waste produced by tanneries, slaughterhouses, and hospitals. Presently, only 32 percent of solid waste is being collected and disposed of. However, with increasing economic activity in agriculture and manufacturing, the environmental and health situation will continue to worsen in the absence of proper disposal mechanisms.

154. The Sahiwal Municipal Corporation (SMC) manages Sahiwal's existing solid waste management system. The existing solid waste collection, in general, is divided into a

primary and secondary system. Sahiwal city comprises of ten union councils, each of which has its peculiar characteristics in terms of land use the composition of waste generated. The amount of waste generated, and the extent of pollution varies from union council to union council. The allocation of sanitary staff in the union councils does not commensurate with the workload, thereby resulting in huge heaps of waste piling up on the streets and in open places.

155. There is no available data on the composition of the waste generated in the city and there is no concept of the segregation of infectious/noninfectious and hazardous/nonhazardous wastes produced by industries, slaughterhouses and hospitals.

156. The SMC has prepared a PC-1 “Integrated Solid Waste Management System in Sahiwal, the estimated cost of which is Rs 135.68 million. The aim of this project is environmental improvement by enhancing institutional capacity and improving the collection, transportation, and disposal of the city’s solid waste, hospital waste, and slaughterhouse waste.

157. Presently, the SMC’s primary waste collection is carried out by the use of handcarts and is taken to open places of heaps on roadsides, followed by secondary collection through tractor trolley, and final dumping at the Ratti Tibbi dump side. Under the present scenario, only 32 percent of solid waste is being collected, transported and disposed of.

4.3.8 Transport

158. Sahiwal city has a total road length of 40 km, of which the regional road/highway is 10 km long. There are 12 km of major roads and 18 km of branch roads. In addition to that, there are numerous streets, which crisscross the city. Also, there are about 11 important junctions in the network, out of which six are roundabouts and the remaining function as chowk.

159. Out of the total urban area of 1,652 hectares (16,515,870 m2), 55 percent offer good vehicular accessibility, 25 percent are fair, and 20 percent offer poor vehicular accessibility. Since the city is basically a planned town, numerous roads in the network are fairly wide. About 9 percent of roads are 37 meter wide, 22 percent are 34 meter wide, 20 percent are 24 meter wide, and 49 percent are 18 meter wide or less.

160. The transport infrastructure in Sahiwal is generally adequate for its existing requirements; there are relatively few circumferential links. This results in extended journey times for many trips and the misuse of minor roads by through traffic. There is little provision for off-streetcar parking. There are no signals on any of the chowks and no

available urban bus or van services. Mostly motorcycle rickshaws or auto rickshaws are being used as urban transport services on all roads.

Sahiwal in the Pak-China Economic Corridor

161. The Pakistan-China Economic Corridor (CPEC) is an ongoing mega project that aims to connect Gwadar Port in southwestern Pakistan to China's autonomous northwestern region of Xinjiang, via a network of highways, railways and pipelines that transport oil and gas. Other than the transport infrastructure, the economic corridor will provide Pakistan with telecommunications and energy infrastructure.

162. Sahiwal lies within this corridor and, thus, would be a direct beneficiary. In this corridor, two coal power plants are to be built in Qadirabad, which is located on Multan Road (N5), around 19 km from Sahiwal, in the direction of Lahore. Work on this project has already begun; it will generate 1,320 MW of electricity and be completed in 30 months, with China's assistance.

4.4 Social Resources

163. Sahiwal is a predominantly rural district, with only 16.9% (almost half of the provincial and national average) of the population living in an urban environment. Sahiwal City experienced rapid urban growth between 1951 and 1998, during which time the population increased from 50,185 to 208,778. The projected population in 2016 is 294,005. Migration from rural to urban areas has declined considerably in recent years. [9]

164. The majority of households (85%) own their own homes and the same percentage of houses are are made of baked bricks with reinforced cement concrete (RCC) rooves. The city has 29 regularized katchi abadis (squatter settlements) comprising 8,697 houses. The three marla low-cost government housing project is only half constructed. Many new housing colonies were planned nearly 10 years ago, but development and construction have not yet begun. Sahiwal City is comprised of 10 urban union councils. With the establishment of the municipal corporation in the near future, this will increase to 12.

165. Both public and private educational institutions exist in the city. The male literacy rate is 82% and the female rate is 71%. The primary school net enrolment ratio is 91 for boys and 82 for girls. Within the district, approximately 10.3% of children are not enrolled in school. Public and private sector health facilities are available in the city. According to one survey, 45% of household have a monthly income of PRs 30,000 or less. Unemployment

[9] https://www.urbanunit.gov.pk/Upload/ProjectDocument/PASDP%20Sahiwal.pdf

is reportedly high, particularly for educated men. There are about 43 units in the small industries estate within municipal limits which provide employment to over 1500 workers.

166. Sahiwal district has witnessed poverty reduction in the past decade. Various studies report the percentage of the population below the poverty line as being in the range of 16% to 32% in urban areas of Sahiwal district. According to the Planning Commission of Pakistan, 30.8% of the population was facing multidimensional poverty in the district in 2015.

4.4.1 Employment and Unemployment

Unemployment

167. The unemployment rate is measured as the ratio of those laid off and seeking employment, and the total number of unpaid family helpers to the total number of those employed among the economically active population. This number is generally represented as a percentage. In 1998, the unemployment rate in the district was 20.6 percent, which was mainly due to unemployment among males, which represented 20.9 percent, while the female unemployment rate was only 2.8 percent, because of the small number of women active in the labor force. The unemployment rate was slightly low in rural areas, as compared to urban areas, representing 20.2 percent and 22.5 percent, respectively

Employment Status

168. The last formal, detailed employment statistics for Sahiwal date to the 1998. The population census is quoted in several publications, including the Sahiwal Urban Profile, 2010. A number of related and more current employment figures that are indicative of Sahiwal's urban situation include:

- The labor force participation in Punjab of 55.4 percent, which is the highest of all four provinces.
- Industry engages 23.9 percent of the formally employed.
- In 2013, there were 220 reported factories in Sahiwal District, employing approximately 8,200 workers.
- Of these workers, 76.5 percent participated in the informal economy. Based on statistics of other employment sectors, this suggests that a proportion of those formally employed also engage in informal economic activity, a situation that is common in most emerging economies.
- Approximately 26 percent were employed as service workers, in shops and as market sales workers.

- Another 27 percent were employed as in crafts and related trades.
- Approximately 14 percent were employed as unskilled workers.
- Just over 6 percent were employed as professionals.
- Another 6 percent were employed as plant machine operators.

169. The main source of formal employment is 220 factories, of varying size, located in Sahiwal and its environs. These provide some 8,200 jobs. Agro-related industry is of particular importance as an employment generator.

4.4.2 Educational Services

170. Sahiwal has a number of higher post-secondary educational institutions, including:

- Thirteen arts and science degree colleges have over 15,000 students enrolled, including the Sahiwal Medical College and the Government College of Technology
- Four vocational institutes have over 500 students enrolled.
- One technical/polytechnic institute has almost 3,000 students.
- Six commercial training Institutes have over 3,000 students enrolled.

171. Additional institutes of higher education are always desired, particularly those directly targeting the employment needs of local industry. These also become important means of keeping youth from migrating to the major cities.

4.4.3 Health Facilities

172. Sahiwal district has nine hospitals, but with a total number of beds of slightly under 1,300. In addition, there are six regional health centers and 42 basic health units. As in most secondary urban centers, is retaining qualified staff, in both the health and education sectors, is one of the challenges. Staff often migrates to a major city to take advantage of the amenities it offers. The better the overall urban environment, quality of life, and social and economic amenities, the more likely they are to stay.

173. The prevalence of hepatitis B and C is reported at 5%. The 2011 Millennium Development Goals (MDG) Report for Punjab indicated a prevalence of Hepatitis B at 2.4% and C at 7.1% in the district. Participants of all FGD indicated that hepatitis prevalence is highest in Sahiwal City because of water supply contamination. In their opinion, roughly one quarter of the city population was suffering from hepatitis

because of contaminated water, highly inadequate waste water disposal and inappropriate solid waste removal.[10]

4.4.4 Harappa Archaeological Site as a Tourist Attraction

174. Harappa is one of the two main cities of the Indus culture, and is located about 20 km west of Sahiwal. It is a major tourist attraction and contains ruins of a fortified Bronze Age city. The city is believed to have had as many as 23,500 people living there as early as 2,500 BC, which can be considered a large population for that time.

175. The Harappa civilization was rediscovered in the 1920s. It was found to have had its own script, urban centers, and a diversified social and economic system. In 1857, the archaeological site at Harappa was partially damaged. Sadly, its current state is not satisfactory.

176. Harappa is generally characterized as having differentiated living quarters, flat-roofed brick houses, and fortified administrative or religious centers. Although copper and bronze were in use, iron was not yet employed. Cotton was woven and dyed for clothing; wheat, rice, and a variety of vegetables and fruits were cultivated; and a number of animals were domesticated, including the humped camel.

4.5 Socioeconomic Condition

177. This section covers the socio-economic conditions of the population that will be directly or indirectly affected by the project. The socio-economic profile focuses on the sources of livelihood, income levels, and accessibility to social services like health, education etc. The socioeconomic survey was divided into a settlement profile and a socio-economic household survey. Residents were interviewed with the help of semi structured questionnaire.

4.5.1 Settlements Profile

178. Social and Cultural Values: The existing community reflects rural culture with its characteristic norms and values. Women do all household work by themselves. Majority of the population follows Islamic tradition. Common food is wheat bread. Yogurt, Lassi and milk are also used. The common dress for males is Shalwar Qameez and for females Shalwar, Qameez and Dupatta/Chadar. Marriages are celebrated in traditional manners.

4.5.2 Conflict Resolution Mechanism

[10] https://www.urbanunit.gov.pk/Upload/ProjectDocument/PASDP%20Sahiwal.pdf

179. The people of the area were found to be loving, caring and hardworking. They reported that for petty conflicts resolution, they involve the influential people, Nazim or Naib Nazim or Councilor of the village, who after listening statements of both the parties, tries to reach to an unbiased decision which is acceptable to the aggrieved. Generally, the people accept the decisions of the influential.

4.5.3 Public Health

180. The major diseases that afflicted the residents of the village are seasonal. There are no adequate health care facilities in the surveyed settlements. Rural Health Centre and Basic Health Unit (BHU) are 4 to 5 km away from settlement. There is no qualified doctor in the surveyed settlement. The only medical services in the village are provided by Lady Health Workers (LHW).

4.5.4 Cultural and Religious Resources

181. Religious sites include shrine, mosques, graveyards and historical buildings. There are ten mosques, one shrine, five graveyard, four imam bargah and three church in the area. Mosque has been built in the recent past and has no historical or architectural significance. Shrine is regarded as a sacred place and receive devotion from the locals of nearby populations but is not well known outside the area.

4.5.5 Religion

182. The main religious groups in the area are Muslims and Christians. The population of the surveyed settlement is predominately Muslims i.e., 98% followed by Christians 2%.

4.5.6 Language Spoken

183. Punjabi is the most common language spoken by majority of population in the area. Urdu is spoken as secondary language.

4.5.7 Castes and Minority Groups

184. The project area is inhabited by the people of various castes including Bhutta, Bhatti, Mughal, Rajpoot, Araen, Rae, Sayyed, Malik, Dogar, Rajpoot, Rana, Jat, Rehmani and Chaudhry. Among all these, Araen is the dominant caste. Reportedly, lower castes associated with hereditary menial professions are also the part of the village population.

4.5.8 Educational Status

185. Educational facilities in any area predict the educational level and the interest of the people towards the education. Educational status of the respondents of surveyed village is shown in **Table-4.18**. This table shows that 149 children having age group of 1-3 have been excluded. Out of remaining, majority of the respondents had middle level education. It is also obvious from the table that the ratio of the masters is very low as compared to those having education up to primary, middle and matriculation.

Table 4-17: Educational Level of the Respondents

Education Level	Male	Female	Male (%)	Female (%)
Primary	115	103	21	25
Middle	130	127	24	31
Matriculation	118	24	22	6
Intermediate	51	22	9	5
Graduation	34	16	6	4
Masters	08	14	2	3
Deeni Taleem	04	08	1	2
Illiterate	78	99	15	24

Source: Socio economic Survey, February 2017

4.5.9 Economic Conditions of the Study Area

186. Occupations and Employment: Various income generating activities are practiced in the village. Apart from the categories of housework and students, which mainly pertains to the house wives and children, the major earning occupations are business and private servant. Residents of the village are also engaged with the small industries as skilled or unskilled labor.

187. Based on the sample-based socio-economic survey of the project area, **Table-4.17** presents distribution of the household members by occupation.

Table 4-18: Distribution of Household Members by Occupation

Occupation/ Source of Income	Number	%age
Agriculture	33	03
Housewives	248	23
Domestic Work	33	03
Students	302	27
Wage labor	67	06
Business	77	07
Private Servant	69	06
Government Servant	62	06
Retired Servant	11	01
Unemployed	18	02
Overseas	37	03
None	11	01
Babies	132	12

Total	1,100	100

Source: Socio economic Survey, February 2017

188. Income Levels: The **Table-4.18** shows the distribution of households with respect to their reported average monthly household income. It is evident from the table that the income level of most of the respondents is reasonable and economic conditions are well off.

Table 4-19: Distribution of Households by Average Monthly Household Income

Income Group	Number	%age
<10,000	11	08
10,001-20,000	52	35
20,001-30,000	30	20
30,000+	54	37
Total	**147**	**100**

Source: Socio economic Census Survey, February 2017

189. Housing Characteristics: Housing condition is an important indicator for determining the economic conditions of the population as it reflects the financial position and living standards of the inhabitants. Most of the houses in the study area are built with cement and bricks and permanent roofing structures. All the respondents (100%) are living in their own houses and none was found to live in the rented house. Nature of the housing conditions of the study area is shown in **Table-4.19**.

Table 4-20: Housing Type

Categories	Number	%age
Pucca (bricks, cement)	127	86
Katcha (bricks, mud)	-	-
Semi Pucca (bricks, cement, mud)	20	14
Total	**147**	**100**

Source: Socio economic Survey, February 2017

190. Livestock: In the surveyed settlement, livestock is normally raised for food and farming purposes. Livestock has market potential and is sold at the time of need. Major livestock of the area are cows, buffalos, goats, sheep, donkeys and poultry birds. Poultry birds are only kept for meeting the household's eggs and meat requirements.

5 Analysis of Alternatives

5.1 Overview

191. The discussion and analysis of alternatives considers other practicable strategies that will promote the elimination of negative environmental impacts identified. This section is critical in consideration of the ideal development with minimal environmental disturbance.

192. The report identifies potential environmental impacts of each alternatives, develops comparative analysis matrix with respect to transportation objectives and environmental impacts to suggest the most feasible alternative that can be taken up for development.

193. The following alternatives that have been assessed are as follows:

- Alternative I No Project Option
- Alternative II 'Widening of high street Road'
- Alternative III 'Dualization of Existing Fateh Sher Road'
- Alternative IV 'Improved Traffic Management'

5.2 No Project Option

194. 'No project' option assumes there will be no investment and development in the transport sector other than the operation and maintenance of the existing transport infrastructure. The 'Do nothing' alternative will have no new physical impact on the environment, however, the existing/ ongoing impacts of the 'No project option' scenario such as high traffic density on the existing roads, increased safety hazards during the rainy season, limited job opportunities, less efficient travelling, discouraging the mobility of commuters, increased air and noise pollution, increased dust nuisance created by driving on deteriorated roads and increase in the wear and tear of on the vehicles etc.

195. With these conditions, traffic congestion in future is expected to increase, roads' conditions are expected to deteriorate further, resulting in an increase in traffic jams with the passage of time. The 'Do nothing' scenario will result in further worsening of the existing environmental conditions and thus it is not a viable option.

5.3 Alternative-II 'Widening of High Street Road'

196. Widening of high street road is not sufficient to cater the present and expected future traffic loads. Majority of population use high street road that increase traffic congestion in peak hours. High street road is already well-developed road. Widening of high street road needs a big investment as land acquisition and resettlement of people will be involved. This option is not economically viable as compared to dualization of existing fateh sher road.

5.4 Alternative-III 'Dualization of Existing Fateh Sher Road'

197. This alternative presents another option of dualization of existing fateh sher road from single lane to a two-lane road. The environmental and social impacts of the dualization are expected to be positive as compared to rest of alternatives. The reason being that space around the RoW of existing road is available and numbers of houses and shops are not to be relocated. Traffic surveys conducted for this project estimate that existing traffic on road will almost be doubled in the next 20 years (2020-2044). In this situation, dualization of the road is the best option that will provide space for additional traffic flows between city and reduce existing load of dust pollution and elevated the social status of the ignored area of fateh sher road.

5.5 Comparison Analysis of Alternatives

198. The comparison between four alternatives based on environmental, social and economic impacts as described in table 5.1;

Table 5.1: Comparison Analysis of Alternatives

Project Alternatives	**Impacts**		
	Environmental Health and Safety	**Social**	**Economic**
Alternative-I: **No project option**	▪ Emission of high dust on existing road. ▪ Noise Pollution ▪ Increase in probability of accidents. ▪ Limited access for rescue in case of emergency ▪ Health hazards due to air and noise pollution.	▪ People may suffer from severe mental anguish due to broken roads. ▪ Drivers due to inhalation of dust pollution in loss of work days and per mature mortality.	▪ Increase fuel consumption. ▪ The damage to cars, motorcycles and auto rickshaws due to broken roads. ▪ Minimum trades and development activities.

Alternative: 2 Widening of High Street Road	▪ Comparatively generate lesser air and noise pollution.	▪ Land acquisition. ▪ Damages the existing utilities. ▪ Resettlement of existing business across the road sides.	▪ Economically not feasible. ▪ Damage to the existing utilities. ▪ High cost due to extensive resettlement of public, private structures and utilities.
Alternative:3 Dualization of Existing Fateh Sher road	▪ Reduction of air pollution due to smooth flow of traffic ▪ Migration of fauna due to disturbance/ fragmentation of habitat. ▪ Reduction in chances of accidents.	▪ People willingness as it is public demand since many years. ▪ Social benefits ▪ Medical benefits. ▪ Low cost than other options. ▪ Benefits of education. ▪ No damage to existing infrastructure and buildings not demolition of private infrastructure like small shops.	▪ Increase in trade activities. ▪ It will provide development activities in project areas. ▪ Reduction in wear and tear of vehicles. ▪ Efficient fuel consumption. ▪ Faster travel facility and saving of raveling times

199. Based on the above comparison, the most environmental sound and most economical alternative is the dualization of the existing carriageway i.e. upgradation of fateh sher roads.

6 Potential Environmental Impacts and Mitigation Measures

200. This chapter identifies the potential impacts due to the implementation of the proposed project on the physical, ecological and socio-cultural environment of the proposed roads of Sahiwal city and the proposed mitigation measures to minimize the negative impacts, if any.

201. Impact-screening matrices during each of the project phases i.e. project design, construction and operation are presented below.

6.1 Methodology for impact screening

202. The methodology for assessing the risk level associated with each potential impact is presented below.

203. Risk is assessed as the likelihood that the activity will have an effect on the environment as well as the consequence of the effect occurring. It is often described like this:

Risk = Likelihood × Consequence

Likelihood Scale

Likelihood	Definition	Scale
Certain	Will certainly occur during the activity at a frequency greater than every week if preventative measures are not applied	5
Likely	Will occur more than once or twice during the activity but less than weekly if preventative measures are not applied	3
Unlikely	May occur once or twice during the activity if preventative measures are not applied	2
Rare	Unlikely to occur during the project	1

Consequence Scale

Consequence	Definition	Score
Catastrophic	The action will cause unprecedented damage or impacts on the environment or surrounding communities	5
Major	The action will cause major adverse damage on the environment or surrounding communities	3

Moderate	No or minimal adverse environmental or social impacts	2
Minor	No or minimal adverse environmental or social impacts	1

Risk Score Table

Likelihood	Consequence				
		Catastrophic	Major	Moderate	Minor
	Certain	**25**	**15**	**10**	5
	Likely	**15**	**9**	6	3
	Unlikely	**10**	**6**	4	2
	Rare	5	3	2	1

Risk: Significant: 15-25
Medium: 6-10
Low 1-5

204. Any 'Medium' to 'Significant' risk requires an environmental management measure to manage the potential environmental risk. Judgement will be required concerning the application of an environmental management measure to mitigate low risk situations.

6.2 Design/Pre-Construction Phase

Impact Screening Matrix

205. The 'activity wise' screening of potential impacts across the two Lots during the design/pre-construction phase is provided in **Table 6.1** below.

Table 6-1: 'Activity Wise' Screening of possible Impacts during Design/Pre-Construction phase

S/No.	Potential Impact	Likelihood (Certain, Likely, Unlikely, Rare)	Consequence (Catastrophic, Major, Moderate, Minor)	Risk Level (Significant, Medium, Low)	Residual Impact (Significant, Medium, Low)
1	Lack of integration of IEE/EMP	Likely	Moderate	Medium	Low

	requirements into Construction bid documents				
2	Material Haul Routes	Likely	Moderate	Medium	Low
3	Improper location of worker camps leading to improper disposal of solid waste and sewage and privacy issues for residents in project area.	Likely	Moderate	Medium	Low
4	Contractor's Environmental Safeguards Capacity	Likely	Moderate	Medium	Low
5	Natural Hazard Risks (Flooding, Earthquakes etc.)	Unlikely	Moderate	Low	Low

Critical Risk Level

Significant Risk Level

Medium Risk Level

Low Risk Level

6.2.1 Lack of integration of IEE/EMP requirements into Construction bid documents

Impacts

206. The bidding documents must reflect the requirement to select a qualified and experienced Contractor from the perspective of ensuring implementation of required safeguards during project development.

Mitigation Measures

The proposed 'Safeguards unit' that should be developed at the PMU should be assigned the task to check that design and bid documents are responsive to key environmental, social and safety considerations, and that the proposed method of

work reflects the boundaries defined in the EMP. The bid documents must include the EMP and its implementation cost must be reflected in the BoQ.

6.2.2 Material Haul Routes

Impacts

207. Hauling of material can have significant impacts on the community, public safety, traffic congestion, air quality and lifespan of the Sahiwal city roadways.

Mitigation Measures

208. The construction vehicles hauling materials along the Sahiwal city roads and anywhere where there are sensitive receptors such as hospitals, schools and/or roadside residences will be limited and the PMU in collaboration with the CIU will establish a route plan to minimize this disruption which shall be appended to the EMP.

6.2.3 Contractor's Environmental Safeguards Capacity

Impacts

209. The responsibility of the PMU in collaboration with the CIU is to review and finalize the documents relating to environmental issues. Contractors that do not possess the required capacity for safeguards management do not comply with workplace environmental, social and safety regulations.

Mitigation Measures

210. So far, local Contractor firms in Pakistan working on large and medium scale environmentally sensitive projects have an unsatisfactory record for complying with workplace and environmental safety regulations. To address this, the contractor will be required to define an Occupational and Environmental Health and Safety procedure for all work, including work camp operation, management of cement dust, and use of Personal Safety Equipment (PPE). These procedures will be developed and approved by the PMU in collaboration with the CIU before the contractor commences any physical works on ground.

6.2.4 Identification of Locations for Labor Camps and ancillary facilities

Impacts

211. The duration of the construction activity for the upgradation of roads is expected to be 3 months and a considerable amount of work force will be engaged. As a result, temparory worker camps will need to be developed and ancillary facilities

will need to be provided such as electricity, washrooms for labor with suitable effluent and sewage disposal facilities as well as water for their everyday use for drinking and bathing etc.

Mitigation measures

212. In order to prevent a nuisance, specific locations shall be designated for development of the labor camps. All necessary facilities and amenities shall be provided in these camps such as electricity, sufficient supply of water, solid and liquid effluent waste disposal facilities etc.

213. The use of proper planning while identifying locations for the labor camps will ensure there is minimal disturbance to all key receptors and the traffic is not disrupted by labor camps being set up roadside next to the construction sites.

6.2.5 Natural Hazard Risks (Flooding, Earthquakes etc.)

Impacts

214. Urban flood can possibly happen, particularly during the monsoon season, due to inadequate storm and sewer system within the city. Heavy storm induced urban flood happens to a small degree in Sahiwal. Floods of Sahiwal in the past were triggered by extreme rainfall events.

215. The project area is located in the seismic Zone '2B' and thus there is limited risk to the project related to seismic events. In addition, since the project is located in Punjab province, which consists of plain terrain with no tecntonic plates or any major faults located in the project area, thus there really is a low risk of seismic events taking place during the project life.

Mitigation Measures

216. Required provisions in the project design, such as storm water drainage, shall be incorporated into the roads' design to cater to extreme weather events.

6.2.6 Cultural Heritage & Religious Sites, Social Infrastructure

Impacts

217. No temples or religious sites are in proximity to the works to cause a nuisance.

218. The sensitive receptors already identified in the project areas are all separated from the sub-project and there will be sufficient buffer distance between the works and these facilities such that no major significant impact would be expected from the

works. However, consideration should be made not to construct at night, from 7 pm onwards till 6 am in the morning, to avoid nuisances.

Mitigation Measures

No mitigation measures are required.

6.2.7 Land Acquisition and Resettlement Impacts

Impacts

219. The proposed works for the upgradation of roads will be conducted on publicly owned land and no land acquisition or resettlement is expected.

Mitigation Measures

No mitigation measures required.

6.3 Construction Phase

Impact Screening Matrix

220. The screening of potential impacts during the construction phase is provided in **Table 6.2** below.

Table 6-2: Screening of Possible Impacts during Construction Phase

S/No.	Potential Impact	Likelihood (Certain, Likely, Unlikely, Rare)	Consequence (Catastrophic, Major, Moderate, Minor)	Risk Level (Significant, Medium, Low)	Residual Impact (Significant, Medium, Low)
1	Degradation of air quality due to construction works	Certain	Major	Significant	Low
2	Potential accidents and injuries to communities in project area during construction works	Likely	Major	Medium	Low
3	Injuries to workers from lack of necessary training and/or not using PPEs etc.	Likely	Major	Medium	Low
4	High noise levels from construction activities	Likely	Major	Medium	Low

5	Untreated disposal of effluent from worker camps and batching plant(s)	Likely	Moderate	Medium	Low
6	Soil Contamination	Likely	Moderate	Medium	Low
7	Employment Conflicts	Likely	Moderate	Medium	Low
8	Communicable diseases	Likely	Major	Medium	Low
9	Water Contamination	Unlikely	Moderate	Low	Low
10	Vegetation and Wildlife Loss	Unlikely	Moderate	Low	Low
11	Historical/Archaeological Sites	Unlikely	Low	Low	Low

Critical Risk Level

Significant Risk Level

Medium Risk Level

Low Risk Level

6.3.1 Air Quality

Impacts

221. The proposed upgradation of roads will involve earth works and transporting and dumping large quantities of debri material. This will likely lead to an increase in SPM (Suspended Particulate Matter) in and around the construction zones.

222. Potential sources of particulate matter emission during construction activities include earthworks (dirt or debris pushing and grading), exposed surfaces, exposed storage piles, truck dumping, hauling, vehicle movement on unpaved roads, combustion of liquid fuel in equipment and vehicles, land excavation, and concrete mixing and batching.

223. Vehicles carrying construction material are expected to result in increased SPM levels near the haul roads. This can be of potential importance if the vehicles pass through the areas with a high concentration of sensitive receptors, such as schools and hospitals in this particular case.

224. At the construction yard, the dust levels are also expected to increase due to unloading of construction materials and demolishing of roads. It shall be ensured that most of the excavated material will be used within the project, with minimal cut and fill material to come from outside the site.

225. The quantity of dust that will be generated on a particular day will depend on the magnitude and nature of activity and the atmospheric conditions prevailing on the day. Due to the uncertainty in values of these parameters, it is not possible to calculate the quantity from a 'bottom-up' approach, that is, from adding PM10 emissions from every activity on the construction site separately. Typical and worst-case PM10 emissions from construction sites have been estimated11 as 0.27 megagram per hectare per month of activity (Mg/ha-month) and 1.04 Mg/ha-month, respectively.

Fugitive Dust Control

226. The source wise fugitive control measures are provided in **Table 6.3** below.

Table 6-3: Control measures for Fugitive Dust emissions

Source	Control Measures
Earth Moving	For any earth moving that is to take place in the immediate vicinity from the site boundary, watering must be conducted as required to prevent visible dust emissions
Disturbed Surface Areas	Apply dust suppression measures (clear vegetation only from areas where work is to commence, plant or mulch areas that will not receive traffic, construct artificial wind breaks or wind screens) frequently to maintain a stabilized surface. Areas that cannot be stabilized, such as wind driven dust, must have an application of water at least twice a day
Inactive Disturbed Surface Areas	Apply dust suppressants (clear vegetation only from areas where work is to commence, plant or mulch areas that will not receive traffic, construct artificial wind breaks or wind screens) in sufficient quantity and frequency to maintain a stabilized surface
Unpaved Roads	Water all roads used for any vehicular traffic at least twice per day during active operations and restrict vehicle speed to 20 kmph.
Open Storage	Apply water to at least 80 percent of the surface areas of all open

[11] Gaffney, G. and Shimp, D. 1997. *Improving PM_{10} Fugitive Dust Emission Inventories*. Sacramento, CA. California Air Resource Board. <www.arb.ca.gov/emisinv/pubs/pm10tmp.pdf>

Piles	storage piles on a daily basis when there is evidence of wind driven fugitive dust or install an enclosure all along the storage piles
Track-out Control	Wash down of construction vehicles (particularly tyres) prior to departure from site.

Mitigation Measures

227. The following mitigation measures will be adopted for preservation of the environment:

- At the construction site and the immediately adjoining areas, water will be sprinkled every three hours and at a higher frequency if felt necessary, at all construction sites to suppress dust emissions.
- All heavy equipment and machinery shall be fitted in full compliance with the national and local regulations.
- Stockpiled soil and sand shall be slightly wetted before loading, particularly in windy conditions.
- Fuel-efficient and well-maintained haulage trucks shall be employed to minimize exhaust emissions.
- Vehicles transporting soil, sand and other construction materials shall be covered with tarpaulin.
- Limitations to speeds of such vehicles as felt necessary. Transport through densely populated area should be avoided.
- Concrete plants to be controlled in line with statutory requirements and shall not be close to sensitive receptors.
- Stack height of generators will be at least 3 meters above the ground.
- Project traffic will maintain maximum speed limit of 20 km/hr on all unsealed roads within project area.
- A minimum distance of 300 meters will be ensured between batching plant(s) and the nearest community.
- The need for large stockpiles shall be minimized by careful planning of the supply of materials from controlled sources. Stockpiles should not be located within 50 m of schools, hospitals or other public amenities and shall be covered with tarpaulin when not in use and at the end of the working day to enclose dust. If large stockpiles (>25m^3) of crushed materials are necessary, they should be enclosed with side barriers and also covered when not in use.

Vehicular & Equipment Emissions

228. It shall be ensured that the following measures are taken to control emissions from vehicles being used in the construction activity:

- Periodically check and conduct maintenance of the construction machinery and haul vehicles.
- Regularly change the engine oil and use new engines/machinery/equipment having good efficiency and fuel burning characteristics.
- Use of catalytic converters and low Sulphur fuels.
- The stack height of generators will be at least 3 meters above the ground.
- Training of the technicians and operators of the construction machinery and drivers of the vehicles.
- Air quality monitoring at the project site during the construction phase.

6.3.2 Community Health and Safety

Impacts

229. The upgradation of roads will involve the use of considerable heavy machinery at the project site along with posing the risk of community members falling into trenches. In addition, the risk to commuters on the road during the construction works will be significant and thus a number of precautionary measures will be necessary to minimize the risk of possible accidents.

Mitigation Measures

230. The following mitigation measures will be implemented:

- Work areas outside the project site, especially where machinery is involved, will be barricaded and will be constantly monitored to ensure that local residents, particularly children stay away while construction activities will also be cordoned off. Also, no machinery will be left unattended, particularly in running condition.
- Local communities in the project area will be briefed on traffic safety, especially women who are the main care providers to children.
- Speed limit of 20 km/hr will be maintained by all project related vehicles and nighttime driving of project vehicles will be limited where possible.
- Educate drivers on safe driving practices to minimize accidents and to prevent spill of hazardous substances and other construction materials during transport.

6.3.3 Occupational Health and Safety

Impacts

231. There is invariably a safety risk when construction works are conducted, and precautions will be needed to ensure the safety of the workers.

232. The major safety hazards expected during the proposed activities are as follows:[12]

Accident Hazards

- Falls from height, especially when standing/working on ladders;
- Slips, trips and falls, especially while carrying heavy or bulky loads;
- Cuts and injuries caused by sharp instruments and tools;
- Hazard of suffocation from asphyxiant gases released in sewerage systems, or from oxygen deficiency, during maintenance and cleaning operations;
- Burns caused by hot parts of equipment, steam lines etc, by release of hot water or steam;
- Electric traumas, caused by defective installations and equipment, especially portable;
- Musculoskeletal injury (especially of back), resulting from lifting and moving of heavy loads;

Physical Hazards

- Exposure to cold and/or heat stress, as a result of rapid movement between cold and hot areas;
- Exposure to UV radiation during welding operations;

Chemical Hazards

- Exposure to various chemicals, such as: adhesives, caulking compounds, fluxes (solder), hydrochloric acid, zind chloride, tar and solvents, various greases and inorganic lead;

Biological Hazards

- Exposure to parasites, such as hookworm, ascaris, and various mites, chiggers and ticks;

Ergonomic, psychosocial and organizational factors

- Psychological stress due to dissatisfaction at work due to issues with peers, superiors etc.;
- General ill feeling as a result of work in confined spaces and development of 'sick

[12] https://www.ilo.org/wcmsp5/groups/public/---ed_protect/---protrav/---safework/documents/publication/wcms_192256.pdf

building syndrome';

Mitigation Measures

233. The Contractor will be required to take measures such as:

- Ensuring that all workers are provided with and use appropriate Personal Protective Equipment (helmet, hand gloves, boots, masks etc);
- Follow standard practices of safety checks as prescribed before use of equipment;
- Provide on-site Health and Safety Training for all site personnel;

234. The Contractor will be required to prepare and implement an effective Worker Health and Safety Plan that is supported by trained first aid personnel and emergency response facilities. Construction contracts will include standard Worker Health and Safety measures and contractors will be bound to implement these fully. This will include mandatory wearing of dust masks for any cement handling operations or at any area were cement dust is in the air.

235. Monitoring will be required to ensure that the health and safety plan based on contract specifications is followed. Cement feed hopper areas will be inspected daily to ensure compliance with the requirement of dust masks.

236. Based on the type of hazard applicable during the proposed works at site, the following mitigation measures as per IFC guidelines for Occupational Health and Safety (OH&S) must be implemented:[13]

Physical Hazards

Rotating and Moving Equipment

237. Injury or death can occur from being trapped, entangled, or struck by machinery parts due to unexpected starting of equipment or unobvious movement during operations. Recommended protective measures include:

- Designing machines to eliminate trap hazards and ensuring that extremities are kept out of harm's way under normal operating conditions. Examples of proper design considerations include two-hand operated machines to prevent amputations or the availability of emergency stops dedicated to the machine and placed in strategic locations. Where a machine or equipment has an exposed moving part or exposed pinch point that may endanger the safety of any worker, the machine or equipment should be equipped with, and protected by, a guard or other device that prevents access to the moving part or pinch point. Guards should be designed and installed in conformance with appropriate machine safety

[13] https://www.ifc.org/wps/wcm/connect/1d19c1ab-3ef8-42d4-bd6b-cb79648af3fe/2%2BOccupational%2BHealth%2Band%2BSafety.pdf?MOD=AJPERES&CVID=ls62x8l

standards.

- Turning off, disconnecting, isolating, and de-energizing (Locked Out and Tagged Out) machinery with exposed or guarded moving parts, or in which energy can be stored (e.g. compressed air, electrical components) during servicing or maintenance.

- Designing and installing equipment, where feasible, to enable routine service, such as lubrication, without removal of the guarding devices or mechanisms.

Noise

- No employee should be exposed to a noise level greater than 85 dB(A) for a duration of more than 8 hours per day without hearing protection. In addition, no unprotected ear should be exposed to a peak sound pressure level (instantaneous) of more than 140 dB(C).

- The use of hearing protection should be enforced actively when the equivalent sound level over 8 hours reaches 85 dB(A), the peak sound levels reach 140 dB(C), or the average maximum sound level reaches 110dB(A). Hearing protective devices provided should be capable of reducing sound levels at the ear to at least 85 dB(A). ·

- Although hearing protection is preferred for any period of noise exposure in excess of 85 dB(A), an equivalent level of protection can be obtained, but less easily managed, by limiting the duration of noise exposure. For every 3 dB(A) increase in sound levels, the 'allowed' exposure period or duration should be reduced by 50 percent.

- Prior to the issuance of hearing protective devices as the final control mechanism, use of acoustic insulating materials, isolation of the noise source, and other engineering controls should be investigated and implemented, where feasible.

- Periodic medical hearing checks should be performed on workers exposed to high noise levels.

Vibration

238. Exposure to hand-arm vibration from equipment such as hand and power tools, or whole-body vibrations from surfaces on which the worker stands or sits, should be controlled through choice of equipment, installation of vibration dampening pads or devices, and limiting the duration of exposure. Limits for vibration and action values. Exposure levels should be checked on the basis of daily exposure time and data provided by equipment manufacturers.

Electrical

239. Exposed or faulty electrical devices, such as circuit breakers, panels, cables, cords and hand tools, can pose a serious risk to workers. Overhead wires can be struck by metal devices, such as poles or ladders, and by vehicles with metal booms. Vehicles or grounded metal objects brought into close proximity with overhead wires can result in arcing between the wires and the object, without actual contact. Recommended actions include:

- Marking all energized electrical devices and lines with warning signs; ·
- Locking out (de-charging and leaving open with a controlled locking device) and tagging-out (warning sign placed on the lock) devices during service or maintenance;
- Checking all electrical cords, cables, and hand power tools for frayed or exposed cords and following manufacturer recommendations for maximum permitted operating voltage of the portable hand tools; ·
- Double insulating / grounding all electrical equipment used in environments that are, or may become, wet; using equipment with ground fault interrupter (GFI) protected circuits; ·
- Protecting power cords and extension cords against damage from traffic by shielding or suspending above traffic areas; ·
- Appropriate labeling of service rooms housing high voltage equipment ('electrical hazard') and where entry is controlled or prohibited; ·
- Rubber tired construction or other vehicles that come into direct contact with, or arcing between, high voltage wires may need to be taken out of service for periods of 48 hours and have the tires replaced to prevent catastrophic tire and wheel assembly failure, potentially causing serious injury or death;
- Conducting detailed identification and marking of all buried electrical wiring prior to any excavation work.

Eye Hazards

240. Solid particles from a wide variety of industrial operations, and / or a liquid chemical spray may strike a worker in the eye causing an eye injury or permanent blindness. Recommended measures include:

- Use of machine guards or splash shields and/or face and eye protection devices, such as safety glasses with side shields, goggles, and/or a full face shield. Specific Safe Operating Procedures (SOPs) may be required for use of sanding and grinding tools and/or when working around liquid chemicals. Frequent checks of these types of equipment prior to use to ensure mechanical integrity is also good practice. Machine and equipment guarding should conform to standards

published by organizations such as CSA, ANSI and ISO. ·

- Moving areas where the discharge of solid fragments, liquid, or gaseous emissions can reasonably be predicted (e.g. discharge of sparks from a metal cutting station, pressure relief valve discharge) away from places expected to be occupied or transited by workers or visitors. Where machine or work fragments could present a hazard to transient workers or passers-by, extra area guarding or proximity restricting systems should be implemented, or PPE required for transients and visitors.

- Provisions should be made for persons who have to wear prescription glasses either through the use overglasses or prescription hardened glasses.

Welding/Hot Work

241. Welding creates an extremely bright and intense light that may seriously injure a worker's eyesight. In extreme cases, blindness may result. Additionally, welding may produce noxious fumes to which prolonged exposure can cause serious chronic diseases. Recommended measures include: ·

- Provision of proper eye protection such as welder goggles and/or a full-face eye shield for all personnel involved in, or assisting, welding operations. Additional methods may include the use of welding barrier screens around the specific work station (a solid piece of light metal, canvas, or plywood designed to block welding light from others). Devices to extract and remove noxious fumes at the source may also be required. ·

- Special hot work and fire prevention precautions and Standard Operating Procedures (SOPs) should be implemented if welding or hot cutting is undertaken outside established welding work stations, including 'Hot Work Permits, stand-by fire extinguishers, stand-by fire watch, and maintaining the fire watch for up to one hour after welding or hot cutting has terminated. Special procedures are required for hot work on tanks or vessels that have contained flammable materials.

Industrial Vehicle Driving and Site Traffic

242. Poorly trained or inexperienced industrial vehicle drivers have increased risk of accident with other vehicles, pedestrians, and equipment. Industrial vehicles and delivery vehicles, as well as private vehicles on-site, also represent potential collision scenarios. Industrial vehicle driving and site traffic safety practices include:

- Training and licensing industrial vehicle operators in the safe operation of specialized vehicles such as forklifts, including safe loading/unloading, load limits.

- Ensuring drivers undergo medical surveillance. ·

- Ensuring moving equipment with restricted rear visibility is outfitted with audible back-up alarms. ·

- Establishing rights-of-way, site speed limits, vehicle inspection requirements, operating rules and procedures (e.g. prohibiting operation of forklifts with forks in down position), and control of traffic patterns or direction. ·
- Restricting the circulation of delivery and private vehicles to defined routes and areas, giving preference to 'one-way' circulation, where appropriate.

Ergonomics, Repetitive Motion, Manual Handling

243. Injuries due to ergonomic factors, such as repetitive motion, overexertion, and manual handling, take prolonged and repeated exposures to develop, and typically require periods of weeks to months for recovery. These OHS problems should be minimized or eliminated to maintain a productive workplace. Controls may include: ·

- Facility and workstation design with 5th to 95th percentile operational and maintenance workers in mind. ·
- Use of mechanical assists to eliminate or reduce exertions required to lift materials, hold tools and work objects, and requiring multi-person lifts if weights exceed thresholds. ·
- Selecting and designing tools that reduce force requirements and holding times, and improve postures. ·
- Providing user adjustable workstations.
- Incorporating rest and stretch breaks into work processes, and conducting job rotation. ·
- Implementing quality control and maintenance programs that reduce unnecessary forces and exertions. ·
- Taking into consideration additional special conditions such as left-handed persons.

Physical Hazards

Air Quality

244. Poor air quality due to the release of contaminants into the workplace can result in possible respiratory irritation, discomfort, or illness to workers. Employers should take appropriate measures to maintain air quality in the work area. These include: ·

- Maintaining levels of contaminant dusts, vapors and gases in the work environment at concentrations below those recommended as TWA-TLV's (threshold limit value)—concentrations to which most workers can be exposed

repeatedly (8 hours/day, 40 hrs/week, week-after week), without sustaining adverse health effects. ·

- Developing and implementing work practices to minimize release of contaminants into the work environment including:
  - Direct piping of liquid and gaseous materials
  - Minimized handling of dry powdered materials; Enclosed operations
  - Local exhaust ventilation at emission/release points
  - Vacuum transfer of dry material rather than mechanical or pneumatic conveyance
  - Indoor secure storage, and sealed containers rather than loose storage
- Where ambient air contains several materials that have similar effects on the same body organs (additive effects).

Fire and Explosions

245. Fires and or explosions resulting from ignition of flammable materials or gases can lead to loss of property as well as possible injury or fatalities to project workers. Prevention and control strategies include:

- Storing flammables away from ignition sources and oxidizing materials. Further, flammables storage area should be:
  - Remote from entry and exit points into buildings
  - Away from facility ventilation intakes or vents
  - Have natural or passive floor and ceiling level ventilation and explosion venting
  - Use spark-proof fixtures
  - Be equipped with fire extinguishing devices and self closing doors, and constructed of materials made to withstand flame impingement for a moderate period of time ·
- Providing bonding and grounding of, and between, containers and additional mechanical floor level ventilation if materials are being, or could be, dispensed in the storage area. ·
- Where the flammable material is mainly comprised of dust, providing electrical grounding, spark detection, and, if needed, quenching systems.
- Defining and labeling fire hazards areas to warn of special rules (e.g. prohibition in

use of smoking materials, cellular phones, or other potential spark generating equipment). ·

- Providing specific worker training in handling of flammable materials, and in fire prevention or suppression.

Corrosive, oxidizing, and reactive chemicals

246. Corrosive, oxidizing, and reactive chemicals present similar hazards and require similar control measures as flammable materials. However, the added hazard of these chemicals is that inadvertent mixing or intermixing may cause serious adverse reactions. This can lead to the release of flammable or toxic materials and gases, and may lead directly to fires and explosions. These types of substances have the additional hazard of causing significant personal injury upon direct contact, regardless of any intermixing issues. The following controls should be observed in the work environment when handling such chemicals: ·

- Corrosive, oxidizing and reactive chemicals should be segregated from flammable materials and from other chemicals of incompatible class (acids vs. bases, oxidizers vs. reducers, water sensitive vs. water based, etc.), stored in ventilated areas and in containers with appropriate secondary containment to minimize intermixing during spills. ·

- Workers who are required to handle corrosive, oxidizing, or reactive chemicals should be provided with specialized training and provided with, and wear, appropriate PPE (gloves, apron, splash suits, face shield or goggles, etc). ·

- Where corrosive, oxidizing, or reactive chemicals are used, handled, or stored, qualified first-aid should be ensured at all times. Appropriately equipped first-aid stations should be easily accessible throughout the place of work, and eye-wash stations and/or emergency showers should be provided close to all workstations where the recommended first-aid response is immediate flushing with water.

Biological Hazards

247. Biological agents represent potential for illness or injury due to single acute exposure or chronic repetitive exposure. Biological hazards can be prevented most effectively by implementing the following measures: ·

- If the nature of the activity permits, use of any harmful biological agents should be avoided and replaced with an agent that, under normal conditions of use, is not dangerous or less dangerous to workers. If use of harmful agents cannot be avoided, precautions should be taken to keep the risk of exposure as low as possible and maintained below internationally established and recognized exposure limits.

- Work processes, engineering, and administrative controls should be designed, maintained, and operated to avoid or minimize release of biological agents into the working environment. The number of employees exposed or likely to become exposed should be kept at a minimum. ·
- The employer should review and assess known and suspected presence of biological agents at the place of work and implement appropriate safety measures, monitoring, training, and training verification programs. ·
- Measures to eliminate and control hazards from known and suspected biological agents at the place of work should be designed, implemented and maintained in close co-operation with the local health authorities and according to recognized international standards.

6.3.4 Noise and Vibration issues

Impacts

248. The upgradation of roads will result in different construction equipment and machinery being used which will generate high noise levels at the project site.

249. The detailed mapping of sensitive receptors has been conducted and the types of receptors and their respective distances from the work sites are provided earlier. However, any required mitigation measures that shall be proposed will be to control potential impacts on noise to prevent any long-term impacts within the project area.

250. The assessment of the noise impacts on the sensitive receptors that have been identified at various locations in the project area depend upon:

- Characteristics of noise source (instantaneous, intermittent or continuous in nature)
- Time of day at which noise occurs, and
- Location of noise source

251. Each construction phase has its unique noise characteristics due to use of different equipment items. The potential sources of noise during the preparation, construction, and worksite closure phases for the upgradation of roads include equipment, machinery, and transportation used for the construction activities. The equipment used for construction will be the major source of noise.

252. The construction activities will include use of generators, excavators, concrete mixing trucks and back up alarms, which can generate significant noise.

253. Since various modern machines are acoustically designed to generate low noise levels, any high noise levels that might be generated will only be for a short duration during the construction phase.

254. Depending on the construction equipment used and its distance from the receptors, the community and the workers may typically be exposed to intermittent and variable noise levels. During the day, such noise results in general annoyance and can interfere with sleep during the night. In general, human sound perception is such that a change in sound level of 3 dB is just noticeable, a change of 5 dB is clearly noticeable, and a change of 10 dB is perceived as a doubling or halving of sound level.

255. Due to the various construction activities, there will be temporary noise impacts in the immediate vicinity of the project site. The movement of heavy vehicles, loading, transportation and unloading of construction materials produces significant noise during the construction stage. However, these increased noise levels will prevail only for a short duration during the construction phase.

256. The **Table 6.4** below represents typical noise levels from various construction equipment items. It should be noted that the values indicated in the table may differ depending on the brand and age of machinery provided/used by construction company.

257. This **Table 6.4** below is only indicative since at the Site-Specific Environmental Management Plan (SSEMP) development stage, the Contractor will clearly define the specific equipment to be used. However, it is clear that the scope and scale of works for the road rehabilitation works will be quite minor. In this regard, since the construction works will only be short term in nature, thus any potential noise generation during the construction works will also be short term in nature and are not expected to significantly impact any sensitive receptors that may be present along the project corridors.

258. Lastly, the mitigation measures already provided in the EMP will be implemented in true letter and spirit to ensure that any potential impacts from noise are minimized as far as possible.

Table 6-4: Construction Equipment Noise Ranges, dB(A)

Equipment	Peak	Typical	Typical	Construction Phase

	Noise Range at 15 m	Peak Sound Level in a Work Cycle[a] at 15 m	'Quieted Equipment' Sound Level[b] at 15 m	Earthworks	Structures	Installation
Batching plant	82-86	84	81		Y	
Concrete mixers	76-92	85	82		Y	
Cranes	70-94	83	80		Y	Y
Excavators	74-92	85	82	Y		
Front loader	77-94	85	82	Y	Y	Y
Water bowsers	85-93	88	85	Y	Y	Y
Graders	72-92	85	82	Y		
Bulldozers	65-95	85	80	Y		
Pavers	87-89	88	80	Y		
Pumps	68-72	76	75	Y	Y	Y
Diesel generators	72-82	81	77		Y	Y
Drilling machines	82-98	90	87		Y	Y
Compressors	74-88	81	71		Y	
Dumpers	77-96	88	83	Y	Y	
Dump/flatbed Truck	75-85	80	77	Y	Y	Y

Sources: USEPA, 1971; http://www.waterrights.ca.gov/EIRD/text/Ch11-Noise.pdf; http://www.lacsd.org/LWRP%202020%20Facilities%20Plan%20DEIR/4_6_Noise.pdf; http://newyorkbiz.com/DSEIS/CH18Construction.pdf

Notes:

a. Where typical value is not cited in literature, mean of the peak noise range is assumed

b. Quieted equipment can be designed with enclosures, mufflers, or other noise-reducing features. Where data is not available, a 3 dB reduction is assumed

259. Precise information on the type, quantity and location of equipment to be used during the construction phase is not available at this stage and will be dependent on the working methods of the selected contractors. However, preliminary calculations have been conducted to provide a general magnitude of the noise levels during various construction phases. No pile driving or piling works will be conducted and thus no vibration impacts of any significance or concern are expected due to the proposed works.

260. As mentioned above, the scope of works is quite limited. Furthermore, there are no old/decayed structures along the project corridors that might be vulnerable from the construction works. It also should be mentioned that no pile driving or piling works will be conducted and thus no vibration impacts of any significance or concern are expected due to the proposed works.

261. The mitigation measures listed below shall be implemented to minimize noise levels during the construction activity as far as possible.

Mitigation Measures

262. The following mitigation measures will be implemented:

- Equipment noise will be reduced at source by proper design, maintenance and repair of construction machinery and equipment. Noise from vehicles and power generators will be minimized by use of proper silencers and mufflers.
- Excessive noise emitting equipment will not be allowed to operate and will be replaced.
- Blowing of horns will be prohibited on access roads to work sites.
- As a rule, the operation of heavy equipment shall be conducted in daylight hours.
- Construction equipment, which generates excessive noise, shall be enclosed or fitted with effective silencing apparatus to minimize noise.
- Well-maintained haulage trucks will be used with speed controls.

6.3.5 Hazardous and Non-Hazardous Waste Management

Impacts

263. In the absence of national or domestic regulations and a waste management system in the project areas, waste disposal of materials containing contents of both hazardous and nonhazardous nature such as scrap wood, bricks, concrete, asphalt, plumping fixtures, piping, insultation (asbestos and non-asbestos), metal scraps, oil, electrical wiring and components, chemicals, paints, solvents etc. can potentially become a serious environmental issue, particularly with the local contractors. To avoid any potential issue, the CIU in collaboration with the PMU will need to impose adequate internal controls.

Mitigation measures

264. A waste management plan will be developed prior to the start of construction. This plan will cater to sorting of hazardous and non-hazardous materials prior to disposal, placing of waste bins at the project sites for waste disposal and an onsite hazardous waste storage facility.

265. Licensed waste contractors will be engaged to dispose off all non-hazardous waste material that cannot be recycled or reused.

266. Training will be provided to personnel for identification, segregation and management of waste.

6.3.6 Camp & Batching Plant Effluent

Impacts

267. The staff and labor camps for the construction of the proposed upgradation of roads will be a source of wastewater generated from the toilets, washrooms and the kitchen. The wastewater will not meet the national environmental standards and will therefore need treatment prior to disposal.

268. The project sites where construction is being conducted must not be treated by the project staff and/or labor as a public toilet or for disposal of camp effluent.

Mitigation measures

269. It will be ensured that no untreated effluent is released to the environment.

270. A closed sewage treatment system will treat the effluent, which will then be disposed of in a soak pit or will be used for plantation. The sewage treatment plants will be installed at each respective labor camp based on the number of laborers residing at the respective camp.

271. Water being released from any batching plant(s) must be treated as per requirements of PEQS prior to release to sewerage system/any other water body.

6.3.7 Soil Erosion and Sedimentation

Impacts

272. The majority of the works proposed for upgradation of roads may result in soil erosion and sedimentation. Earthwork excavation involves open cutting upto 5'-0" (1.5 m depth for storm water channels, drains, sullage drains in open areas, roads, streets, lanes, including under pinning of walls and shoring to protect existing works, shuttering and timbering the trenches, dressed to design level and dimensions, trimming, back filing and surplus excavated material.

Mitigation measures

273. Any drainage structures, culverts or pipes crossing the project site may need to be modified or protected and the detailed designs must make provisions to protect or re-provision all infrastructure that may be affected by the construction works. The surplus excavated material will be disposed on designated dumping sites, yet to be identified by the metropolitan corporation.

6.3.8 Soil Contamination

Impacts

274. During the project construction, spills of fuel, lubricants and chemicals can take place while transferring from one container to another or during refueling. Also, during maintenance of equipment and vehicles, through leakages from equipment and containers and as a result of traffic accidents.

275. Depending on the nature of the material, location of spill and quantity of spill, the soil can get contaminated.

Mitigation measures

276. It will be ensured that spill prevention trays are provided and used during refueling. Also, on-site maintenance of construction vehicles and equipment will be avoided as far as possible. In case on-site maintenance is unavoidable, tarpaulin or other impermeable material will be spread on the ground to prevent contamination of soil.

277. Regular inspections will be carried out to detect leakages in construction vehicles and equipment and all vehicles will be washed in external commercial facilities.

278. Fuels, lubricants and chemicals will be stored in covered bounded areas, underlain with impervious lining. Appropriate arrangements, including shovels, plastic bags and absorbent materials will be available near fuel and oil storage areas.

6.3.9 Employment Conflicts

Impacts

279. The proposed roads upgradation project is not likely to create any significant permanent job opportunities. Even unskilled and semi-skilled employment opportunities that are likely to be created will be for a short period, while the project is constructed. As persons with relevant skills may be available locally, people from the project area are likely to fill a significant number of the semi-skilled and skilled jobs.

280. This issue of provision of jobs can become particularly problematic if it is perceived by the local population that a significant number of construction-related jobs opportunities are not given to people from the local community. This can result in friction between local residents and construction workers from outside of the community.

Mitigation measures

281. The Construction Contractor will adopt a transparent hiring policy. Prior to the commencement of the construction activity, the local communities in the project

area will be informed of the employment policy in place and number of people that can be employed for this project.

282. It will be ensured that maximum number of unskilled and semi-skilled jobs will be provided to the residents of the project area.

283. The PMU will ensure a balanced process of employment of the communities in the project area with preference given to those most directly affected by the project.

6.3.10 Communicable diseases

Impacts

284. Communicable diseases such as COVID-19 and HIV may be introduced due to the immigration of workers associated with the project.

Mitigation measures

285. A communicable diseases prevention program will be prepared for construction workers or residents near the construction sites.

286. Reporting employees who are showing symptoms such as fever or high body temperature, coughing, difficulty of breathing or chest pain. Sending them to clinic or nearest hospital immediately.

287. Body temperature monitoring through Thermal Scanner or other devices to monitor the body temperature of each employee entering/leaving the site or at camp.

288. Awareness and implementation of Quaratine Procedure for all employees who came back from vacation.

289. Conduct regular housekeeping and sanitation for all access/egress points as well as Log-in/Log-out devices. If possible, deactivate Log-in/Log-out devices such as biometrics. Conduct awareness on how to protect yourself against the infection of COVID-19 through campaign (posters, distribution of brochure). Communicating and implementing COVID-19 Guidelines

290. Ensure Disinfection of offices and machinery periodically, temperature screening at project entrances, provision of hand sanitizers to office and labour staff, provision of surgical face masks, instruction boards and signage at different locations for COVID-19 awareness

6.3.11 Water Contamination

Impacts

291. There is no possibility of water contamination since the project corridors do not contain any water bodies. In addition, the proposed works only consist of rehabilitation works with no possibility of any water supply lines being ruptured.

Mitigation measures

292. No mitigation measures required.

6.3.12 Vegetation and Wildlife Loss

Impacts

293. The project consists of a semi-urban environment located in the outskirts of Sahiwal city with limited human settlements and activities and thus contains limited vegetation cover and limited wildlife of any significance as common in areas located close to urban centers.

294. No impact on vegetation and wildlife is expected since cutting of trees present on the project site will not be permitted. There are only minor shrubs and bushes that will be cleared up, if felt necessary, during the site preparation stage of the project.

Mitigation measures

295. No hunting or killing of animals will be permitted.

296. No cutting down of vegetation or using vegetation or trees as firewood will be permitted.

6.3.13 Historical/Archaeological Sites

297. No historical/archaeological sites have been identified in the project area or project site.

Mitigation measures

298. If evidence of any archaeological remains is found during the construction activities, the excavation work will be stopped immediately, and necessary next steps taken to identify the archaeological discovery based on the 'Chance Find' procedures provided as **Annexure E**.

6.4 Impacts Associated with Operation Phase

299. The potential impacts from operation phase are provided as **Table 6.5** below.

Operation Phase

Table 6-5: Screening of Possible Impacts during Operation Phase

S/No.	Potential Impact	Likelihood (Certain, Likely, Unlikely, Rare)	Consequence (Catastrophic, Major, Moderate, Minor)	Risk Level (Significant, Medium, Low)
1	Noise levels	Unlikely	Moderate	Low
2	Air Quality	Unlikely	Moderate	Low
3	Reduced Travel Times	Positive impacts expected		
4	Road Safety	Positive impacts expected		
5	Socioeconomic Impacts	Positive impacts expected		

Critical Risk Level

Significant Risk Level

Medium Risk Level

Low Risk Level

Positive Impacts

6.4.1 Noise Levels

Impacts

300. The proposed three minor roads to be developed will be for a total length of only 2.72 km and thus the vehicles will only be traveling at low speeds while traversing along these three roads.

301. Furthermore, the sensitive receptor mapping has already been conducted along the three roads and presented in Chapter 4 above. As can be observed, no sensitive receptors are located in close proximity to the project corridors and thus no disturbance to the receptors from the movement of vehicles etc. along these three road corridors is expected.

Mitigation measures

No measures required.

6.4.2 Air Quality

Impacts

302. Since the total length of the three proposed road corridors is only 2.72 km, thus the volume of vehicles to be traveling along these three roads is also expected to be quite low. Thus, any potential vehicular emissions will also be quite limited and keeping in view the project setting, the air quality is not expected to be adversely affected in a significant manner since any emissions are expected to dissipate quickly since the project corridors are not heavily built up areas.

Mitigation measures

No measures required.

6.4.3 Reduced Travel Times

Impacts

280. The proposed road works will result in improved road infrastructure, thus enabling smoother and congestion free movement of traffic. As a result, the overall travel times while traveling over these roads will also be significantly reduced.

Mitigation measures

303. No mitigation measures required.

6.4.4 Road Safety

Impacts

281. Enhanced vehicular movement and speed in the long run may result in road safety issues like traffic accidents. This impact is permanent but moderately adverse in nature, since the frequency of accidents may be lowered, but their intensity may be quite severe due to enhanced speeds at which vehicles will move. During operation, traffic signs, markings and other devices used to regulate traffic at appropriate places shall be properly maintained.

Mitigation measures

304. No mitigation measures required.

6.4.5 Socioeconomic impacts

Impacts

305. The improvement of the project road surface will reduce travel time and transport costs. This will be a positive impact on the socio-economics of the local community.

306. The road will only provide an incremental benefit in improving access to services for rural people. The improved roads will create easier access to government services.

Mitigation measures

307. No mitigation measures required.

6.5 Cumulative Impacts

308. No other infrastructure works are planned to be conducted in the project area where these project works shall be conducted. Thus, no cumulative impacts are expected.

6.6 Indirect and Induced Impacts

309. The potential impact of development of the proposed roads in the project area has been examined, which indicated that the existing and planned infrastructure such as water supply, wastewater collection and treatment, municipal solid waste collection and disposal would be adequate to accommodate any potential population intake as a result of the proposed roads development. Impacts on the environment from air emissions, traffic and community noise, and treated effluent discharge have also been assessed and have found to be acceptable and within the carrying capacities of the environmental media.

310. Thus, negative indirect and induced impacts from the proposed road works are not expected.

7 Environmental Management Plan & Institutional Requirements

7.1 Introduction

311. The Environmental Management Plan (EMP) is developed to eliminate and/or mitigate the impacts envisaged at the design, construction and operation stages.

312. The detailed EMP provided in this document as **Table 7.1** ensures that this sub-project has no detrimental effect on the surrounding environment. The Plan shall act as a guideline for incorporating environmental measures to be carried out by the contractors engaged for the proposed sub-project. It shall also be used for other parties concerned for mitigating possible impacts associated with each sub-project and will form part of the Contract documents to be considered alongside the specifications. This Plan shall act as the Environmental Management and Monitoring Plan during the construction phase of the sub-project and will allow for prompt implementation of effective corrective measures.

7.2 Environmental Management Plan (EMP)

313. The EMP attached with this report ensures the following:

- Delivery of the prescribed environmental outcomes during all phases of this sub-project;
- Formulating a system for compliance with applicable legislative requirements and obligations and commitments for this sub-project;
- Ensure that project design process incorporates best practice environmental design and sustainability principles to minimize potential impacts of construction on the environment and community.
- Ensure that the construction work procedures minimize potential impacts on the environment and community.
- Develop, implement and monitor measures that minimize pollution and optimize resource use.

7.3 Objectives of EMP

314. The EMP provides a delivery mechanism to address potential impacts of the project activities, to enhance project benefits and to outline standardized good practice

to be adopted for all project works. The EMP has been prepared with the objectives of:

- Defining the roles and responsibilities of the project proponent for the implementation of EMP and identifying areas where these roles and responsibilities can be shared with other parties involved in the execution and monitoring of the project;
- Outlining mitigation measures required for avoiding or minimizing potential negative impacts assessed by environmental study;
- Developing a monitoring mechanism and identifying requisite monitoring parameters to confirm effectiveness of the mitigation measures recommended in the study;
- Defining the requirements for communication, documentation, training, monitoring, management and implementation of the mitigation measures.

7.4 Environmental Management/Monitoring and Reporting

315. During the construction phase, the overall responsibility for the implementation and monitoring of the EMP rests with the City Manager – Sahiwal (CMS). The CMS, using the Project Management Consultant (PMC), will supervise the implementation of the proposed mitigation measures and monitor the implementation progress in the field.

316. The specific roles and responsibilities for environmental management and monitoring are provided in **Table 7.1** below. The expected costs for implementing any required mitigation measures are provided in **Table 7.7** below.

7.5 Institutional Arrangements

317. The environmental management plan will require involvement of the following organizations for its implementation:

i. Local Government and Community Development Department (LG&CDD)

318. The Local Government and Community Development Department (LG&CDD) of Punjab will be the executing agency (EA) of the project. Under the guidance of the Project Steering Committee, LG&CDD will be responsible for the overall execution of the project.

319. A Project Management Unit (PMU) has been established within LG&CDD to support LG&CDD.

ii. City Implementation Unit (CIU) - Sahiwal

320. The EA has established CIU in each of the two participating cities. The key role of the CIUs will be to support the cities in the implementation of the civil works components of the project.

Role of LG&CDD

321. The LG&CD Department, GoPb will:

- Act as the project executing agency (EA) for PICIIP;
- Establish a PMU, with adequate staff acceptable to ADB;
- Liaise with ADB to address any issues during design and implementation;
- Approve delegation of authorities to PMU and CIUs.

Role of PMU

322. The PMU will support LG&CD Department. The PMU will:

- Provide support to ADB missions;
- Coordinate activities with all stakeholders, review consultants, proposals, and provide overall guidance during various stages of project preparation;
- Act as a Secretariat to PSC headed by Chairman P&D Board;
- Manage and ensure safeguard due diligence and disclosure requirements including resettlement and environmental safeguards in accordance with ADB's Safeguard Policy Statement (2009) and government requirements;
- Manage and ensure effective implementation of the gender action plan;
- Ensure submission of all IEE requirements as per law by responsible entities; and
- Monitoring of activities in CIUs and the whole project.

Role of Municipal Corporation (MC)

323. The MC will:

- Facilitate land acquisition;
- Approve and implement all reforms related system, organizations, plans, and programs as required for the project including service delivery arrangements;
- Transfer assets and completed civil works to WSCs/USCs, as required for the projects and agreements; and
- Fill all vacancies in the MC, as per approved organogram and facilities required for CIU and Staff.

Role of City Implementation Unit (CIU)

324. The CIU will support the Municipal Corporations of Sahiwal in the following aspects:

- Conduct city level progress monitoring and reporting;
- Facilitate all monitoring requirements and reporting of GoPb and ADB;
- Ensure safeguard compliance and reporting in line with loan agreements;
- Monitor and ensure effective implementation of the gender action plan;
- Monitor city level activities for reporting and compliance.

Role of the ADB

325. The ADB will:

- Support the coordination and administration of the project;
- Provide guidance to LG&CD Department, PMU, MCs, and CIUs on implementation issues and project design;
- Disclose all safeguards documents, and monitor safeguards implementation;
- Monitor and report project performance;
- Conduct periodic review of the project;

Role of Project Contractor

326. The project contractor will be responsible for following items:

- Implementation of, or adherence to, all provisions of the IEE and EMP;
- Preparation of site specific EMPs (SSEMPs) as required. The SSEMPs will be submitted to PMU/SC prior starting any civil works in order to clear the SSEMPs with consent of ADB Environment Team.
- Contractor's environmental performance will rest with the person holding the highest management position within the contractor's organization. Reporting to their management, the contractor's site managers will be responsible for the effective implementation of the EMP.
- The Contractor will be required to have qualified Environmental Specialists in their team to ensure all mitigation measures are implemented during the different development phases of the project.

7.6 Monitoring Parameters

327. A monitoring plan for the construction phase of the project, indicating environmental parameters, frequency and applicable standards is provided below as **Table 7.3** below.

328. During the procurement/pre-construction period, the monitoring activities will focus on (i) checking the contractor's bidding documents, particularly to ensure that all necessary environmental requirements have been included; and (ii) checking that the contract documents' references to environmental mitigation measures requirements have been incorporated as part of contractor's assignment and making sure that any advance works are carried out in good time.

329. During the construction period, the monitoring activities will focus on ensuring that any required environmental mitigation measures are implemented to address possible impacts.

330. In general, the construction impacts will be manageable, and no insurmountable impacts are predicted, provided that the EMP is implemented to its full extent as required in the Contract documents. However, experience suggests that some Contractors may not be familiar with this approach or may be reluctant to carry out some measures. For the proposed sub-project, in order that the Contractor is fully aware of the implications of the EMP and to ensure compliance, environmental measures must be costed separately in the tender documentation and listed as BoQ items, and that payment milestones must be linked to environmental performance, vis a vis the carrying out of the EMP.

331. The effective implementation of the EMP will be audited as part of the loan conditions and the executing agency must be prepared for this. In this regard, the PMC will guide the design engineers and Contractors on the environmental aspects.

7.7 Environmental Training

7.7.1 Capacity Building and Training

332. Capacity building and training programs are necessary for the project staff in order to control the negative impacts resulting from the project construction and during its operation phase. They will also require trainings on monitoring and inspecting of such a project for environmental impacts and for implementation of mitigation measures.

333. The details of this capacity building and training program are presented in the **Table 7.7** below.

7.8 Environmental Staffing and Reporting Requirements

334. EMP implementation would be responsibility of all project stakeholders including PMU, Project Construction contractors, O&M contractor and other suppliers involved in the project. Requirement of environmental staffing will be part of bidding documents and necessary cost will be allocated as BOQ item by the bidder.

335. PMU will maintain environmental safeguard staffing (Environmentalist/Environment Associate) for construction and operation phase of the project to monitor and supervise EMP implementation and performance. Environment expert will also be part of Construction Supervision Consultant (CSC) technical time and will produce bi-weekly and monthly environmental compliance reports during construction phase.

336. Environment expert of CSC will be responsible to monitor the implementation of EMP during construction phase. Project Contractor(s) will also hire sufficient environmental officers to impement the EMP requirements and prepare necessary EMP documentation. Project contractor staff will prepare daily environmental reports and submit to CSC for approval and record.

337. The Communication and Works (C&W) department will hire qualified environmental specialist during operation phase of the project, who will be responsible for EMP implementation and reporting by the O&M contractors during operation. Bi-annual environmental compliance report will be prepared by WSSP and circulated to concerned authorities.

338. Semi-annual environmental monitoring reports (SAEMRs) will be prepared by the Project CSC and submitted to ADB for review, clearance and disclosure on the ADB website as part of the ADB SPS, 2009 guidelines on environmental due diligence for projects being financed by ADB.

Table 7-1: Environmental Management Plan

Project Activities	Section	Impact	Mitigation Measures Recommended	Responsibility		Timing
				Execution	Monitoring	
Design/Pre-Construction Phase	1.1	Lack of Integration of IEE/EMP requirements into bidding documents	The proposed 'Safeguards unit' that should be developed at the PMU should be assigned the task to check that design and bid documents are responsive to key environmental, social and safety considerations, and that the proposed method of work reflects the boundaries defined in the EMP. The bid documents must include the EMP and its implementation cost must be reflected in the BoQ.	CIU	PMU	BC: during detailed designing of the sub-project
	1.2	Material Haul routes	The construction vehicles hauling materials along the Sahiwal city roads and anywhere where there are sensitive receptors such as hospitals, schools and/or roadside residences will be limited and the PMU in collaboration with the CIU will establish a route plan to minimize this disruption which shall be appended to the EMP.	CIU	PMU	BC: during detailed designing of the sub-project
	1.3	Identification of Locations for Labor Camps and	▪ In order to prevent a nuisance, specific	CIU	PMU	BC: during detailed designing of the sub-

		ancillary facilities	locations shall be designated for development of the labor camps. All necessary facilities and amenities shall be provided in these camps such as electricity, sufficient supply of water, solid and liquid effluent waste disposal facilities etc. ▪ The use of proper planning while identifying locations for the labor camps will ensure there is minimal disturbance to all key receptors and the traffic is not disrupted by labor camps being set up roadside next to the construction sites.			project
	1.4	Contractor's Environmental Safeguards Capacity	So far, local contractor firms in Pakistan working on large and medium scale environmentally sensitive projects have an unsatisfactory record for complying with workplace and environmental safety regulations. To address this, the contractor will be required to define an Occupational and Environmental Health and Safety procedure for all work, including work camp operation, management of	CIU	PMU	BC: during detailed designing of the sub-project

			cement dust, and use of Personal Safety Equipment. These procedures should be developed and approved by the PMU in collaboration with the CIU before the contractor commences any physical works on ground.			
	1.5	Natural Hazard Risks (Flooding, Earthquakes etc.)	Required provisions in the project design, such as storm water drainage, shall be incorporated into the roads' design to cater to extreme weather events.	CIU	PMU	BC: during detailed designing of the sub-project
Construction Phase	2.1	Air Quality	▪ At the construction site and the immediately adjoining areas, water will be sprinkled every three hours and at a higher frequency if felt necessary, at all construction sites to suppress dust emissions. ▪ All heavy equipment and machinery shall be fitted in full compliance with the national and local regulations. ▪ Stockpiled soil and sand shall be slightly wetted before loading, particularly in windy conditions. ▪ Fuel-efficient and well-maintained haulage trucks shall be employed to	Contractor	PMC, CIU	DC

Construction Phase (Continued…)			minimize exhaust emissions. ▪ Vehicles transporting soil, sand and other construction materials shall be covered with tarpaulin. ▪ Limitations to speeds of such vehicles as felt necessary. Transport through densely populated area should be avoided. ▪ Concrete plants to be controlled in line with statutory requirements and shall not be close to sensitive receptors. ▪ Stack height of generators will be at least 3 meters above the ground. ▪ Project traffic will maintain maximum speed limit of 20 km/hr on all unsealed roads within project area. ▪ A minimum distance of 300 meters will be ensured between batching plant(s) and the nearest community. ▪ The need for large stockpiles shall be minimized by careful planning of the supply of materials from controlled sources. Stockpiles should not be located within 50 m of schools,			

			hospitals or other public amenities and shall be covered with tarpaulin when not in use and at the end of the working day to enclose dust. If large stockpiles (>25m^3) of crushed materials are necessary, they should be enclosed with side barriers and also covered when not in use. It shall be ensured that the following measures are taken to control emissions from vehicles being used in the construction activity: ▪ Periodically check and conduct maintenance of the construction machinery and haul vehicles. ▪ Regularly change the engine oil and use new engines/machinery/equipment having good efficiency and fuel burning characteristics. ▪ Use of catalytic converters and low Sulphur fuels. ▪ The stack height of generators will be at least 3 meters above the ground. ▪ Training of the technicians and operators of the construction			

			machinery and drivers of the vehicles. ▪ Air quality monitoring at the project site during the construction phase.			
	2.2	Community Health and Safety	▪ Work areas outside the project site, especially where machinery is involved, will be barricaded and will be constantly monitored to ensure that local residents, particularly children stay away while construction activities and also be cordoned off. Also, no machinery will be left unattended, particularly in running condition. ▪ Local communities in the project area will be briefed on traffic safety, especially women who are the main care providers to children. ▪ Speed limit of 20 km/hr will be maintained by all project related vehicles and nighttime driving of project vehicles will be limited where possible.	Contractor	PMC, CIU	DC

			▪ Educate drivers on safe driving practices to minimize accidents and to prevent spill of hazardous substances and other construction materials during transport.			
	2.3	Occupational Health and Safety	▪ Ensuring that all workers are provided with and use appropriate Personal Protective Equipment (helmet, hand gloves, boots, masks etc); ▪ Follow standard practices of safety checks as prescribed before use of equipment; ▪ Provide on-site Health and Safety Training for all site personnel; ▪ The Contractor will be required to prepare and implement an effective Worker Health and Safety Plan that is supported by trained first aid personnel and emergency response facilities. Construction contracts will include standard Worker Health and Safety measures and contractors will be	Contractor	PMC, CIU	DC

			bound to implement these fully. This will include mandatory wearing of dust masks for any cement handling operations or at any area were cement dust is in the air. ▪ Monitoring will be required to ensure that the health and safety plan based on contract specifications is followed. Cement feed hopper areas will be inspected daily to ensure compliance with the requirement of dust masks. **Physical Hazards** ***Rotating and Moving Equipment*** Injury or death can occur from being trapped, entangled, or struck by machinery parts due to unexpected starting of equipment or unobvious movement during operations. Recommended protective measures include: ▪ Designing machines to eliminate trap hazards and ensuring that extremities			

			are kept out of harm's way under normal operating conditions. Examples of proper design considerations include two-hand operated machines to prevent amputations or the availability of emergency stops dedicated to the machine and placed in strategic locations. Where a machine or equipment has an exposed moving part or exposed pinch point that may endanger the safety of any worker, the machine or equipment should be equipped with, and protected by, a guard or other device that prevents access to the moving part or pinch point. Guards should be designed and installed in conformance with appropriate machine safety standards. ▪ Turning off, disconnecting, isolating, and de-energizing (Locked Out and Tagged Out) machinery with exposed or guarded moving parts, or in which			

			energy can be stored (e.g. compressed air, electrical components) during servicing or maintenance. ▪ Designing and installing equipment, where feasible, to enable routine service, such as lubrication, without removal of the guarding devices or mechanisms. ***Noise*** ▪ No employee should be exposed to a noise level greater than 85 dB(A) for a duration of more than 8 hours per day without hearing protection. In addition, no unprotected ear should be exposed to a peak sound pressure level (instantaneous) of more than 140 dB(C). ▪ The use of hearing protection should be enforced actively when the equivalent sound level over 8 hours reaches 85 dB(A), the peak sound			

			levels reach 140 dB(C), or the average maximum sound level reaches 110dB(A). Hearing protective devices provided should be capable of reducing sound levels at the ear to at least 85 dB(A). · ▪ Although hearing protection is preferred for any period of noise exposure in excess of 85 dB(A), an equivalent level of protection can be obtained, but less easily managed, by limiting the duration of noise exposure. For every 3 dB(A) increase in sound levels, the 'allowed' exposure period or duration should be reduced by 50 percent. ▪ Prior to the issuance of hearing protective devices as the final control mechanism, use of acoustic insulating materials, isolation of the noise source, and other engineering controls should be investigated and implemented, where feasible.			

			▪ Periodic medical hearing checks should be performed on workers exposed to high noise levels. ***Vibration*** ▪ Exposure to hand-arm vibration from equipment such as hand and power tools, or whole-body vibrations from surfaces on which the worker stands or sits, should be controlled through choice of equipment, installation of vibration dampening pads or devices, and limiting the duration of exposure. Limits for vibration and action values. Exposure levels should be checked on the basis of daily exposure time and data provided by equipment manufacturers. ***Electrical*** ▪ Exposed or faulty electrical devices, such as circuit breakers, panels, cables, cords and hand tools, can pose a serious risk to workers. Overhead			

			wires can be struck by metal devices, such as poles or ladders, and by vehicles with metal booms. Vehicles or grounded metal objects brought into close proximity with overhead wires can result in arcing between the wires and the object, without actual contact. Recommended actions include: ▪ Marking all energized electrical devices and lines with warning signs; · ▪ Locking out (de-charging and leaving open with a controlled locking device) and tagging-out (warning sign placed on the lock) devices during service or maintenance; ▪ Checking all electrical cords, cables, and hand power tools for frayed or exposed cords and following manufacturer recommendations for maximum permitted operating voltage of the portable hand tools; · ▪ Double insulating / grounding all			

			electrical equipment used in environments that are, or may become, wet; using equipment with ground fault interrupter (GFI) protected circuits; · ▪ Protecting power cords and extension cords against damage from traffic by shielding or suspending above traffic areas; · ▪ Appropriate labeling of service rooms housing high voltage equipment (‘electrical hazard’) and where entry is controlled or prohibited; · ▪ Rubber tired construction or other vehicles that come into direct contact with, or arcing between, high voltage wires may need to be taken out of service for periods of 48 hours and have the tires replaced to prevent catastrophic tire and wheel assembly failure, potentially causing serious injury or death;			

			▪ Conducting detailed identification and marking of all buried electrical wiring prior to any excavation work. ***Eye Hazards*** ▪ Solid particles from a wide variety of industrial operations, and / or a liquid chemical spray may strike a worker in the eye causing an eye injury or permanent blindness. Recommended measures include: ▪ Use of machine guards or splash shields and/or face and eye protection devices, such as safety glasses with side shields, goggles, and/or a full face shield. Specific Safe Operating Procedures (SOPs) may be required for use of sanding and grinding tools and/or when working around liquid chemicals. Frequent checks of these types of equipment prior to use to ensure mechanical integrity is also good practice. Machine and equipment			

			guarding should conform to standards published by organizations such as CSA, ANSI and ISO. · ▪ Moving areas where the discharge of solid fragments, liquid, or gaseous emissions can reasonably be predicted (e.g. discharge of sparks from a metal cutting station, pressure relief valve discharge) away from places expected to be occupied or transited by workers or visitors. Where machine or work fragments could present a hazard to transient workers or passers-by, extra area guarding or proximity restricting systems should be implemented, or PPE required for transients and visitors. ▪ Provisions should be made for persons who have to wear prescription glasses either through the use overglasses or prescription hardened glasses. ***Welding/Hot Work***			

			▪ Welding creates an extremely bright and intense light that may seriously injure a worker's eyesight. In extreme cases, blindness may result. Additionally, welding may produce noxious fumes to which prolonged exposure can cause serious chronic diseases. Recommended measures include: · ▪ Provision of proper eye protection such as welder goggles and/or a full-face eye shield for all personnel involved in, or assisting, welding operations. Additional methods may include the use of welding barrier screens around the specific work station (a solid piece of light metal, canvas, or plywood designed to block welding light from others). Devices to extract and remove noxious fumes at the source may also be required. · ▪ Special hot work and fire prevention precautions and Standard Operating			

			Procedures (SOPs) should be implemented if welding or hot cutting is undertaken outside established welding work stations, including 'Hot Work Permits, stand-by fire extinguishers, stand-by fire watch, and maintaining the fire watch for up to one hour after welding or hot cutting has terminated. Special procedures are required for hot work on tanks or vessels that have contained flammable materials. ***Industrial Vehicle Driving and Site Traffic*** ▪ Poorly trained or inexperienced industrial vehicle drivers have increased risk of accident with other vehicles, pedestrians, and equipment. Industrial vehicles and delivery vehicles, as well as private vehicles on-site, also represent potential collision scenarios. Industrial vehicle driving and site traffic safety practices			

			include: ▪ Training and licensing industrial vehicle operators in the safe operation of specialized vehicles such as forklifts, including safe loading/unloading, load limits. · ▪ Ensuring drivers undergo medical surveillance. · ▪ Ensuring moving equipment with restricted rear visibility is outfitted with audible back-up alarms. · ▪ Establishing rights-of-way, site speed limits, vehicle inspection requirements, operating rules and procedures (e.g. prohibiting operation of forklifts with forks in down position), and control of traffic patterns or direction. · ▪ Restricting the circulation of delivery and private vehicles to defined routes and areas, giving preference to 'one-way' circulation, where appropriate. ***Ergonomics, Repetitive Motion,***			

			Manual Handling ▪ Injuries due to ergonomic factors, such as repetitive motion, overexertion, and manual handling, take prolonged and repeated exposures to develop, and typically require periods of weeks to months for recovery. These OHS problems should be minimized or eliminated to maintain a productive workplace. Controls may include: · ▪ Facility and workstation design with 5th to 95th percentile operational and maintenance workers in mind. · ▪ Use of mechanical assists to eliminate or reduce exertions required to lift materials, hold tools and work objects, and requiring multi-person lifts if weights exceed thresholds. · ▪ Selecting and designing tools that reduce force requirements and holding times, and improve postures. · ▪ Providing user adjustable workstations.			

			▪ Incorporating rest and stretch breaks into work processes, and conducting job rotation. · ▪ Implementing quality control and maintenance programs that reduce unnecessary forces and exertions. · ▪ Taking into consideration additional special conditions such as left-handed persons. **Physical Hazards** ***Air Quality*** ▪ Poor air quality due to the release of contaminants into the workplace can result in possible respiratory irritation, discomfort, or illness to workers. Employers should take appropriate measures to maintain air quality in the work area. These include: · ▪ Maintaining levels of contaminant dusts, vapors and gases in the work environment at concentrations below			

			those recommended as TWA-TLV's (threshold limit value)—concentrations to which most workers can be exposed repeatedly (8 hours/day, 40 hrs/week, week-after week), without sustaining adverse health effects. · ▪ Developing and implementing work practices to minimize release of contaminants into the work environment including: ▪ Direct piping of liquid and gaseous materials ▪ Minimized handling of dry powdered materials; Enclosed operations ▪ Local exhaust ventilation at emission/release points ▪ Vacuum transfer of dry material rather than mechanical or pneumatic conveyance ▪ Indoor secure storage, and sealed containers rather than loose storage			

			▪ Where ambient air contains several materials that have similar effects on the same body organs (additive effects). ***Fire and Explosions*** ▪ Fires and or explosions resulting from ignition of flammable materials or gases can lead to loss of property as well as possible injury or fatalities to project workers. Prevention and control strategies include: ▪ Storing flammables away from ignition sources and oxidizing materials. Further, flammables storage area should be: ▪ Remote from entry and exit points into buildings ▪ Away from facility ventilation intakes or vents ▪ Have natural or passive floor and ceiling level ventilation and explosion			

			venting ▪ Use spark-proof fixtures ▪ Be equipped with fire extinguishing devices and self closing doors, and constructed of materials made to withstand flame impingement for a moderate period of time · ▪ Providing bonding and grounding of, and between, containers and additional mechanical floor level ventilation if materials are being, or could be, dispensed in the storage area. · ▪ Where the flammable material is mainly comprised of dust, providing electrical grounding, spark detection, and, if needed, quenching systems. ▪ Defining and labeling fire hazards areas to warn of special rules (e.g. prohibition in use of smoking materials, cellular phones, or other potential spark generating equipment). ·			

			▪ Providing specific worker training in handling of flammable materials, and in fire prevention or suppression. ***Corrosive, oxidizing, and reactive chemicals*** ▪ Corrosive, oxidizing, and reactive chemicals present similar hazards and require similar control measures as flammable materials. However, the added hazard of these chemicals is that inadvertent mixing or intermixing may cause serious adverse reactions. This can lead to the release of flammable or toxic materials and gases, and may lead directly to fires and explosions. These types of substances have the additional hazard of causing significant personal injury upon direct contact, regardless of any intermixing issues. The following controls should be observed in the work environment when handling such chemicals: ·			

			▪ Corrosive, oxidizing and reactive chemicals should be segregated from flammable materials and from other chemicals of incompatible class (acids vs. bases, oxidizers vs. reducers, water sensitive vs. water based, etc.), stored in ventilated areas and in containers with appropriate secondary containment to minimize intermixing during spills. · ▪ Workers who are required to handle corrosive, oxidizing, or reactive chemicals should be provided with specialized training and provided with, and wear, appropriate PPE (gloves, apron, splash suits, face shield or goggles, etc). · ▪ Where corrosive, oxidizing, or reactive chemicals are used, handled, or stored, qualified first-aid should be ensured at all times. Appropriately equipped first-aid stations should be			

			easily accessible throughout the place of work, and eye-wash stations and/or emergency showers should be provided close to all workstations where the recommended first-aid response is immediate flushing with water. **Biological Hazards** ▪ Biological agents represent potential for illness or injury due to single acute exposure or chronic repetitive exposure. Biological hazards can be prevented most effectively by implementing the following measures: · ▪ If the nature of the activity permits, use of any harmful biological agents should be avoided and replaced with an agent that, under normal conditions of use, is not dangerous or less dangerous to workers. If use of harmful agents cannot be avoided, precautions should be taken to keep the risk of exposure			

			as low as possible and maintained below internationally established and recognized exposure limits. ▪ Work processes, engineering, and administrative controls should be designed, maintained, and operated to avoid or minimize release of biological agents into the working environment. The number of employees exposed or likely to become exposed should be kept at a minimum. · ▪ The employer should review and assess known and suspected presence of biological agents at the place of work and implement appropriate safety measures, monitoring, training, and training verification programs. · ▪ Measures to eliminate and control hazards from known and suspected biological agents at the place of work should be designed, implemented and			

			maintained in close co-operation with the local health authorities and according to recognized international standards.			
	2.4	Noise	▪ Equipment noise will be reduced at source by proper design, maintenance and repair of construction machinery and equipment. Noise from vehicles and power generators will be minimized by use of proper silencers and mufflers. ▪ Excessive noise emitting equipment will not be allowed to operate and will be replaced. ▪ Blowing of horns will be prohibited on access roads to work sites. ▪ As a rule, the operation of heavy equipment shall be conducted in daylight hours. ▪ Construction equipment, which generates excessive noise, shall be enclosed or fitted with effective	Contractor	PMC, CIU	DC

			silencing apparatus to minimize noise. ▪ Well-maintained haulage trucks will be used with speed controls.			
	2.5	Hazardous and Non-Hazardous Waste Management	▪ A waste management plan will be developed prior to the start of construction. This plan will cater to sorting of hazardous and non-hazardous materials prior to disposal, placing of waste bins at the project sites for waste disposal and an onsite hazardous waste storage facility. ▪ Licensed waste contractors will be engaged to dispose off all non-hazardous waste material that cannot be recycled or reused. ▪ Training will be provided to personnel for identification, segregation and management of waste.	Contractor	PMC, CIU	DC
	2.6	Untreated disposal of effluent from worker camps	▪ It will be ensured that no untreated effluent is released to the environment. ▪ A closed sewage treatment system will	Contractor	PMC, CIU	DC

			treat the effluent, which will then be disposed of in a soak pit or will be used for plantation. The sewage treatment plants will be installed at each respective labor camp based on the number of laborers residing at the respective camp. ▪ Water being released from any batching plant(s) must be treated as per requirements of PEQS prior to release to sewerage system/any other water body.			
	2.7	Soil Contamination	▪ It will be ensured that spill prevention trays are provided and used during refueling. Also, on-site maintenance of construction vehicles and equipment will be avoided as far as possible. In case on-site maintenance is unavoidable, tarpaulin or other impermeable material will be spread on the ground to prevent contamination of soil.	Contractor	PMC, CIU	DC

			▪ Regular inspections will be carried out to detect leakages in construction vehicles and equipment and all vehicles will be washed in external commercial facilities. ▪ Fuels, lubricants and chemicals will be stored in covered bounded areas, underlain with impervious lining. Appropriate arrangements, including shovels, plastic bags and absorbent materials will be available near fuel and oil storage areas.			
	2.8	Employment Conflicts	▪ The Construction Contractor will adopt a transparent hiring policy. Prior to the commencement of the construction activity, the local communities in the project areas of Sahiwal city will be informed of the employment policy in place and number of people that can be employed for this project. ▪ It will be ensured that maximum number of unskilled and semi-skilled	Contractor	PMC, CIU	DC

			jobs will be provided to the residents of Sahiwal city and adjoining areas. ▪ PMU will ensure a balanced process of employment of the communities in the project area with preference given to those most directly affected by the project.			
	2.9	Communicable diseases	▪ A communicable diseases prevention program will be prepared for construction workers or residents near the construction sites. ▪ Reporting employees who are showing symptoms such as fever or high body temperature, coughing, difficulty of breathing or chest pain. Sending them to clinic or nearest hospital immediately. ▪ Body temperature monitoring through Thermal Scanner or other devices to monitor the body temperature of each employee entering/leaving the site or at camp.	Contractor	PMC, CIU	DC

			▪ Awareness and implementation of Quaratine Procedure for all employees who came back from vacation. ▪ Conduct regular housekeeping and sanitation for all access/egress points as well as Log-in/Log-out devices. If possible, deactivate Log-in/Log-out devices such as biometrics. Conduct awareness on how to protect yourself against the infection of COVID-19 through campaign (posters, distribution of brochure). Communicating and implementing COVID-19 Guidelines ▪ Ensure Disinfection of offices and machinery periodically, temperature screening at project entrances, provision of hand sanitizers to office and labour staff, provision of surgical face masks, instruction boards and signage at different locations for COVID-19 awareness			

	2.10	Vegetation and Wildlife Loss	▪ No hunting or killing of animals will be permitted. ▪ No cutting down of vegetation or using vegetation or trees as firewood will be permitted.	Contractor	PMC, CIU	DC
	2.11	Historical/Archaeological Sites	If evidence of any archaeological remains is found during the construction activities, the excavation work will be stopped immediately and necessary next steps taken to identify the archaeological discovery based on the 'Chance Find' procedures	Contractor	PMC, CIU	DC

PMC : Project Management Consultant

BC : Before Construction

DC : During Construction

CIU : City Implementation Unit

Table 7-2: 'Pre-Construction' Environmental Monitoring Plan for Baseline Development

Parameter to be measured	Objective of Monitoring	Parameters to be Monitored	Measurements	Location	Frequency	Responsibility
Ambient Air Quality	To establish baseline air quality levels	CO,NO_2, SO_2, O_3 & PM_{10} (particulate matter smaller than 10 microns) concentration at receptor level	1-hr and 24-hr concentration levels	At three random receptor locations in the project area/depending upon sensitive receptors	Once	PMC
Ambient Noise	To establish baseline noise levels	Ambient noise level near receptors in project area	A-weighted noise levels – 24 hours, readings taken at 15 s intervals over 15 min. every hour, and then averaged	At three random receptor locations in the project area/ depending upon sensitive receptors	Once	PMC

Table 7-3: Construction Phase Monitoring Requirements

Project Activity and Potential Impact	Objective of Monitoring	Parameters to be Monitored	Measurements	Location	Frequency	Responsibility
Noise Disturbance due to noise from construction activity	To determine the effectiveness of noise abatement measures on sound pressure levels	Ambient noise level at different locations in project area	A-weighted noise levels – 24 hours, readings taken at 15 s intervals over 15 min. every hour at 15 m from receptors, and then averaged	At three random receptor locations in project area	Once	Contractor's Environmental officer, PMC

Project Activity and Potential Impact	Objective of Monitoring	Parameters to be Monitored	Measurements	Location	Frequency	Responsibility
Air Quality Dust emissions from construction vehicles and equipment	To determine the effectiveness of dust control program on dust at receptor level	CO,NO_x & PM_{10} (particulate matter smaller than 10 microns) concentration at receptor level	1-hr and 24-hr concentration levels	At three random receptor locations in project area	Once	Contractor's Environmental officer, PMC
		Visible dust	Visual observation of size of dust clouds, their dispersion and the direction of dispersion	Construction site	Once	Contractor's Environmental officer, PMC
Safety precautions by Safety workers	To prevent accidents for workers and general public	Number of near miss events and accidents taking place	Visual inspections	Construction site	Once Daily	Contractor's Environmental officer, PMC
Soil Contamination	To prevent contamination of soil from oil and toxic chemical spills and leakages	Incidents of oil and toxic chemical spills	Visual inspections	At construction site and at vehicle and machinery refuelling & maintenance areas	Once a month	Contractor's Environmental officer, PMC
Solid Waste & Effluent disposal Insufficient procedures for waste collection, storage, transportation and disposal	To check the availability of waste management system and implementation	Inspection of solid and liquid effluent generation, collection, segregation, storage, recycling and disposal will be undertaken at all work sites in project area	Visual inspections	At work sites in project area	Once daily.	Contractor's Environmental officer, PMC

Table 7-4: Capacity Development and Training Programme

Provided by	Organized by	Contents	No. of training events	Duration	Cost (PKR)
Pre-construction Phase Monitoring Consultants/Organizations offering specialized services in environmental management and monitoring	CIU & PMU	Short seminars and courses on: Environmental Management Plan and Environmental Monitoring Plan	Two seminars for Contractor management staff and project staff	1 day	100,000
Construction Phase Monitoring Consultants/Organizations offering specialized services in social management and monitoring	CIU & PMU	Short seminars on Environmental risks associated with construction phase. Development of Environmental Performance Indicators Occupational Health and Safety (OHS) issues	Two seminars for Contractor management staff and project staff dealing in environment and social issues	1 day	100,000
Total			**200,000 (PKR 0.2 million)**		

7.9 Environmental Management Costs

1. The **Table 7.7** below provides cost estimates for 'Pre-Construction phase' monitoring while **Tables 7.7** and **7.8** provides cost estimates for 'Construction phase' and 'Operation phase' monitoring of key environmental parameters.

2. The costs associated with implementation of the EMP and the necessary mitigation measures are provided as Table **7.5** below. The **Table 7.8** below provides the 'Capacity development and training programme' for project contractors for the proposed project.

3. Keeping in view the limited nature of the scope of works and the absence of any water body in the project areas, no significant impact is expected on the water resources in the project area.Also, since only a small work force will conduct the construction tasks, thus, no large-scale water abstraction is to be conducted. Based on this rationale, it was not felt necessary to conduct water quality monitoring.

Table 7-5: Cost Estimates for 'Pre-Construction Phase' Environmental Monitoring[14]

Monitoring Component	Parameters	Quantity	Amount PKR	Details
Air Quality	CO, NO_2, SO_2, O_3 & PM_{10}	1	30,000	1 reading @ PKR 30,000 per sample
Noise Levels	dB(A)	1	30,000	1 reading @ PKR 30,000 per reading
Contingencies			3,000	5% of monitoring cost
Total (PKR)			**63,000**	

Table 7-6: Cost Estimates for 'Construction Phase' Environmental Monitoring[15]

Monitoring Component	Parameters	Quantity	Amount PKR	Details
Air Quality	CO, NO_2, SO_2, O_3 & PM_{10}	2	60,000	1 reading @ PKR 30,000 per sample
Noise Levels	dB(A)	2	60,000	1 reading @ PKR 30,000 per reading
Contingencies			6,000	5% of monitoring cost
Total (PKR)			**126,000**	

[14] For air quality monitoring: 'Passive samplers' such as test tubes can be used or 'Active samplers' with sorbent turbes can also be used.

For noise monitoring: sampling equipment with duration greater than 1 hour can be used.

Table 7-7: Estimated Costs for EMP Implementation

Item	Sub-Item	Estimated Total Cost (PKR)
Staff, audit and monitoring cost[1]	1 person for 3 months (@ 100,000 per month)	**300,000**
Monitoring Activities	Provided separately in Tables 7.5 and 7.6.	189,000
Mitigation Measures	As prescribed under EMP and IEE.	**900,000**
(i) Water sprinkling	To suppress dust emissions	100,000
(ii) Solid waste collection & disposal	From construction sites (based on initial estimates)	100,000
(iii) PPEs/HSE	Helmets, Gloves, face mask, safety harness etc	500,000
(iv) Covid-19 measures	Sanitizers, thermal thermometers face masks etc	200,000
Contingencies	5% of EMP implementation cost	69,450
Total Estimated Cost (PKR)		**1,458,450**

1: To cover staff cost and expenses of Environmental Specialist for Contractor

Table 7.8: Capacity Development and Training Programme for Project Contractor(s)

Provided by	Organized by	Contents	Target Audience	Venue	Duration
Pre-construction Phase PMC offering specialized services in environmental management and monitoring	CIU & PMC	Short seminars and courses on: Environmental Management Plan and Environmental Monitoring Plan	Contractor staff	CIU Office, Sahiwal	One day long training seminar
Construction Phase PMC offering specialized services in social management and monitoring	CIU & PMC	Short seminar on Environmental risks associated with construction phase. Development of Environmental Performance Indicators Occupational Health and Safety (OHS) issues	Contractor staff	CIU Office, Sahiwal	One day long training seminar

8 Public Consultation and Information Disclosure

4. Details on the public consultations conducted are provided below with the pictorial evidences and persons consulted provided as **Annexure A**.

8.1 Approach

5. The following approach was adopted for conducting due diligence to assess the potential impacts from the proposed works:

   - Review of available information including SPS 2009, project design components;
   - Field site visits along with the design team to identify and assess project impacts;
   - Public consultations with the travellers, educational & health institutions in the proximity of project site to seek their views on the project and to discuss probable project impacts and mitigation measures.

6. Public consultations included meetings and interviews with the general public and other stakeholders. The consultation was carried out in accordance with the IR policy requirements of ADB's SPS 2009 and its outcome is discussed in the proceeding sections. Consultations were also held with the PMU, Local Government Board and the design consultants.

7. In this regard, thirty one (31) focus group discussions and five (5) Informal meetings were conducted in North-East direction of Sahiwal City;

8. The consultation process was conducted through out 2.6km of the road length which included

   - Fateh sher road from high street road to old civil line road Sahiwal
   - Main market road from garvi wala pull to fateh sher road Sahiwal
   - Mall mandi chowk to main market road Sahiwal

8.2 Information Disclosure and Consultation

8.2.1 ADB information disclosure requirements

9. Since this is a Category B project, in order to facilitate the required consultations with affected groups and local NGOs, the information about the project's environmental issues as well as technical data needs to be transferred into a form and language(s) accessible to those being consulted. For category B projects, the environmental analysis is posted on the

ADB website as part of the RRP. The full IEE reports are also made available to the interested parties upon request.[16]

8.2.2 Scope of Consultations

10. Due to the covid-19 scenario, the social team followed the ADB SOP's related with social distancing etc. to avoid / minimize any exposure risk.

11. Discussions and consultations on social safeguard aspects of project were held with the educational, health institutions PMU team, CIU team, travelers, students, community in proximity of the project site, and design consultants during the month of July 2020. During the consultations, participants were requested to express their concerns with the proposed upgradtion of roads and suggestions or measures that can address potential consequences and enhance project benefits. During the consultation meetings, participants were informed about the scope of the project. They were also informed about the stakeholder's involvement and their roles and responsibilities in this project. The importance of Grievance Redress Mechanism (GRM) and the role of community in GRM was also the agenda of consultations.

8.2.3 General Response regarding Upgradation of Roads

12. The general response regarding upgradation of roads can be summarized as follows:

- They considered this program of PICIIP as positive step for the development of the city as well as for uplifting the quality of life of the people.
- The project will cause pollution to the area.
- They were keenly interested about the project and its interventions.
- During the consultations, participants were requested to identify concerns with the proposed road rehabilitation measures and suggestions or measures that can address potential pitfalls and enhance project benefits.
- Of the major issues with the existing road travel identified during the stakeholder consultations, traffic congestion and frequency of accidents are the most common. On many of the road sections, stakeholders identified specific locations which have a high accident rate. Moreover, on all the road sections, motorcycles and heavy vehicles were identified as the two most common modes of transport involved in accidents.

[16] https://www.adb.org/sites/default/files/institutional-document/32635/files/environmental-assessment-guidelines.pdf

- Both male and female representatives stressed the need for using good quality construction materials that match the road traffic requirements. In this regard, meeting participants urged for monitoring of the contractors' use of raw materials and workmanship to ensure compliance to contractual obligations and sustainable road works. Moreover, community representatives from some of the road sections expressed their willingness to collaborate with the authorities for joint road repair activities, while participants from other road sections complained regarding generally non-cooperative behavior of the contractors' teams.
- The Grievance Redress Mechanism that provides a mechanism for local communities to register their grievances regarding planned/on-going roadworks. The contractors will be able to use the GRC to maintain a healthy dialogue and cooperation from local communities as and when required.
- Local communities identified several other subproject benefits that not only have the potential to improve road travel, but can also support the socio-economic well-being of the road-side settlements and commercial interests. Road structures that facilitate pedestrians such as pedestrian bridges and speed breakers are in high demand. Insufficient and inadequate maintenance of roadside drains not only add to the misery of road users, but also contribute to road deterioration. Over-speeding and disregard for road safety laws is another major root cause of accidents and traffic congestion. Thus, awareness sessions were proposed for public and private transport drivers at existing bus/taxi stands.
- It was proposed in several meetings that the contract documents require contractors to employ local workers. This is a normal condition in the bidding documents, the bidding documents will provide clauses designed to ensure that all civil works contractors comply with applicable labour laws; do not employ child labour or forced labour; and encourage the employment of the poor.

8.2.4 Gender Responses/Issues

13. The issues discussed were as follows:

- The female consultations were conducted through informal meetings as the social and culture norms did not allow the social team to obtain pictoral evidence. However, their consent and reservations were recorded.
- Females also said that there should be a female in MC specifically to listen and register the complaints of females regarding the irregularity in any sewerage related issue. In this way they can easily go to MC to get the water services in a better way.

- Another opinion of females regarding the complaint registration system that it should be so smart that females can easily register their matters through online application by generating any software in this regard.
- Women consulted at the project site showed serious concerns about restricting their movement due to movement of labor force during construction.
- The construction contractor will make sure that the movement of the labor force is confined within the construction camp and walking/movement routes and passages of the passerby especially women/handicapped of the nearby localities are open and are not blocked.

8.2.5 Recommendations

14. The recommendations made by the stakeholders were as follows:

- Public safety should be on top priority during construction.
- The traffic should be managed properly during the execution of the Project.
- The contractor should comply with the mitigation measures proposed in the Environmental and Management and Monitoring Plan (EMMP) and HSE compliance policy.
- Contractor's activities should be confined to minimize any inconvenience to the public.
- Dust produced due to construction activities may create different health problems, therefore water sprinkling should be carried out regularly to suppress the dust emissions;
- During construction, labour force movement should be controlled so that activities of the community are not disturbed;
- The participants/representatives also stressed the need for timely completion of the project.
- The movement of the heavy machinery should be controlled to avoid harm to other associated properties/structures;
- Grievance redressal mechanism (GRM) at the PMU level should be formalized to address any complaints from the stakeholders at site.
- Awareness campaigns by using Print, Electronic and Social media are highly required to create civic sense among masses.

9 Grievance Redressal Mechanism

9.1 General

15. The ADB Policy (SPS 2009) requires establishment of a local grievance redress mechanism to receive and facilitate resolution of the Displaced/Affected Persons concerns and grievances regarding the project's social and environment performance. The measures have been identified to mitigate any potential environmental and social impacts to be caused due to implementation of the roads works.

16. However, in spite of best efforts, there is every chance that the individuals / households affected by the project or other stakeholders are dissatisfied with measures adopted to address adverse social impacts of the project. To address, such situation an effective Grievance Redress Mechanism (GRM) will be established to ensure timely and successful implementation of the project. It will also provide a public forum to the aggrieved to raise their objections and the GRM would address such issues adequately. It will receive, evaluate and facilitate the resolution of displaced persons' concerns, complaints and grievances about the social and environmental performance at the level of the project.

17. The GRM will aim to investigate charges of irregularities and complaints receive from any displaced persons and provide a time-bound early, transparent and fair resolution to voice and resolve social and environmental concerns link to the project.

18. The PIU shall make the public aware of the GRM through public awareness campaigns. The name of contact person(s) and his/her phone number, PMU contact numbers will serve as a hotline for complaints and shall be publicized through the media and placed on notice boards outside their offices, construction camps of contractors, and at accessible and visible locations in the project area. The project information brochure will include information on the GRM and shall be widely disseminated throughout the project area. Grievances can be filed in writing, via web-based provision or by phone with any member of the PIU.

19. **First tier of GRM.** The PIU is the first tier of GRM which offers the fastest and most accessible mechanism for resolution of grievances. The PIU staff for environment and social safeguards will be designated as the key officers for grievance redressal. Resolution of complaints will be completed within seven (7) working days. Investigation of grievances will involve site visits and consultations

with relevant parties (e.g., affected persons, contractors, traffic police, etc.). Grievances will be documented and personal details (name, address, date of complaint, etc.) will be included, unless anonymity is requested. A tracking number will be assigned for each grievance, including the following elements:

- Initial grievance sheet (including the description of the grievance), with an acknowledgement of receipt handed back to the complainant when the complaint is registered;
- Grievance monitoring sheet, mentioning actions taken (investigation, corrective measures);
- Closure sheet, one copy of which will be handed to the complainant after he/she has agreed to the resolution and signed-off.

20. The updated register of grievances and complaints will be available to the public at the PIU office, construction sites and other key public offices in the project area. Should the grievance remain unresolved, it will be escalated to the second tier.

21. **Second Tier of GRM.** The PIU will activate the second tier of GRM by referring the unresolved issue (with written documentation) to the Sahiwal Waste Management Company (SWMC) who will pass unresolved complaints upward to the Grievance Redress Committee (GRC). The GRC will be established by SWMC before start of site works. The GRC will consist of the following persons: (i) Project Director; (ii) representative District; (iii) representative of the affected person(s); (iv) representative of the local Deputy Commissioners office (land); and (v) representative of the PEPA (for environmental-related grievances). A hearing will be called with the GRC, if necessary, where the affected person can present his/her concerns/issues. The process will facilitate resolution through mediation. The local GRC will meet as necessary when there are grievances to be addressed. The local GRC will suggest corrective measures at the field level and assign clear responsibilities for implementing its decision within fifteen (15) working days. The contractor will have observer status on the committee. If unsatisfied with the decision, the existence of the GRC will not impede the complainant's access to the Government's judicial or administrative remedies.

22. The functions of the local GRC are as follows: (i) resolve problems and provide support to affected persons arising from various environmental issues and including dust, noise, utilities, power and water supply, waste disposal, traffic interference and public safety as well as social issues and land acquisition (temporary or permanent); asset acquisition; and eligibility for entitlements, compensation and assistance; (ii) reconfirm grievances of displaced persons,

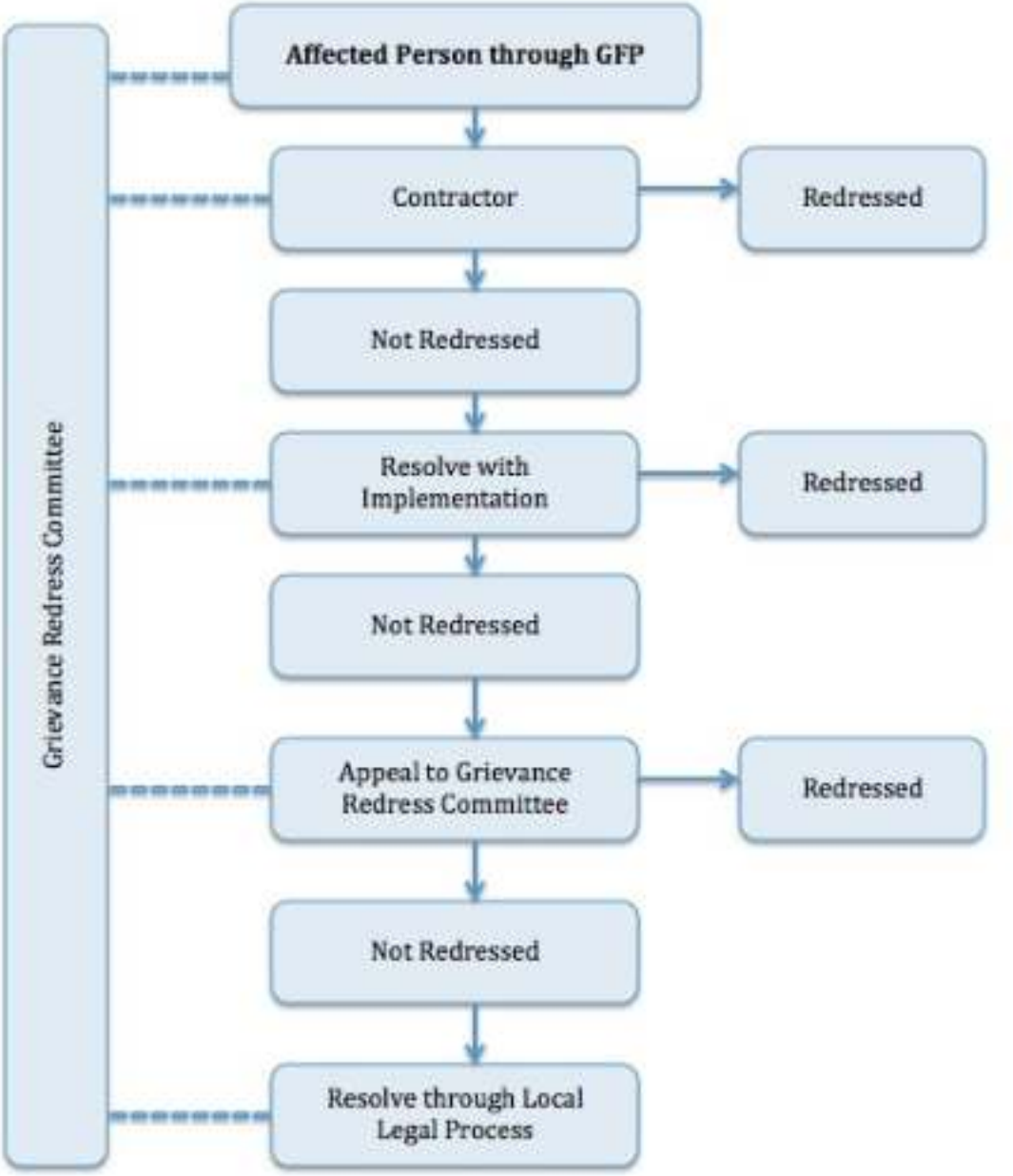
categorize and prioritize them and aim to provide solutions within a month; and (iii) report to the aggrieved parties about developments regarding their grievances and decisions of the GRC.

23. The SWMC officers will be responsible for processing and placing all papers before the GRC, maintaining a database of complaints, recording decisions, issuing minutes of the meetings and monitoring to see that formal orders are issued and the decisions carried out.

24. **Third tier of GRM**. In the event that a grievance cannot be resolved directly by the PIU (first tier) or GRC (second tier), the affected person can seek alternative redressal through the district or sub-district committees as appropriate. The PIUs or GRC will be kept informed by the district, municipal or national authority. The grievance redress mechanism and procedure are depicted in the **Figure 8.1** below. The monitoring reports of the EMP and RP implementation will include the following aspects pertaining to progress on grievances: (i) Number of cases registered with the GRC, level of jurisdiction (first, second and third tiers), number of hearings held, decisions made, and the status of pending cases; and (ii) lists of cases in process and already decided upon may be prepared with details such as Name, ID with unique serial number, date of notice, date of application, date of hearing, decisions, remarks, actions taken to resolve issues, and status of grievance (i.e., open, closed, pending).

25. In order to provide greater clarity, the pictoral description of the GRM is provided in **Figure 8.1** below.

Figure 8.1: Grievance Redressal Mechanism



10 Conclusion and Recommendations

26. Due diligence visits were conducted to the project sites and to the project areas in general where the proposed upgradation of roads network in Sahiwal city are to be conducted. Based on the findings of these visits, this IEE document in order to update the existing umbrella IEE report has been prepared.

27. Since the impact analysis presented earlier in the umbrella IEE report was quite generic and briefly covered all projects to be implemented in Sahiwal city, thus a comprehensive yet focused impact analysis and EMP specifically for the proposed upgradation of roads network works has been prepared as part of this IEE report.

28. The EMP contained within this IEE document is considered sufficient for issuance as part of the Contracts to the successful bidder(s) and for subsequent use during the project works.

29. It should be mentioned that prior to the commencement of works, this EMP must be further updated by the Contractor into site specific EMP (SSEMPs) for review and approval of ADB.

30. In this SSEMP, aspects such as a detailed traffic management plan, identification of locations for disposal of debris and spoil and any other details which shall become available later must be included for efficient implementation of all proposed mitigation measures and the subsequent monitoring of these measures.

31. This IEE document is considered sufficient to proceed with commencement of the required works.

ANNEXURES

Annexure A

Photographs of Public Consultations

Punjab Intermediate Cities Improvement Investment Program (PICIIP) 30

ATTENDANCE SHEET

Subject: Consultations with APs Related to the project of Roads Upgradation in Sahiwal Date: 29/7/20 At: Sultan Ice Autos Near Ganj Pul Fateh Sher

List of Participants:

Sr. No.	Name	Designation	Cell No.	Signature
1	M. Bilal	Riksha Driver	03016926030	
2	Shakeel Ahmad	Labour	03[illegible]6903906	
3	Jameel Ahmad	Riksha Driver	0313 7965549	
4	Masood Mansha	Pvt Job	03064275700	
5	Aziz Ali	Govt Job	03036079512	
6	Gulam Mustafa	Labour	03017067208	
7	M. Ashraf	Shop Keeper	0308 8026422	
8	Aamir Hussain	Moderator	03457650007	
9	Syed Sarfraz	Transcriber	0331 5230000	
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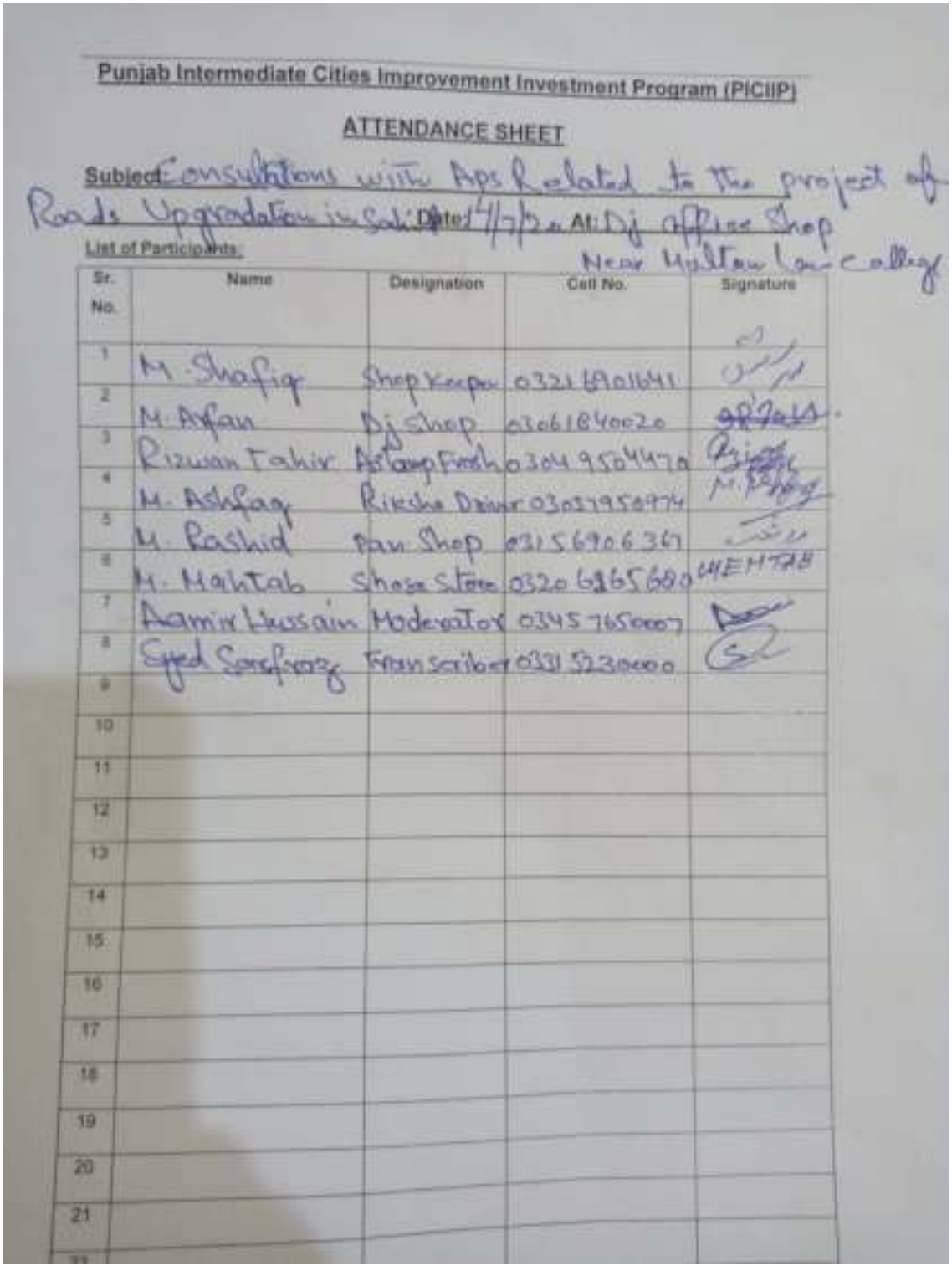

Punjab Intermediate Cities Improvement Investment Program (PICIIP)

ATTENDANCE SHEET

Subject: Consultations with APs Related to the project of Roads Upgradation in Sahiwal Dated 4/7/22 At: Dj office Shop Near Multan Law college

List of Participants:

Sr. No.	Name	Designation	Cell No.	Signature
1	M. Shafiq	Shop Keeper	03216901641	
2	M. Afzal	Dj Shop	03061840020	
3	Rizwan Tahir	Astaan Fresh	03049504470	
4	M. Ashfaq	Rickshaw Driver	03037950974	
5	M. Rashid	Pan Shop	03156906367	
6	M. Mahtab	Shoes Store	03206165680	
7	Aamir Hussain	Moderator	03457650007	
8	Syed Sarfraz	Transcriber	03315230000	
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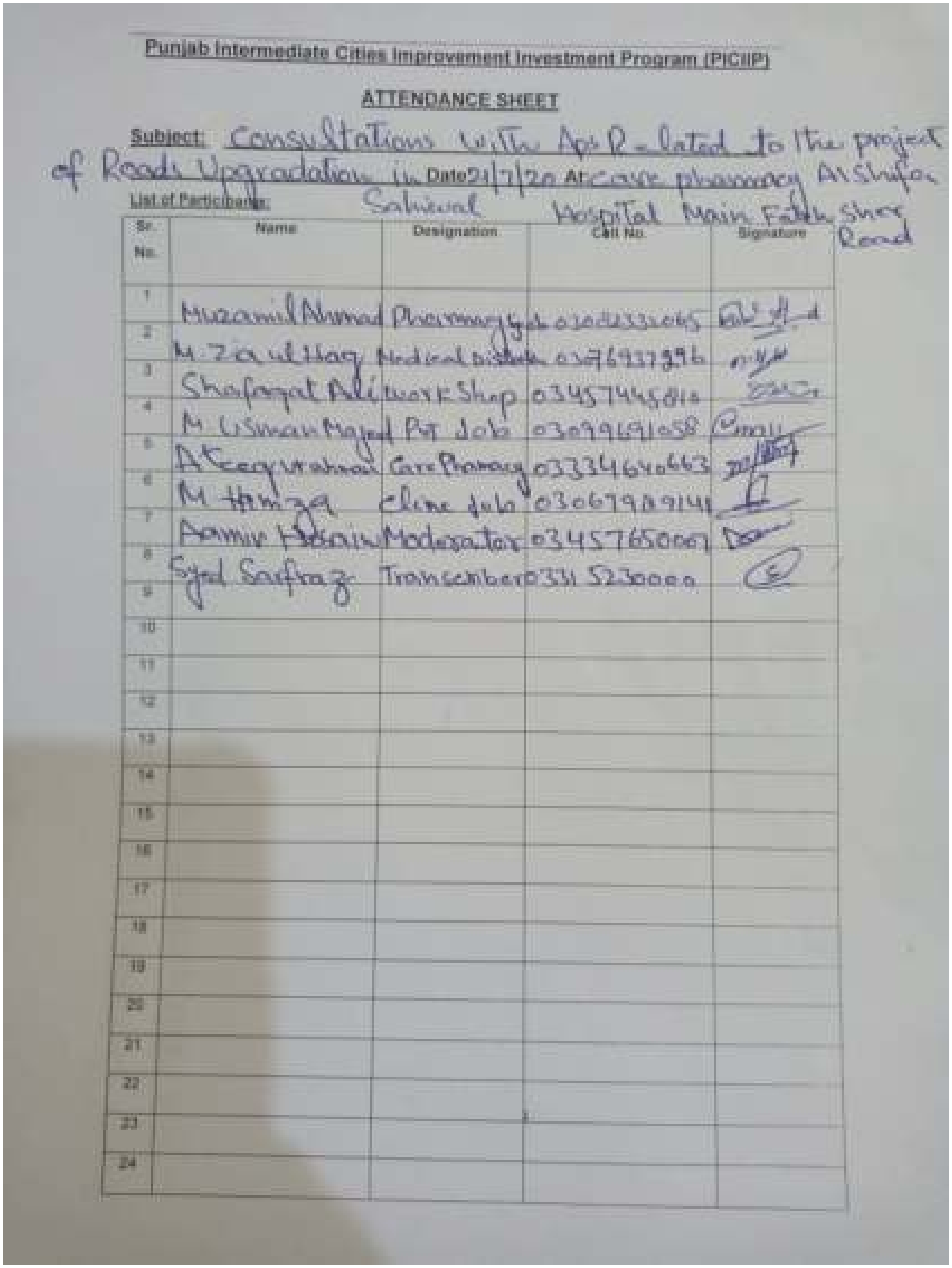

Punjab Intermediate Cities Improvement Investment Program (PICIIP)

ATTENDANCE SHEET

Subject: Consultations with APs Related to the project of Roads Upgradation in Sahiwal **Date** 21/7/20 **At** Care pharmacy Al Shifa Hospital Main Fateh Sher Road

List of Participants:

Sr. No.	Name	Designation	Cell No.	Signature
1	Muzammil Ahmad	Pharmacy job	0302[illegible]	[illegible]
2	M. Zia ul Haq	Medical [illegible]	0307[illegible]96	[illegible]
3	Shafqat Ali	Work Shop	03457445810	[illegible]
4	M. Usman Majeed	Pvt Job	03099191058	[illegible]
5	Ateeq ur rehman	Care Pharmacy	03334640663	[illegible]
6	M Hamza	clinic job	03067989141	[illegible]
7	Aamir Hassan	Moderator	03457650007	[illegible]
8	Syed Sarfraz	Transcriber	0331 5230000	[illegible]
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AL-REHMAN

Punjab Intermediate Cities Improvement Investment Program (PICIIP)

ATTENDANCE SHEET

Subject: Consultation with Apx Related to the project of Roads Upgradation in Sahiwal Date: 19/7/22 At: Al Rahman Digital x-Ray Main Fateh Sher Road

List of Participants:

Sr. No.	Name	Designation	Cell No.	Signature
1	Javed	Labour	03090758286	Javed
2	Wajaht	Labour	03046567933	[illegible]
3	Nasir Abbas	Labour	03026914918	[illegible]
4	Nadeem Tahir	X-Ray Centre	03227040308	[illegible]
5	Rafaqat Ali	S. Guard	03083405877	Rafaqat
6	Mujahid	Student	—	[illegible]
7	Aamir Hussain	Moderator	03457650007	[illegible]
8	Syed Sarfraz	Transcriber	0331 5230000	[illegible]
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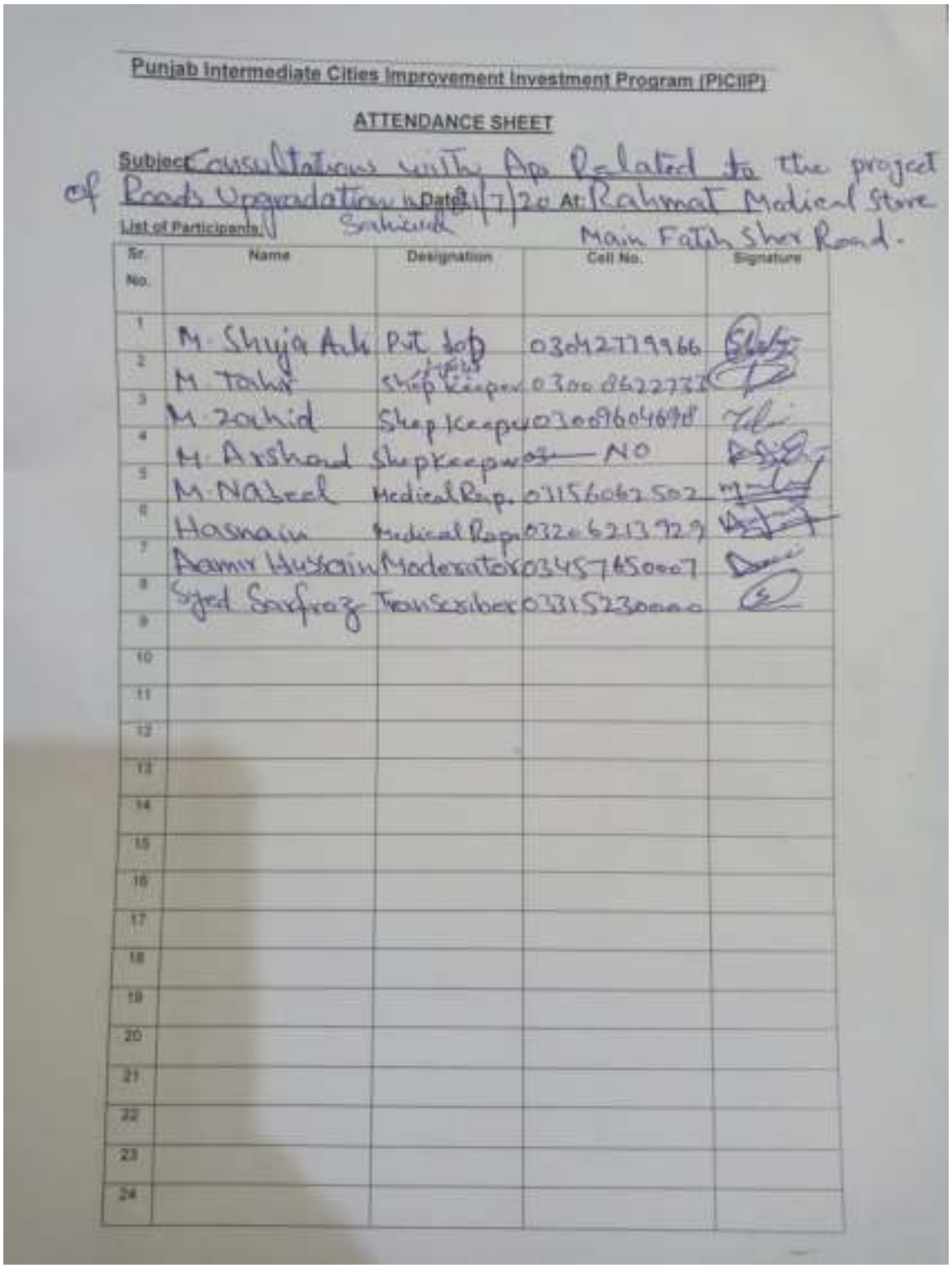

Punjab Intermediate Cities Improvement Investment Program (PICIIP)

ATTENDANCE SHEET

Subject: Consultations with Ags Related to the project of Roads Upgradation in Sahiwal Date: 31/7/20 At: Rahmat Medical Store Main Fatih Sher Road.

List of Participants:

Sr. No.	Name	Designation	Cell No.	Signature
1	M. Shuja Ash	Pvt Sop	03042779966	
2	M Tahir	Shop Keeper	0300 8622733	
3	M Zahid	Shop Keeper	03009604698	
4	M Arshad	Shopkeeper	— NO	
5	M Nabeel	Medical Rep.	03156062502	
6	Hasnain	Medical Rep.	0326 6213729	
7	Aamir Hussain	Moderator	03457450007	
8	Syed Sarfraz	Transcriber	03315230000	
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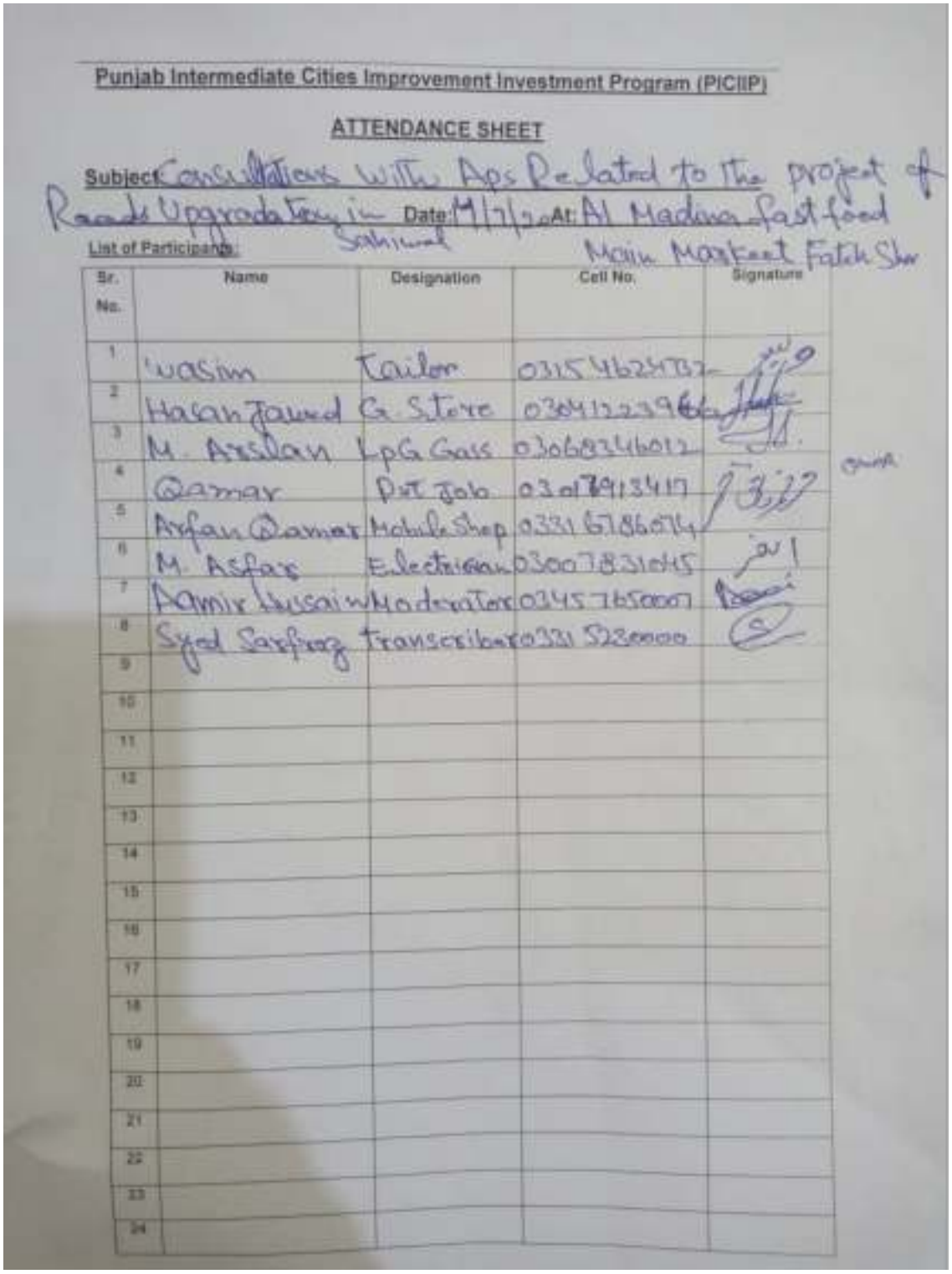

Punjab Intermediate Cities Improvement Investment Program (PICIIP)

ATTENDANCE SHEET

Subject: Consultations with APs Related to the project of Roads Upgradation in Sahiwal Date: 14/7/20 At: Al Madina fast food Main Market Fateh Shr

List of Participants:

Sr. No.	Name	Designation	Cell No.	Signature
1	Wasim	Tailor	0315 4624787	
2	Hasan Jawad	G. Store	0304 1223966	
3	M. Arslan	LpG Gass	03068346012	
4	Qamar	Pvt Job	03017913417	
5	Arfan Qamar	Mobile Shop	0331 6786074	
6	M. Asfar	Electrician	0300 7831045	
7	Aamir Hussain	Moderator	0345 7650007	
8	Syed Sarfraz	Transcriber	0331 5280000	
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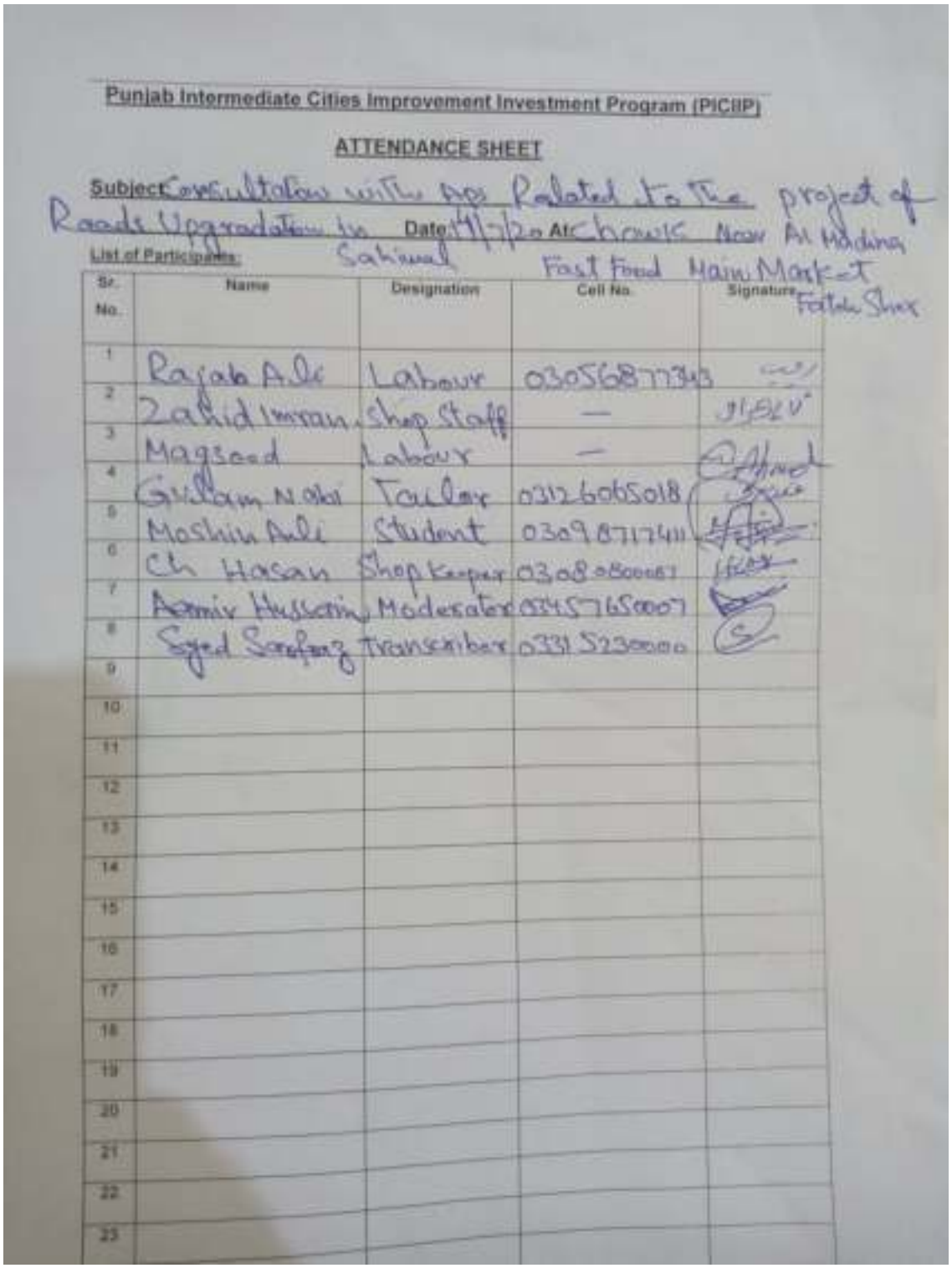

Punjab Intermediate Cities Improvement Investment Program (PICIIP)

ATTENDANCE SHEET

Subject: Consultations with PAPs Related to the project of Roads Upgradation in Sahiwal Date: 4/7/20 At: Chowk Near Al Hadina Fast Food Main Market Fatak Shar

List of Participants:

Sr. No.	Name	Designation	Cell No.	Signature
1	Rajab Ali	Labour	03056877343	
2	Zahid Imran	Shop Staff	—	
3	Maqsood	Labour	—	
4	Gulam Nabi	Tailor	03126065018	
5	Moshin Ali	Student	03098717411	
6	Ch Hasan	Shop Keeper	03080800087	
7	Aamir Hussain	Moderator	03457650007	
8	Syed Sarfaraz	Transcriber	0331 5230000	
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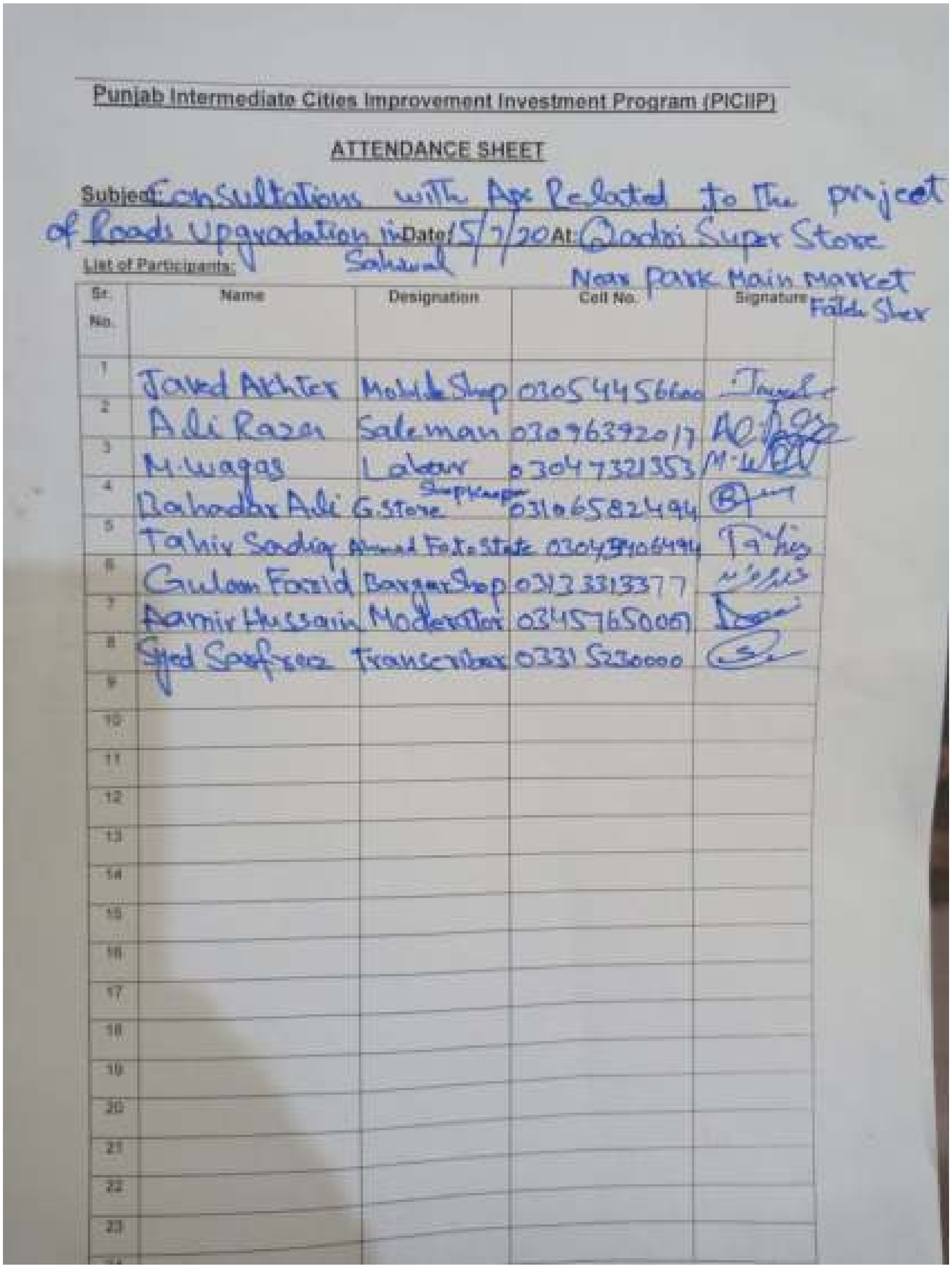

Punjab Intermediate Cities Improvement Investment Program (PICIIP)

ATTENDANCE SHEET

Subject: Consultations with APs Related to The project of Roads Upgradation in Sahiwal Date: 5/7/20 At: Qadri Super Store Near Park Main Market Farid Sher

List of Participants:

Sr. No.	Name	Designation	Cell No.	Signature
1	Javed Akhtar	Mobile Shop	03054456600	[illegible]
2	Ali Raza	Saleman	03096392017	[illegible]
3	M. Waqas	Labour	03047321353	[illegible]
4	Bahadar Ali	G. Store Shopkeeper	03106582494	[illegible]
5	Tahir Sadiq	Ahmad Foto State	03043406494	[illegible]
6	Gulam Farid	Burger Shop	03133313377	[illegible]
7	Aamir Hussain	Moderator	03457650067	[illegible]
8	Syed Sarfraz	Transcriber	03315230000	[illegible]
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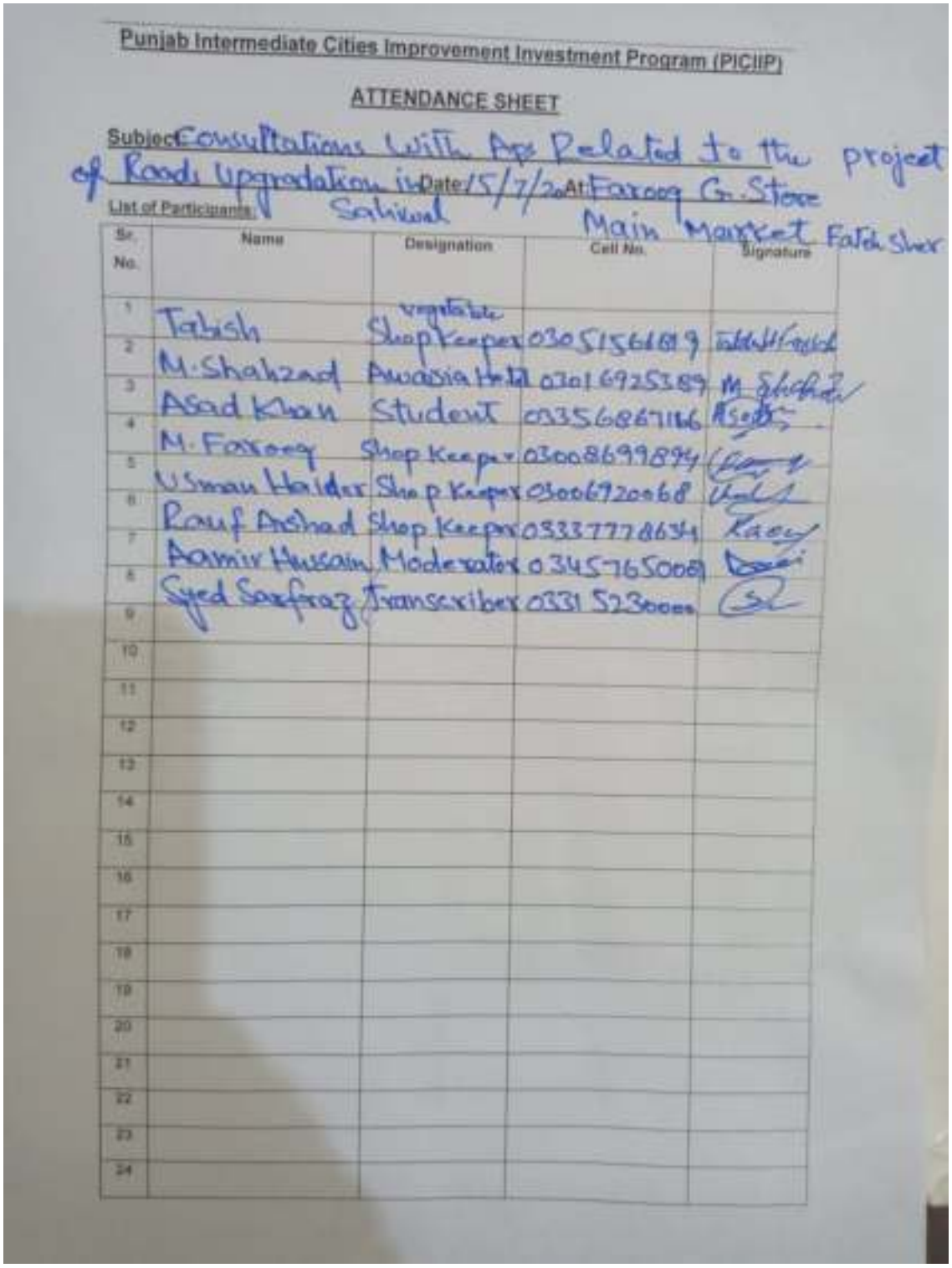

Punjab Intermediate Cities Improvement Investment Program (PICIIP)

ATTENDANCE SHEET

Subject: Consultations With Age Related to the project of Roads Upgradation in Sahiwal Date: 15/7/20 At: Farooq G. Store Main Market Fateh Sher

List of Participants:

Sr. No.	Name	Designation	Cell No.	Signature
1	Tabish	Vegetable Shop Keeper	03051561819	
2	M. Shahzad	Awaisia Hotel	03016925389	
3	Asad Khan	Student	03356867166	
4	M. Farooq	Shop Keeper	03008699894	
5	Usman Haider	Shop Keeper	03006720068	
6	Rauf Arshad	Shop Keeper	03337778634	
7	Aamir Hussain	Moderator	03457650089	
8	Syed Sarfraz	Transcriber	0331 5230000	
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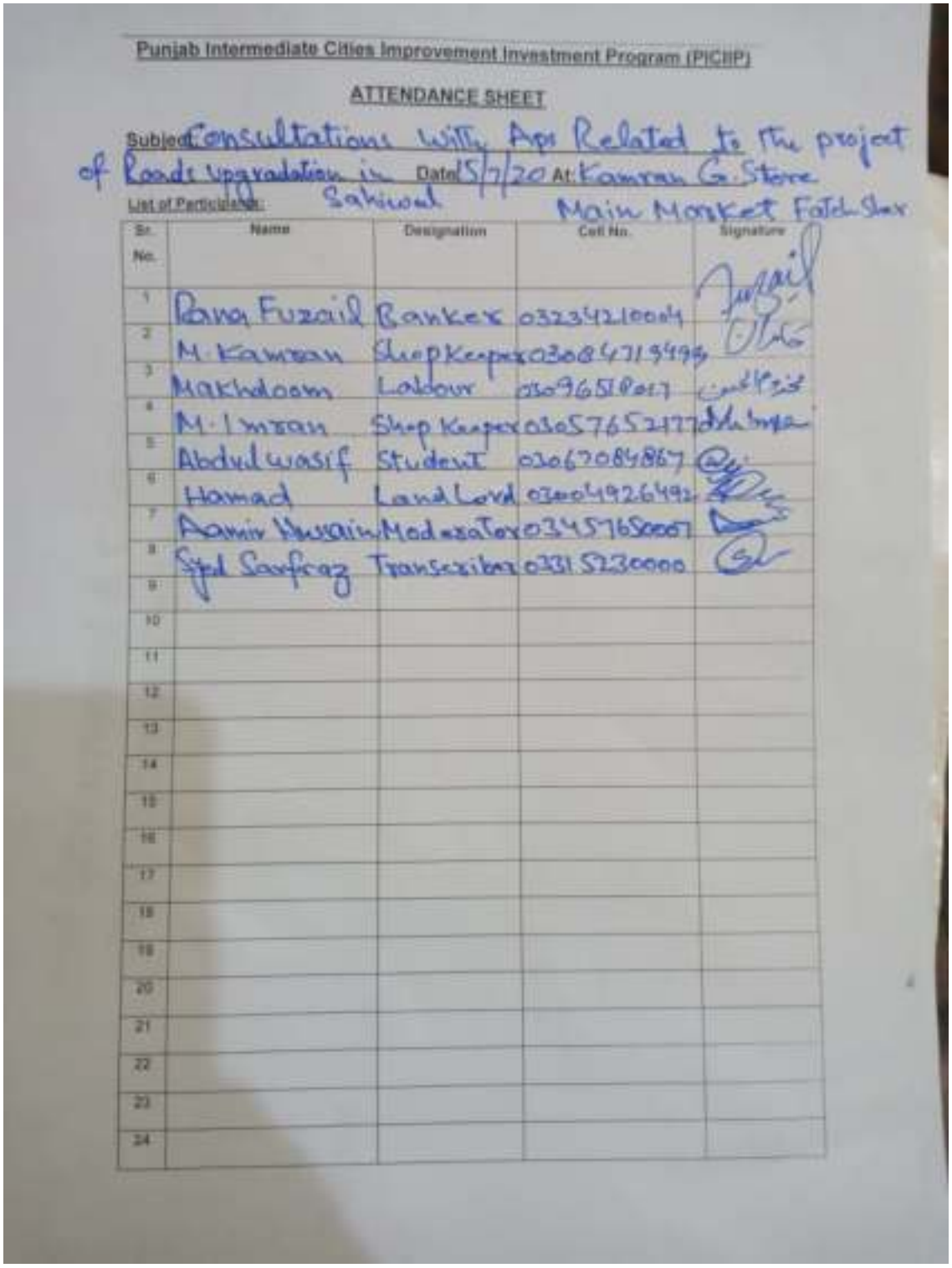

Punjab Intermediate Cities Improvement Investment Program (PICIIP)

ATTENDANCE SHEET

Subject: Consultations with Apx Related to the project of Roads Upgradation in Sahiwal Date: 5/7/20 At: Kamran G. Store Main Market Fateh Shah

List of Participants:

Sr. No.	Name	Designation	Cell No.	Signature
1	Rana Fuzail	Banker	03234210004	
2	M. Kamran	Shop Keeper	03084719496	
3	Makhdoom	Labour	03096518017	
4	M. Imran	Shop Keeper	03057652177	
5	Abdul wasif	Student	03067084867	
6	Hamad	Land Lord	03004926492	
7	Aamir Hussain	Moderator	03457650007	
8	Syd Sarfraz	Transcriber	0331 5230000	
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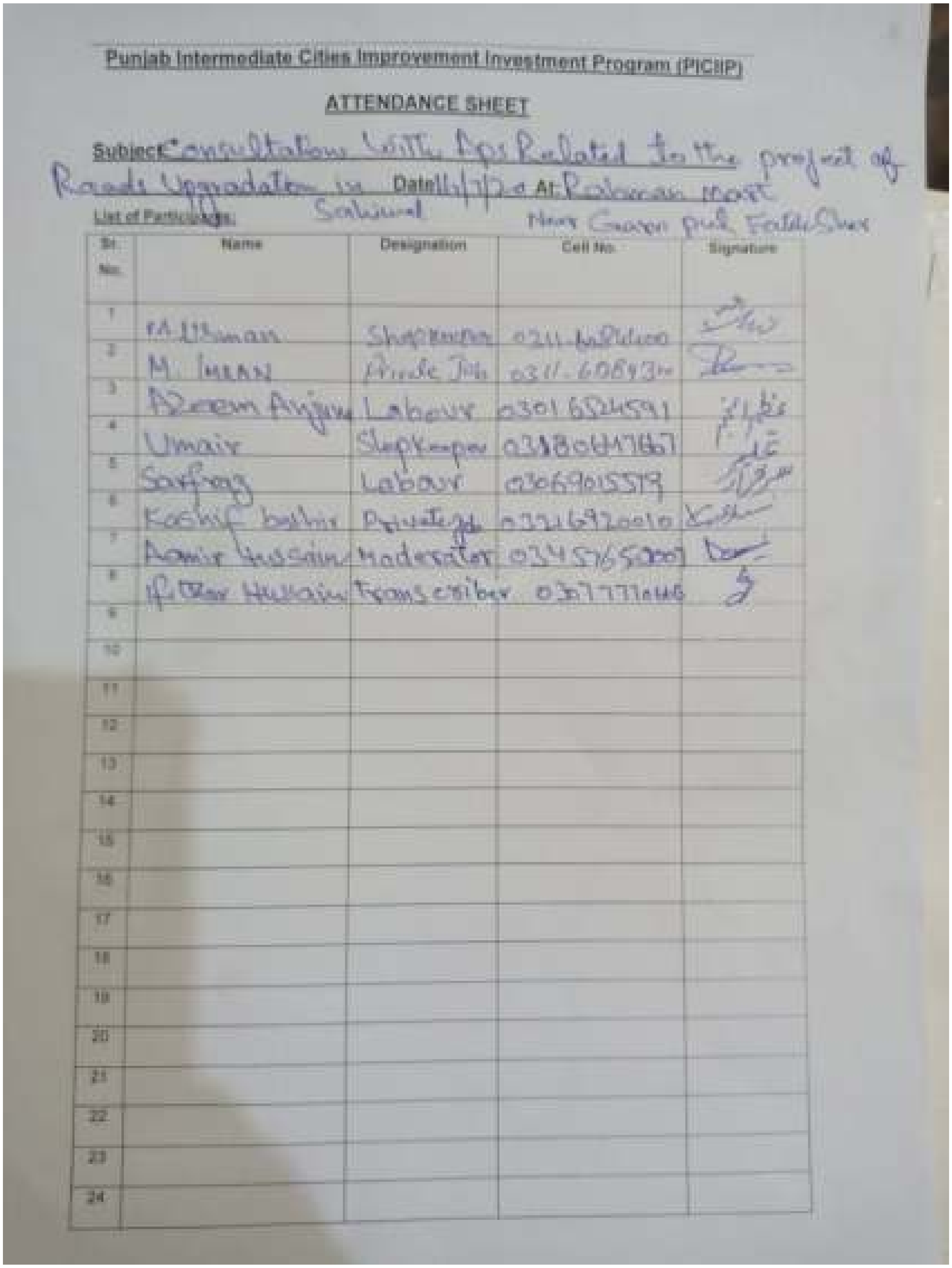

Punjab Intermediate Cities Improvement Investment Program (PICIIP)

ATTENDANCE SHEET

Subject: Consultation With APs Related to the project of Roads Upgradation in Sahiwal Date: 11/7/20 At: Rahman Mart Near Green [illegible] Farid [illegible]

List of Participants:

Sr. No.	Name	Designation	Cell No.	Signature
1	M. Usman	Shopkeeper	0311-[illegible]	[signature]
2	M. Imran	Private Job	0311-60843[illegible]	[signature]
3	Azeem Anjum	Labour	0301 6524591	[signature]
4	Umair	Shopkeeper	03180447867	[signature]
5	Sarfraz	Labour	03069015519	[signature]
6	Kashif [illegible]	Private Job	03216920010	[signature]
7	Aamir Hussain	Moderator	03457650007	[signature]
8	Iftikhar Hussain	Transcriber	0307771446	[signature]
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Punjab Intermediate Cities Improvement Investment Program (PICIIP)

ATTENDANCE SHEET

Subject: Consultation with Aps Related to the Project of Roads Upgradation in Sahiwal **Date:** 16/7/20 **At:** Near Madina Hotel Gravi pul Fateh Sher

List of Participants:

Sr. No.	Name	Designation	Cell No.	Signature
1	MAQSOOD AHMAD	TEACHER	03090022051	[signature]
2	Latif Rahmani	Hotel	03009694503	[signature]
3	Ali Raza	Labour	03034263343	[signature]
4	M. Sadiq	Fruit Seller	03016527121	[signature]
5	Azhar Mehmood	Welder	03459697779	[signature]
6	Ali Asghar	Tyre Shop	03336925570	[signature]
7	Aamir Hussain	Moderator	03457650007	[signature]
8	Iftikhar Hussain	Transcriber	0307 7770666	[signature]
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Punjab Intermediate Cities Improvement Investment Program (PICIIP)

ATTENDANCE SHEET

Subject: Consultation with APs Related to the project of Roads Upgradation in Sahiwal Date: 16/7/2 At: Tahir Auto Near Goods [illegible] Fateh Sher

List of Participants:

Sr. No.	Name	Designation	Cell No.	Signature
1	Tahir Sajjad	Shop Keeper	0301 6921172	[signature]
2	RAHIL Anjum	Shop Keeper	03144529126	[signature]
3	HAMZA	Shop Keeper	0303-5330252	HAMZA
4	Ahmad	Student	0305 8960[illegible]	[signature]
5	Tanveer Sohail	Cattle farm	[illegible]	T. Sohail
6	Nadeem Ahmad	Tailor	03116992126	[signature]
7	Aamir Hussain	Moderator	03457650007	[signature]
8	Iftikhar Hussain	Transcriber	03077770666	[signature]
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Punjab Intermediate Cities Improvement Investment Program (PICIIP)

ATTENDANCE SHEET

Subject: Consultations with APs related To The project of Roads Upgradation in Sahiwal **Date:** 17/7/20 **At:** AL Riaz Karyana Store Near Nishtar Law college

List of Participants:

Sr. No.	Name	Designation	Cell No.	Signature/Thumb
1	Mudassar	Marketing	0318-8209541	
2	M. Awais	Shopkeeper	03166386739	
3	M UMAR SIDDIQUE	[illegible]	0301-3336571	
4	M. Kashif	Shop Keeper	0300-9692055	
5	M. Junaid	Shopkeeper	03144247467	
6	Salman	Chicken shop	0316 7717495	
7	Aamir Hussain	Moderator	03457650007	
8	Syed Sarfraz	Transcriber	0331 [illegible]	
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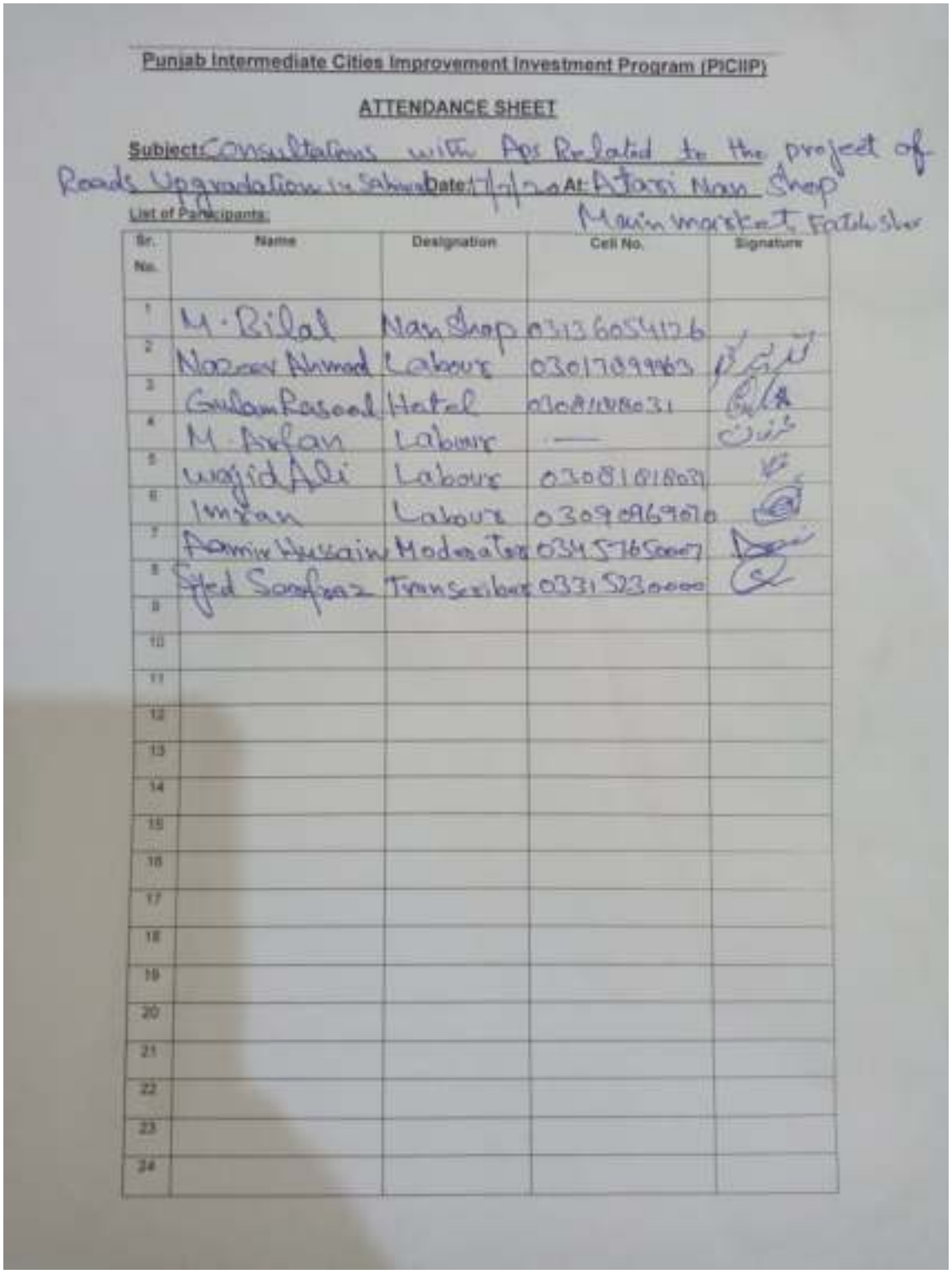

Punjab Intermediate Cities Improvement Investment Program (PICIIP)

ATTENDANCE SHEET

Subject: Consultations with APs Related to the project of Roads Upgradation in Sahiwal Date: 1/7/20 At: Atari Nan Shop Main market, Fatehshah

List of Participants:

Sr. No.	Name	Designation	Cell No.	Signature
1	M. Bilal	Nan Shop	03136054126	
2	Nazeer Ahmad	Labour	03017099963	
3	Gulam Rasool	Hotel	03088188031	
4	M Arfan	Labour	—	
5	Wajid Ali	Labour	03088181803	
6	Imran	Labour	03090969070	
7	Aamir Hussain	Moderator	0345765007	
8	Syed Saqlain	Transcriber	0331523	
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Annexure B

Environment Screening & Categorization Forms (ESCF)

Punjab Intermediate City Improvement Investment Project (PICIIP)

Instructions

Environment Screening & Categorization Form (ESCF

(i) The CIU staff may complete this form to support the environmental categorization of a project and submit to the ADB for verification and approval.

(ii) This checklist focuses on environmental issues and concerns. To ensure that the Social dimensions are adequately considered, refer also to the Checklists on involuntary resettlement and Indigenous Peoples.

(iii) This form is to be completed assuming the "without mitigation" case. The purpose is to identify potential impacts.

1. **Project Name:** Up gradation of road works in Sahiwal

2. Project Scope of Work (list the major interventions): Up gradation of road works in Sahiwal divided in to three patches. One is Mall Mandi Chowk to Main market road, second is Main market road from Garvi Wala Pull to Fateh Sher road and third is Fathe Sher road from High Street road to Civil Line road. The proposed model roads are situated in North-East direction of Sahiwal City. Total length of these three (03) roads which needs to be upgraded is approximately 2.6 km. Roads serve for 35-40% population of the area. Majority of population use High street road that increase traffic congestion in peak hours. High streets and Girls college road are well developed roads. Due to commercialization, residents along these roads convert their residential plots into commercial in the form of markets and corner shops. The aim of these proposed roads may be an alternative route for the existing population to use these roads without disturbing High street traffic

2. **Project Location :** The project is located in the territory of Metropolitan Corporation Sahiwal

3. **Total Project Cost (million PKR):** 268.348/Million

5. Project GPS Coordinates2 30º 40′26.24″N 73º6′32.84"E

6. **TheproposedprojectactivityisNOTlistedintheProhibitedInvestmentActivities List (PIAL) (please refer to Annexure Ibelow).**

☑ **YES** ☐ **No**

Based on mapping of GPS Coordinates onto Google Earth (Annexure II), please respond to the following:

7. **Is the project site(s) located adjacent to or within any environmentally sensitive areas (National Park, Protected Area, Buffer zone of Protected Area, Wetland, Mangrove?) If so, provide details and explain the potential risks to the sensitive areas from the proposed project activities:**

S.No	Issues	Yes	NO
1.	**Is the sub-project area adjacent to or within the cultural heritage site?**		√
2.	**Is the sub-project area adjacent to or within environmentally protected area?**		√

3.	**Is the sub-project area adjacent to or within Wetland?**		√
4.	**Is the sub-project area adjacent to or within the Forest?**		√
5.	**Is the sub-project area adjacent to or within Biodiversity hotspot?**		√
6.	**Is the sub-project area adjacent to or within Buffer zone of**		√

[1] Required to assess categorization under Pak EPA guidelines

[2] In case of cluster of projects, please provide GPS Co-ordinates for each project location

8. Is project(s) located in a densely populated area? NO

9. Use the satellite imagery to identify the numbers and types (as far as possible) of sensitive receptors (SR)below:

SR Type1: School **Approx. Number of SR1:**07

SR Type2: Mosque **Approx. Number of SR2:**03

SR Type3: Hospital/Clinic **Approx. Number of SR3:**06

SR Type 4: Public building **Approx. Number of SR4:**04

SR Type 5: Grave yard **Approx. Number of SR5:**0

10. Will the proposed project activity required is location of people? If so, please mention the estimated number of people to be displaced.

NO

11. Will any land acquisition be required for the proposed project activity? If so, please provide details.

NO

12. Pleaseprovidedetailsofanysignificantexpectedimpacts(''withoutmitigation''case) due to the proposed project activities on the identified sensitive receptors:

Sr.No	Type of expected impact	Details on Severity of expected impacts
1	Generation of high dust levels in sensitive areas during construction.	Medium
2	High noise levels in sensitive areas due to blasting and civil works.	Minimal
3	Occupational and community health and	Medium

	safety risks.	
4	Impact on water bodies due to disposal of Chemicals/oils/lubricants and other hazardous/semi-hazardous substances.	No
5	Risks to community health and safety caused by (any or all of the below) (i) Management and disposal of waste and/or (ii) Civil or electrical work sand/or (iii) Accidental and natural hazards, particularly where structural elements or components of project are accessible to members of affected community and/or (iv) Fire, electric shock or failure of civil structures during operation.	Minimal
6	Generation of disease vectors due to project activities.	Minimal
7	Depletion and/or Contamination of ground water reservoirs due to leaching of chemicals, oil, lubricants and other hazardous/semi- hazardous substances.	Minimal
8	Improper sanitation and liquid waste disposal system.	Minimal
9	Degradation of land and ecosystem (e.g. loss of wetlands and wild lands, coastal zones, watersheds and forests).	NO
10	Road blocking and temporary flooding due to land excavation during rainy season.	Medium
11	Dislocation or involuntary resettlement of people.	Yes
12	Impacts on vulnerable groups such as the poor, women and children and indigenous peoples.	NO
13	Degradation of cultural property and loss of cultural heritage and tourism reserves.	NO

14	Impact on Flora and Fauna, particularly on any endangered species located in project area(s).	Endangered species are not present in project area.
15	Social conflicts	Medium
16	Interference with other utilities and blocking of access to building	Minimal

Project Category Recommendation

13. It is recommended that based on the available project information and subsequent analysis, the project should be placed in (please tick one):

☐ Category 'A' ☑ Category 'B' ☐ Category 'C'

14. Please provide an explanation to justify the Categorization above:

There are a few sensitive receptors at project site and severity of expected impacts as evident from above table are less adverse and few site specific impacts are irreversible and As per ADB Safeguard Policy, a proposed project is classified as category "B" if it is likely to have few site specific adverse environmental impacts. So Initial Environmental Examination (IEE) would be require.

Screening & Categorization Conducted by:

_____

Environment Officer, CIU

Endorsed by:

_____

Head of PMU

Approved by:

_____

ADB Environment Safeguards Focal Point

Endorsed by:

_____

Project Officer, ADB

ANNEXURE I –Prohibited Investment Activities List (PIAL)

The following do not qualify for ADB financing:

(i) Production or activities involving harmful or exploitative forms of forced labor[3] or child labor;[4]

(ii) Production of or trade in any product or activity deemed illegal under host country laws or regulations or international conventions and agreements or subject to international phase outs or bans, such as (a) pharmaceuticals,[5] pesticides, and herbicides,[6] (b) ozone-depleting substances,[7] (c) polychlorinated biphenyls[8] and other hazardous chemicals,[9] (d) wildlife or wildlife products regulated under the Convention on International Trade in Endangered Species of Wild Fauna and Flora,[10] and (e) transboundary trade in waste or waste products;[11]

(iii) Production of or trade in weapons and munitions, including paramilitary materials;

(iv) Production of or trade in alcoholic beverages;[12]

(v) Production of or trade in tobacco;[13]

(vi) Gambling, casinos, and equivalent enterprises;[14]

(vii) Production of or trade in radioactive materials,[15] including nuclear reactors and components thereof;□

(viii) Production of, trade in, or use of unbounded asbestos fibers;[16]

(ix) Commercial logging operations or the purchase of logging equipment for use in □primary tropical moist forests or old-growth forests; and□

(x) Marine and coastal fishing practices, such as large-scale pelagic drift net fishing and fine mesh net fishing, harmful to vulnerable and protected species in large numbers and damaging to marine biodiversity and habitats.□

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[3] Forced labor means all work or services not voluntarily performed, that is, extracted from individuals under threat of force or penalty.

4 Child labor means the employment of children whose age is below the host country's statutory minimum age of employment or employment of children in contravention of International Labor Organization Convention No. 138 "Minimum Age Convention" (www.ilo.org).

5 A list of pharmaceutical products subject to phase outs or bans is available at http://www.who.int.

6 A list of pesticides and herbicides subject to phaseouts or bans is available at http://www.pic.int.

7 A list of the chemical compounds that react with and deplete stratospheric ozone resulting in the widely publicized ozone holes is listed in the Montreal Protocol, together with target reduction and phaseout dates. Information is available at http://www.unep.org/ozone/montreal.shtml.

8 A group of highly toxic chemicals, polychlorinated biphenyls are likely to be found in oil-filled electrical transformers, capacitors, and switchgear dating from 1950 to 1985.

9 A list of hazardous chemicals is available at http://www.pic.int.

10 A list is available at http://www.cites.org.

11 As defined by the Basel Convention; see http://www.basel.int.

12This does not apply to subproject sponsors who are not substantially involved in these activities. Not substantially involved means that the activity concerned is ancillary to a subproject sponsor's primary operations.

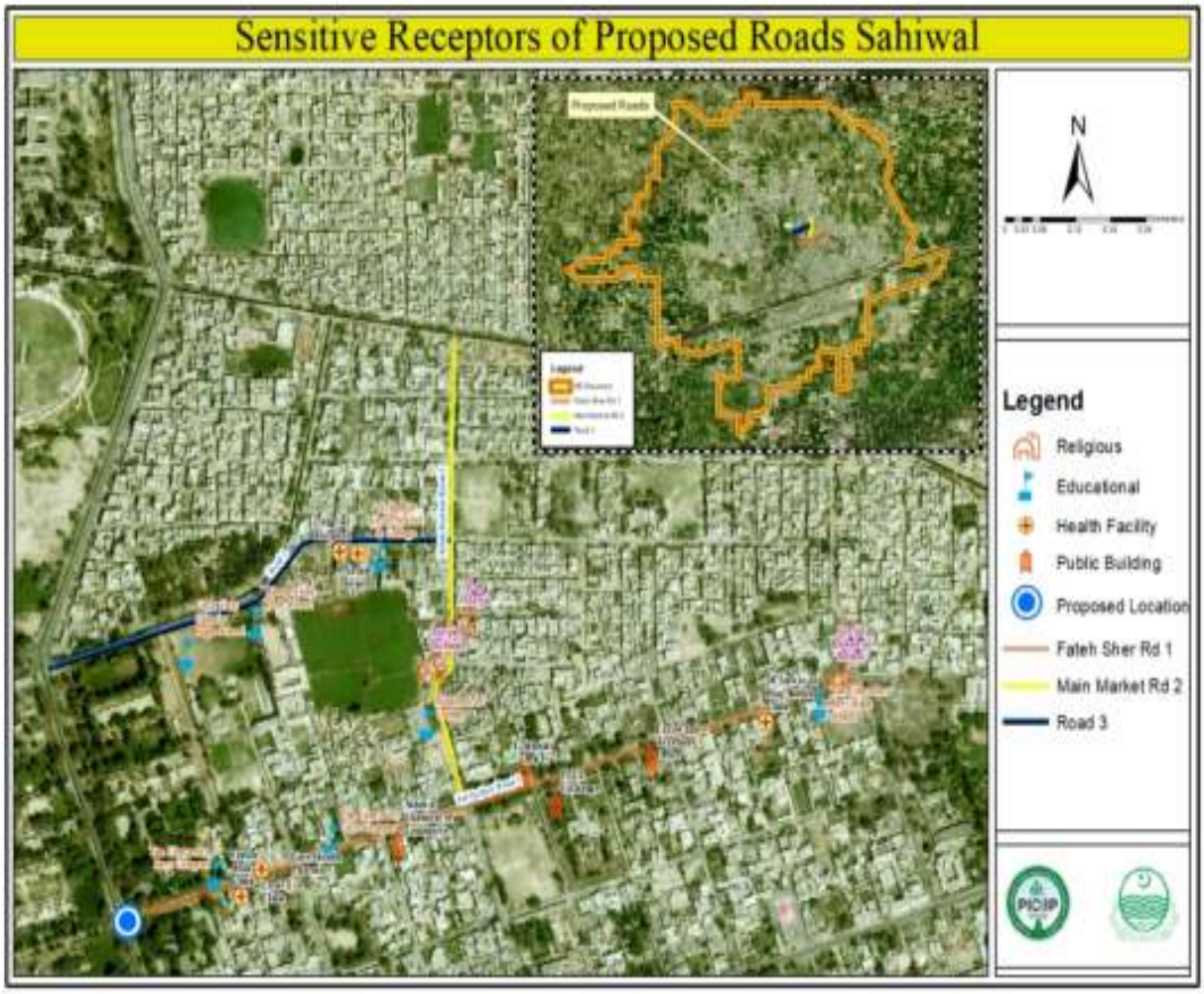
13This does not apply to subproject sponsors who are not substantially involved in these activities. Not substantially involved means that the activity concerned is ancillary to a subproject sponsor's primary operations.

14This does not apply to subproject sponsors who are not substantially involved in these activities. Not substantially involved means that the activity concerned is ancillary to a subproject sponsor's primary operations.15 This does not apply to the purchase of medical equipment, quality control (measurement) equipment, and any equipment for which the PIU considers

the radioactive source to be trivial and adequately shielded.

16 This does not apply to the purchase and use of bonded asbestos cement sheeting where the asbestos content is less than 20%.

ANNEXURE-II Google Earth map clearly showing project Site & Sensitive Receptors



Annexure C

Occupational Health and Safety Plan

Occupational Health and Safety covers all personnel working under the project and will be in line with the World Bank EHS guidelines on health and safety.

The Occupational Health and Safety program will aim to ensure that the workplace is safe and healthy by: addressing the hazards and risks at the workplace; outlining the procedures and responsibilities for preventing, eliminating and minimizing the effects of those hazards and risks; identifying the emergency management plans for the workplace or workplaces; and, specifying how consultation, training and information are to be provided to employees at various workplaces.

Some of the risks/hazards associated with workplaces are due to working close to or at sites associated with the various project construction activities. Other risks associated with the project construction phase include risk of increase of vector borne and other different diseases.

The following sections will be implemented during the construction phase to address and ensure workers' health and safety.

a. Screening and regular unannounced checking of workers.

As per the procedure for hiring workers, all contractors and labor agencies are required to make all prospective workers undergo medical tests to screen for diseases and sicknesses, prior to selection and employment of any worker. The contractor is also responsible for ensuring that no worker who has a criminal record is employed at the project site. It will be ensured that all workers undergo medical tests to screen diseases at source and at sites in consultation with the designated Health Officer.

In addition to this, the Project Management will also undertake sudden, unannounced checks on workers to look for diseases such as HIV, STDs, and hepatitis and take necessary steps as mandated by the Contractual agreement between the Contractor and the Worker(s).

b. Minimizing hazards and risks at the workplace.

To ensure safety at all work sites, the following will be carried out:

i. Installation of signboards and symbols in risky and hazardous areas, to inform workers to be careful.

ii. Construction of barricades around construction sites and deep excavated pits, to cordon off

and deter entry of unauthorized personnel and workers into these areas.

iii. Providing a safe storage site/area for large equipment such as power tools and chains, to prevent misuse and loss.

iv. Proper Housekeeping: Ensuring that materials are all stacked, racked, blocked, interlocked, or otherwise secured to prevent sliding, falling, or collapse. Brick stacks will not be more than 7 feet in height and for concrete blocks they will not be more than 6 feet high.

v. Removing all scrap timber, waste material and rubbish from the immediate work area as the work progresses.

vi. Where scaffolds are required, ensuring that each scaffold or its components shall be capable of supporting its own weight and at least 4 times the maximum intended load applied or transmitted to it. The platform/scaffold plank shall be at least 15 inches wide and 1.5 inches thick. The rope should be capable of supporting at least 6 times the maximum intended load applied or transmitted to that rope. Pole scaffolds over 60 feet in height shall be designed by a registered professional engineer and shall be constructed and loaded in accordance with that design. Where scaffolds are not provided, safety belts/safety nets shall be provided;

vii. Ensure that all ramps or walkways are at least 6 feet wide, having slip resistance threads and not inclined at more than a slope of 1 vertical and 3 horizontal.

viii. Stacking away all excavated earth at least 2 feet from the pit to avoid material such as loose rocks from falling back into the excavated area and injuring those working inside excavated sites.

ix. Constructing support systems, such as bracing to adjoining structures that may be endangered by excavation works nearby.

x. Only a trained electrician to construct, install and repair all electrical equipment to prevent risks of electrical shocks and electrocution.

xi. Install fire extinguishers and/or other fire-fighting equipment at every work site to prepare for any accidental fire hazards.

c. Provision of Personal Protective Equipment

Risks to the health and safety of workers can be prevented by provision of Personal Protective

Equipment (PPEs) to all workers. This will be included in the construction cost for each Contractor. Depending on the nature of work and the risks involved, contractors must provide without any cost to the workers, the following protective equipment:

i. High visibility clothing for all personnel during road works must be mandatory.

ii. Helmet shall be provided to all workers, or visitors visiting the site, for protection of the head against impact or penetration of falling or flying objects.

iii. Safety belt shall be provided to workers working at heights (more than 20 ft) such as roofing, painting, and plastering.

iv. Safety boots shall be provided to all workers for protection of feet from impact or penetration of falling objects on feet.

v. Ear protecting devices shall be provided to all workers and will be used during the occurrence of extensive noise.

vi. Eye and face protection equipment shall be provided to all welders to protect against sparks.

vii. Respiratory protection devices shall be provided to all workers during occurrence of fumes, dusts, or toxic gas/vapor.

viii. Safety nets shall be provided when workplaces are more than 25 feet (7.5 m) above the ground or other surfaces where the use of ladders, scaffolds, catch platforms, temporary floors or safety belts is impractical.

The specific PPE requirements for each type of work are summarized below.

Table C.1 PPE Requirement List

Type of Work	PPE
Elevated work	Safety helmet, safety belt (height greater than 20 ft), footwear for elevated work.
Handling work safety	Helmet, leather safety shoes, work gloves.
Welding and cutting work	Eye protectors, shield and helmet, protective gloves.

Grinding work	Dust respirator, earplugs, eye protectors.
Work involving handling of chemical substances	Dust respirator, gas mask, chemical-proof gloves. Chemical proof clothing, air-lined mask, eye protectors.
Wood working	Hard hat, eye protectors, hearing protection, safety footwear, leather gloves and dust respirator.
Blasting	Hard hat, eye and hearing protection.
Concrete and masonry work	Hard hat, eye protectors, hearing protection, safety footwear, leather gloves and dust respirator.
Excavation, heavy equipment, motor graders, and bulldozer operation	Hard hat, safety boots, gloves, hearing protection.
Quarries	Hard hat, eye protectors, hearing protection, safety footwear, leather gloves and dust respirator.

d. Procedures to Deal with Emergencies such as Accidents, Sudden Illness and Death of Workers

First aid kits will be made available at all times throughout the entire construction period by the respective contractors. This is very important, because most work sites will be at some distance from the nearest hospital. In addition to the first aid kits, the following measures should be in place:

i. Provision of dispensaries by the individual EPC contractor.

ii. A vehicle shall be on standby from the Project Office so that emergency transportation can be arranged to take severely injured/sick workers to the nearest hospital for immediate medical attention.

iii. A designated Health Officer/worker for the Project will be identified as a focal person to attend to all health and safety related issues. This employee's contact number will be posted at all work sites for speedy delivery of emergency services. The focal person shall be well versed with the medical system and facilities available at the hospital.

iv. Communication arrangements, such a provision of radios or mobile communication for all work sites, for efficient handling of emergencies, will be made.

e. Record Maintenance and Remedial action

The Project Management will maintain a record of all accidents and injuries that occur at the work site. This work will be delegated by the contractor to the site supervisor and regularly reviewed every quarter by project management. Reports prepared by the contractor shall include information on the place, date and time of the incident, name of persons involved, cause of incident, witnesses present and their statements. Based on such reports, the management can jointly identify any unsafe conditions, acts or procedures and recommend for the contractor to undertake certain mitigative actions to change any unsafe or harmful conditions.

f. Compensation for Injuries and Death

Any casualty or injury resulting from occupational activities should be compensated as per the local labor laws of Kyrgyz Republic. Where compensation is sought by the injured party, proper procedures for documentation of the case will be followed, including a detailed report on the accident, written reports from witnesses, report of the examining doctor and his/her recommendation for treatment. Each individual contractor will be responsible for ensuring compensation for the respective workers.

g. Awareness Programs

The Project management will undertake awareness programs through posters, talks, and meetings with the contractors to undertake the following activities:

i. Dissemination sessions will clarify the rights and responsibilities of the workers regarding interactions with local people (including communicable disease risks, such as HIV/AIDS), work site health and safety, waste management (waste separation, recycling, and composting), and the illegality of poaching.

ii. Make workers aware of procedures to be followed in case of emergencies such as informing the focal health person who in turn will arrange the necessary emergency transportation or treatment.

h. Nomination of a Health and Safety Focal Person

Within each site (especially if different sites are being implemented by different contractors), a Health and Safety Focal Person will be appointed. The Terms of Reference for the focal person will mainly be as follows:

i. Function as the focal person/representative for all health and safety matters at the

workplace;

ii. Responsible for maintaining records of all accidents and all health and safety issues at each site, the number of accidents and its cause, actions taken and remedial measures undertaken in case of safety issues;

iii. Be the link between the contractor and all workers and submit grievances of the workers to the contractor and instructions/directives on proper health care and safety from the contractors back to the workers;

iv. Ensure that all workers are adequately informed on the requirement to use Personal Protective Equipment and its correct use;

v. Also responsible for the first aid kit and making sure that the basic immediate medicines are readily available.

Annexure D

Emergency Response Plan

D.1 PURPOSE

The purpose of this Emergency Response Procedure is to provide measures and guidance for the establishment and implementation of emergency preparedness plans for the BNBR project. The aim of the Emergency Response Procedure is to:

(i) Ensure all personnel and visitors to the office/job sites are given the maximum protection from unforeseen events.

(ii) Ensure all personnel are aware of the importance of this procedure to protection of life and property.

D.2 EMERGENCY PREPARATION AND RESPONSE MEASURE SCOPE

The emergency management program is applied to all Project elements and intended for use throughout the Project life cycle. The following are some emergencies that may require coordinated response.

(i) Construction Accident

(ii) Road & Traffic Accident

(iii) Hazardous material spills

(iv) Structure collapse or failure

(v) Trauma or serious illness

(vi) Sabotage

(vii) Fire

(viii) Environmental Pollution

(ix) Loss of person

(x) Community Accident

D.3 RESPONSIBILITIES

The detailed roles and responsibilities of certain key members of the Emergency Response team available to assist in emergency are provided in **Table D.1** below.

Table D.1 Emergency Response Team

Action Group	Responsibility
Emergency Coordinator	▪ Overall control of personnel and resources. ▪ The Emergency Coordinator will support and advise the Site Safety Supervision as necessary. ▪ Serves as public relations spokes persons, or delegates to some staff member the responsibility for working with news media regarding any disaster or emergency. Also assure proper coordination of news release with appropriate corporate staff or other designated people.
Site Safety Supervision (Emergency Commander)	▪ Overall responsibility for activating emergency plan and for terminating emergency actions. ▪ Be alternative of emergency response chairpersons. ▪ Disseminates warnings and information as required to ensure all people in the immediate area have been warned and evacuated either by alarms or by word of mouth. ▪ Supervise the actions of the Emergency Response Team to ensure all persons are safe from the danger. ▪ Notify outside authorities if assistance is required. ▪ Carries the responsibility for coordinating actions including other organizations in accordance with the needs of the situation. ▪ Ensure maximum co-operation and assistance is provided to any outside groups called to respond to an emergency. ▪ Establish and appoint all emergency organization structure and team. ▪ Assures adequate delegation of responsibilities for all key positions of assistants on the Project to assist with any foreseeable emergency. ▪ Ensure resources available to purchase needed emergency response equipment and supplies. ▪ Assures that all persons on the Emergency Response Team aware and fully understand their individual responsibilities for implementing and supporting the emergency plan. ▪ Establish the emergency drill schedule of all identified emergency scenarios, track the status and evaluate the emergency. ▪ The Emergency Commander shall ensure that senior management personnel have been reported of the emergency as soon as practical after the event.

Security Team	▪ Ensure that the exit route is regularly tested and maintained in good working order. ▪ Maintain station at the security gate or most suitable location to secure the area during any emergency such that only authorized personnel and equipment may enter, prevent access to the site of unauthorized personnel. ▪ Assist with strong/activation of services during an emergency. ▪ Ensure vehicles and obstructions are moved to give incoming emergency vehicles access to the scene, if ambulance or emergency services are attending the site, ensure clear access and personnel are located to direct any incoming emergency service to the site of emergency.
Rescue & Medical Team	▪ Protect the injured from further danger and weather. ▪ Provide treatment to the victim(s) to the best of their ability by first aid and then transfer to hospital. ▪ Remain familiar with the rescue activities and rescue apparatus. ▪ Assist outside medical services personnel when they arrive
General Administration Team	Response to support any requested general facilities for assisting Emergency Response Team in their work.
Government Relation Team	▪ Coordinate with local government on a matter of concerned in the emergency response plan to liaise with local officers in their affair for support Emergency Response Team. ▪ Coordinate emergency plan with the government authorities, local community.
Environment Team	In case of emergency related to the environmental pollution such as the chemical spill, oil spill into the ambient, the environment team will support the technical advice to control and mitigate the pollution until return to the normal situation.
Department Heads	▪ Call up of personnel into the safe location for protective life and property. ▪ Take immediate and appropriate action while Emergency Response Team is being mobilized. ▪ Keep in touch with the Emergency Commander ▪ Control and supervise operators and contractors on the implementation of this procedure, with consultation with Safety Team as necessary. ▪ Provide and maintain emergency equipment of their responsible areas.
Other Staff and Employees	▪ All other staff and employees will remain at their workstations or assembly point unless directed otherwise from Emergency Response Team. ▪ Each supervisor will ensure that all members of his work group are accounted for and keep in touch with each of their Department Head.

D.4 PROCEDURE

Emergency situation and injuries to person can occur at any time or place either on Project site or elsewhere. The most two common types of emergencies on site are fire and serious accident.

Figure D.1 Emergency Procedure for Fire

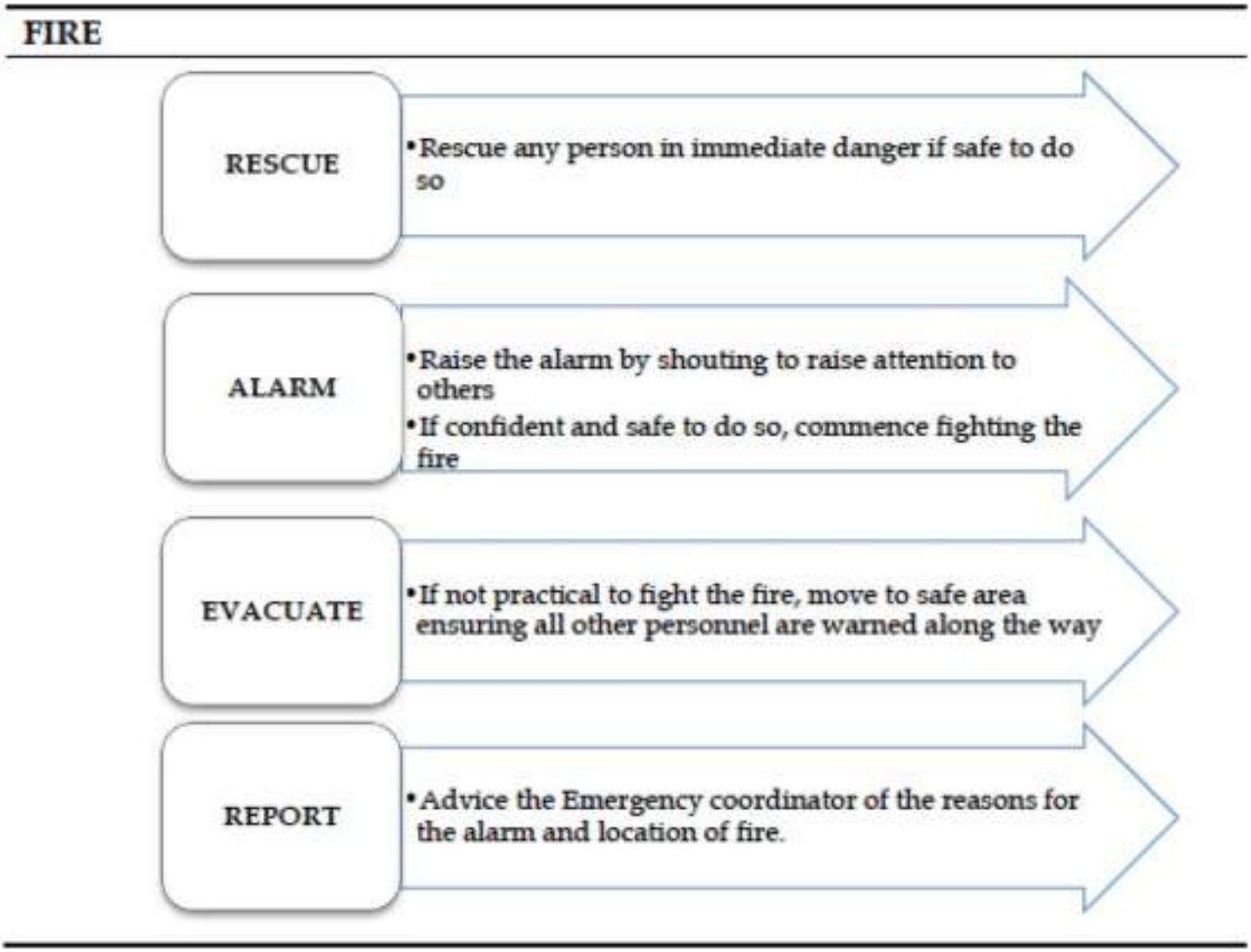
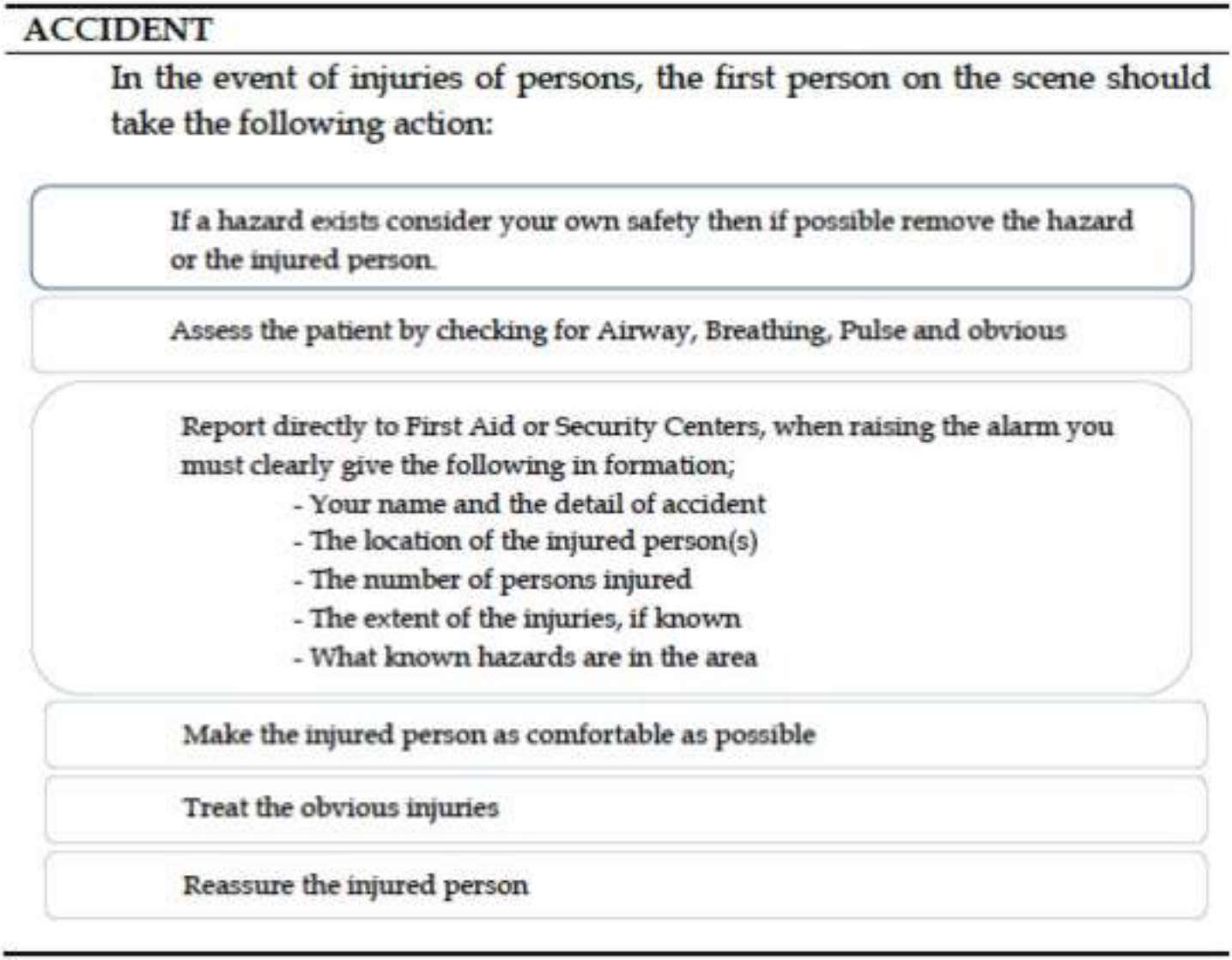


Figure D.2 Emergency Procedure for Serious Accident



D.5 COMMUNICATION WITH AUTHORITIES / PRESS AT SITE

In the event of an accident or incident, only senior staff is permitted to give factual information to the authorities for resource of liability exposure. The press must be avoiding politely, at all costs, with the terse comment that “the matter is under investigation and relevant information when available will be provided by our Head Office” Do not ever give your opinion or story.

First Aid Persons

Upon advice of medical emergency, make immediate assessment to response required and if necessary, advise security to summon ambulance or medical assistance, the qualified first aid attendant should also,

- Provide treatment to the victim(s) to the best of his/her ability.
- Ensure the safety of victims by ceasing any work activity in the area.
- Protect the injured from further danger and weather.
- Assist medical services personnel when they arrive.

General Administration Team

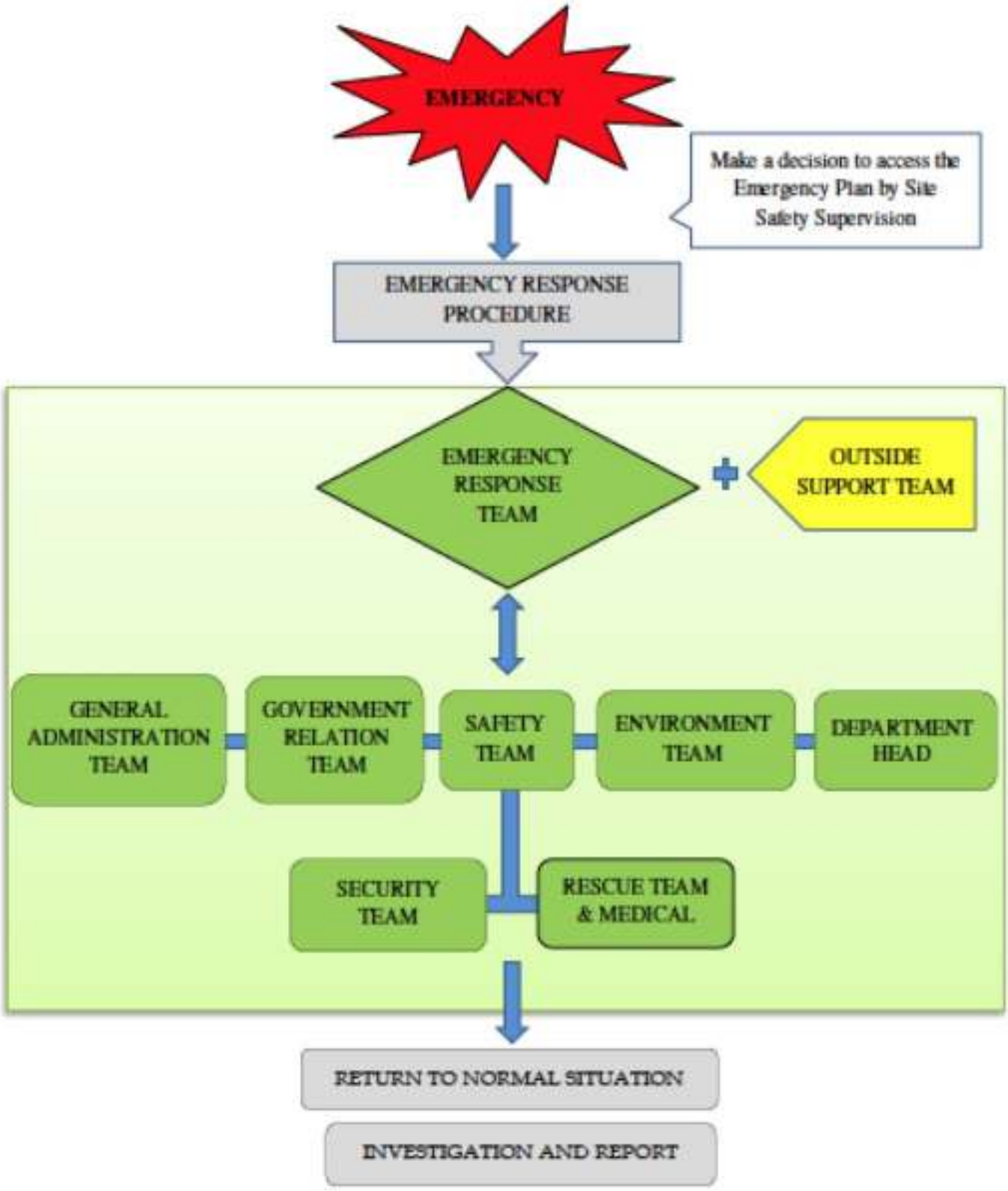
Upon advice of medical emergency, maintain contact with first aid personnel and summon ambulance if required.

Security Team

- If ambulance or emergency services are attending the site, ensure clear access and personnel are located to direct vehicle closest to the scene.
- Prevent access to the site of unauthorized personnel (press, etc.).

Emergency Coordinator

- The Emergency Coordinator shall assist emergency personnel at the scene as required through allocation of company resources.
- The Emergency Coordinator shall ensure next-of-kin are properly notified as soon as possible and give whatever company support and assistance is necessary to assist them bundle the situation
- The Emergency Coordinator shall ensure that senior management personnel are advised of the emergency as soon as practical after the event.



Note: Name of contact person and call number from Owner/Contractor to be determined.

H.5 INCIDENT AND ACCIDENT REPORT

Section A: Identification Data

Report No:	Date of Reported:	Reporter:	Sign:
Job Title:		Company Name:	

Section B: Violence Rate

Accident Violence: ☐ 01-Death ☐ 02-Serious Injury ☐ 03-Lost Time Injury ☐ 04-First Aid ☐ 05- Not Injury ☐ 06-Near Miss

Property Damage Cost: ☐ 1-2,000 USD ☐ 2,001-10,000 USD ☐ 10,001-50,000 ☐ > 50,001

Section C: Environmental Impact

Affected area	☐ Construction area	☐ Public area	
Receptor	☐ None	☐ Workers	☐ Community
Type of pollution	☐ Physical	☐ Chemical	☐ Biological
Toxicity	☐ Non-toxic	☐ Low - toxic	☐ High - toxic
Return to Normal	☐ 1 day	☐ 1 day to 1 week	☐ ≥ 1 week
Cumulative impact	☐ Non-cumulative	☐ Cumulative	

Section D: Injured/Illness Employee

1.Name:	Sex:	Date of Birth: Month	Day	Year	Age:	Regular Job Title:	Experience: In this job title Years Weeks	In this Project Years Weeks
	☐ Male ☐ Female							

Site:	Company:	Reference:	Phone No:	Social Security Numbe

Part of Body Injured or Affected:

☐ Head	☐ Hands	☐ Face	☐ Nose
☐ Eyes	☐ Legs	☐ Teeth	☐ Neck
☐ Trunk	☐ Toes	☐ Elbow	☐ Shoulder
☐ Back	☐ Ankle	☐ Wrist	☐ Foot
☐ Arms	☐ Thump	☐ Fingers	☐ Internal

Remark: .....

Nature of Injury or Illness:

☐ Laceration	☐ Amputation	☐ Puncture	☐ Fracture
☐ Strain & Spain	☐ Burns	☐ Contusion	☐ Dry Heat Friction
☐ Hernia	☐ Foreign Body	☐ Chemical	☐ Contamination
☐ Skin (Occupationnel)	☐ Rash	☐ Irritation	

Remark: .....

2.Name:	Sex:	Date of Birth: Month	Day	Year	Age:	Regular Job Title:	Experience: In this job title Years Weeks	In this Project Years Weeks
	☐ Male ☐ Female							

Site:	Company:	Reference:	Phone No:	Social Security Numbe

Part of Body Injured or Affected:

☐ Head	☐ Hands	☐ Face	☐ Nose
☐ Eyes	☐ Legs	☐ Teeth	☐ Neck
☐ Trunk	☐ Toes	☐ Elbow	☐ Shoulder
☐ Back	☐ Ankle	☐ Wrist	☐ Foot
☐ Arms	☐ Thump	☐ Fingers	☐ Internal

Remark: .....

Nature of Injury or Illness:

☐ Laceration	☐ Amputation	☐ Puncture	☐ Fracture
☐ Strain & Spain	☐ Burns	☐ Contusion	☐ Dry Heat Friction
☐ Hernia	☐ Foreign Body	☐ Contamination	☐ Chemical
☐ Skin (Occupationnel)	☐ Rash	☐ Irritation	

Remark: .....

Section E: Accidents/incident Details

Date Accident/Incident Occurred:	Time Accident/Incident Occurred:	Exact Location of the Accident / Incident:

Details of the actual Job Being done at the time:

Details of Accident / Incident / What actually happened?

Section F: Accident Cause (Basic cause mark X / Contributing cause, if any mark O)

UNSAFE CONDITIONS		UNSAFE ACTS	
1	☐ Inadequately Guarded	1	☐ Operating Without Authority / Training
2	☐ Unguarded	2	☐ Operating at Unsafe Speed
3	☐ Defective Tools, Equipment, or Substance	3	☐ Marking SHE Device Inoperative
4	☐ Unsafe Design or Construction	4	☐ Using Unsafe Equipment or Equipment Unsafely
5	☐ Hazardous Arrangement	5	☐ Unsafe Loading, Placing, Mixing
6	☐ Unsafe Illumination	6	☐ Taking Unsafe Position
7	☐ Unsafe Ventilation	7	☐ Working on Moving or Dangerous Equipment
8	☐ Unsafe Clothing	8	☐ Distraction, Teasing, Horse Play
9	☐ Insufficient Instruction	9	☐ Failure to use Personal Protective Devices
10	☐ Lack of system of work	10	☐ Lack of effective instruction or supervision

Why was the unsafe act committed? _____ Why did the unsafe condition exist? _____

Section G: Guide to Corrective Action (Base on the cause checked above, I am taking the following corrective action)

UNSAFE ACT	UNSAFE CONDITION	If Supervisor can't handle, then recommend to
☐ Stop the Behaviour	☐ Remove	☐ Site Engineer, or
☐ Study the job	☐ Guard	☐ Site Manager, or
☐ Instruct (tell-show-try-check)	☐ Warn	☐ Project Manager, or
☐ Follow Up	☐ Supervisory Training	☐ Safety Committee
☐ Enforce		

Detail below any immediate remedial actions that have been taken:

Detail below any corrective and preventative actions that could be taken to prevent future re-occurrence:	Responsible	Completion Date

Section H: Witness Statement	
Witness Name	Interviewer Name

Section I: Reviewed & Recommend by			
Recommendation:			
Reviewed By:	Position:	Signature:	Date:

Remarks : If Accident or Incident happened with lost time injury and affected to the publicity must further report to Safety Department;

: First Aid Cases will not applicable to this form;

: The accident report shall submit to Safety Department within 3 days

: Attached the photograph or sketch the location of accident / incident;

PRECAUTIONARY ACTION AGAINST THE POTENTIAL RISK OF NOVEL CORONAVIRUS

INTRODUCTION

On February 11, 2020 the World Health Organization announced an official name for the disease that is causing the 2019 novel coronavirus outbreak, first identified in Wuhan China. The new name of this is coronavirus disease 2019, abbreviated as COVID-19. In COVID-19, 'CO' stands for 'corona,' 'VI' for 'virus,' and 'D' for disease. Formerly, this disease was referred to as "2019 novel coronavirus" or "2019-nCoV".

Coronaviruses are a large family of viruses. Some cause illness in people, and others, such as canine and feline coronaviruses, only infect animals. Rarely, animal coronaviruses that infect animals have emerged to infect people and can spread between people. This is suspected to have occurred for the virus that causes Coronavirus Disease 2019 (COVID-19). Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS) are two other examples of coronaviruses that originated from animals and then spread to people.

The risk of exposure to COVID-19 is no different for employees of Employer, Engineer, Contractor, and suppliers than for the general population. Contractor, therefore, must consider the physical well-being and safety of all the persons entitled to be on the Site and follow reasonable guidelines and recommendations of Government authorities and healthcare professionals. As experience has shown in other countries, confirmed cases of COVID-19 expand exponentially if health and safety controls are left unheeded.

Contractor should enforce all health and safety procedures at Site including sanitary protocols, proper hygiene, social distancing, use of personal protective equipment (PPE), toolbox talks on special COVID-19 requirements, and prompt reporting of health issues related to COVID-19. Contractors must put safeguards in place to keep workers exposed to COVID-19 away from Site for at least 14 days after the last potential exposure.

WHO declared the COVID-19 as a Public Health Emergency of International Concern (PHEIC) in January 2020 and afterwards announced the COVID-19 outbreak as pandemic on 11th March 2020 due to the widespread of the disease in 114 countries at that time. WHO Director General urged the countries to take action now to stop the disease.

The rapid spread of COVID-19 hits all the provinces of Pakistan Sindh, Balochistan, Punjab & Khyber Pakhtunkhwa including the Gilgit Baltistan and Azad Jammu & Kashmir. The prevailing virus creates the menacing and distressing situation when it arrived around the closed proximities of the Project Area.

Government of Pakistan has launched the National Action Plan for COVID-19 Pakistan to combat the challenge of prevailing virus, also available at https://www.nih.org.pk/wp-content/uploads/2020/03/COVID-19-NAP-V2-13-March-2020.pdf. The Government of Pakistan has

launched the real-time data portal for COVID-19 http://covid.gov.pk/. These measures are mostly relating to the containment and awareness and capacity building. Besides this COVID-19 daily situation report is also available at https://www.nih.org.pk/wp-content/uploads/2020/04/COVID-19-Daily-Updated-SitRep-03-April-2020.pdf.

All the stakeholders are on board to jointly prevent/ limit/ control the spread of COVID-19. All of the staff is required to take precautionary measures as well as maintain social distances. The use of thermal guns for checking every single person body temperature, placement of relevant flyers and disinfection spray inside of all the containers are few of the measures to combat COVID-19.

OBJECTIVE

Following are the objectives of this report to jointly prevent / limit/ control the spread of COVID-19 at Site that can hamper the progress of proposed Project:

1. To enhance understanding of the evolving COVID-19;
2. To share knowledge on COVID-19 and preparedness measures being implemented at Site;
3. To generate recommendations for adjusting COVID-19 containment and response measures; and
4. Outline the measures taken at Site. The advised measures will help all the stakeholders to plan their work continuity in response to the COVID-19.

Due to the evolving situation of the COVID-19, this document should be read in conjunction with the latest relevant advisories issued by WHO (especially "Getting your workplace ready for COVID-19, 3 March 2020") and Government of Pakistan.

WHAT IS CORONA VIRUS (COVID-19)

The COVID-19 belongs to a family of viruses known as the Coronaviruses, which can cause illnesses ranging from the common cold to more severe diseases, such as the Severe Acute Respiratory Syndrome (SARS) and Middle East Respiratory Syndrome (MERS)[17].

SYMPTOMS

The symptoms of the COVID-19 are similar to that of regular pneumonia. Typical symptoms include;

- Fever;
- Cough;
- Difficulty in breathing;
- Pneumonia;
- Runny nose;
- Sore throat; and
- Feeling of being unwell.

[17] Source: World Health Organization

MODE OF SPREAD

Infected person – person transmission; Infected people can spread COVID-19 through their respiratory secretions via droplets produced when an infected person coughs or sneezes, similar to how influenza and other respiratory pathogens spread. The spread from person-to person is most likely among close contacts (about 6 feet);

- Infected animals' dead or Alive;
- Air by coughing and sneezing;
- Close personal contact, such as touching or shaking hands;
- Touching an object or surface with a virus on it; and
- Touching your mouth nose or eyes before washing your hands.

GENERAL STANDARDIZED PRECAUTIONARY MEASURES

Following measures/recommendations are suggested as a general guidance to be followed for the protection of potential impacts of COVID-19:

Since, there is no vaccine available to protect against human Coronavirus infections. Therefore, transmission can be prevented through following measures:

- Cover your mouth while cough or sneeze;
- Avoid close contact with people who are sick;
- Avoid the use of hard soap;
- Wash your hands often with liquid soap and water for at least 20 seconds;
- All the employees should ensure sanitization of hands at appropriate time;
- Avoid touching your eyes, nose, and mouth with unwashed hands;
- If you are concerned about your symptoms you should see your health care provider at site or in office;
- Use of Personal Protective Equipment (PPE) according to risk (a surgical or N95 mask);
- Do not spit, wrap your oral and nasal secretion with tissue and throw it in a covered dustbin;
- Balance your nutrition and exercise moderately;
- Sterilization / disinfection of medical devices at Site dispensaries; and
- Do not touch, buy or eat wild animals (gamey). Try to avoid visiting markets that sell such animals.

PROJECT SITE SPECIFIC PRECAUTIONARY MEASURES

Measures for protecting staff and labour from exposure to, and infection with, the COVID-19 depend on the type of work being performed and exposure risk, including potential for interaction with infectious people and contamination of the work environment. Regardless of specific exposure risks, following are the main actions that have been jointly taken at Site to combat the COVID-19:

Employer's Side

Employer should issue the notification containing the precautionary measures in the light of GoS guidelines to be implemented at Site. Upon receiving the Employer notification all the mentioned precautionary measures will be communicated to Engineer staff for compliance. Employer technical staff is also complying with the GoS guidelines and Contractor suggestion to control the spread of COVID-19 at Site in the best interest of the Project and country.

Consultant's Side

Consultant's top management will issue the orders in the light of GoS guidelines containing the precautionary measures to control the spread of COVID-19 for the staff working at Site.

Consultant staff at Site will fully complying with the orders including photographic evidence. Considering the severity of the prevailing virus Engineer devised the Standard Operating Procedure (SOP) containing precautionary action against the potential risk of novel corona virus.

Besides, above Consultant will ensure the following precautionary measures at Site.

- Adequate signage and information at all entrances and exits showing what is Corona Virus, how it spreads, what are the symptoms, standard precautions;

- The awareness session for the Contractor staff is equally important as of Consultant staff to combat the COVID-19 at Site. The Consultant will ensuring that Contractor is arranging such session at Site from time to time to reduce the potential risk of COVID-19. Further, all the newly inducted and existing staff have been given HSE training by the Consultant & Contractor.

Contractor's Side

Contractor will communicate various precautionary measures to Employer and Engineer through letters to control the spread of COVID-19 at Site. Following are the major steps to be taken by the Contractor:

- Contractor will convey the instructions and requirements of its superior unit for the prevention and control of COVID-19 epidemic at Site.
- Contractor will establish a special organization for epidemic prevention and control on the Project Site that is responsible for arranging, implementing, publicizing and supervising the epidemic prevention and control measures.
- Launch the plan for epidemic prevention and control on the project Site that includes:
    - All personnel in temporary camp are required to wear masks;
    - Contractor personnel incharge of Site to wear masks;
    - Arranged special personnel to measure and record the temperature of all personnel when entering or leaving the temporary camp;
    - If any person with fever, cold and other symptoms are found, they will be admonished to go home for isolation and asked about the development of the disease every day; and
    - Propagate and implement the epidemic prevention measures for the staffs and labours and warn them not to go outside and home as much as possible.
- All these meetings should carried out through video conference.

Contractor is not limited to the above precautionary measures but practicing and implementing the following;

- Contractor will prepare a pamphlet for the awareness of Site staff to combat the COVID-19. It will also place/posted at strategic points at Site.
- Launch awareness campaign to inform all the staff and labour about the coronavirus, to use facemask, hand hygiene, cough etiquette, and avoidance of close contact with animals and consumption of their raw products.
- Everyday awareness speech in English and Urdu in the temporary camp.
- All the employees are not allowed to go outside of the Project Area or on vacation to their homes and on daily basis visit to sites;
- Contractor will provide medical masks and antibacterial liquid hand wash to all personnel.
- Contractor will prepare the isolation facility at Site and provided three isolated rooms for such patients inside the temporary camp. Each room have three beds, oxygen cylinder, sanitizers, isolation kit, hand wash.
- Thermal scanning will be carried out continuously in the morning for everybody at the main gate of temporary camp.
- Record will be maintained for everyone that includes the temperature value of each person with their names, every morning and afternoon go to each department for scanning separately and noted down their name with temperature values.
- Contractor carry out disinfectant spray on daily basis morning and afternoon in each office and rooms and all the area of the camp.
- LG &CDD and Consultant staff will also requested by Contractor to do not interact physically rather through electronically by emails or video conferencing.

RECOMMENDATIONS FOR THE CONTROL OF COVID-19 AT SITE

To Avoid Transmission

For all personnel at Site, it is always a good to practice the following precautionary measures:

- Workers to remain at least two meters apart from each other at all times (social distancing) – i.e. spread out and reduce the number of people working together in one area of the site;
- Avoid eating lunch in the form of group in available mess/canteens at Site;
- Close site canteens/ food preparation and eating areas (avoid gatherings) – workers to bring their own prepared lunch to site and eat alone e.g. in their van, car, or in an open space;
- Avoid in-person meetings if possible. In the case that an in-person meeting is unavoidable, make sure to have it in a well-ventilated area with sufficient space for attendees to distance themselves from one another. For meetings such as toolbox talks, consider breaking them up into smaller group meetings versus one large meeting;
- Introduce enhanced cleaning procedures across the Site and touch points e.g. office equipment, plant and machinery controls, taps/toilet/washing facilities, handrails;
- Stagger start times on site to avoid congestion in entrance areas;
- Reduce the number of people on site inductions at any one time and hold them outdoors if possible;
- Stop workers moving across various sites (potential for cross contamination);
- No outsiders should be at the Project Site;

- Contractor, Consultant and Employer personnel are advised to avoid travelling and in case traveling is unavoidable, prior approval from the management should be essential. In case of travelling, the above mentioned measures need to be strictly followed by the traveller;
- Prompt identification and isolation of potentially infectious individuals is a critical first step in protecting workers and other Site staff. An isolated area should be available at Site to immediately isolate suspected person, as it is most important to stop its spread at Site.
- Rapid Response Team should be formed and be informed immediately in case of suspect and confirmed case of COVID-19.
- Medical team at Site should separate the suspected person displaying fever, cough or difficulty breathing from other personnel; and
- If a person has had close contact with an individual that has confirmed COVID-19, that person will not be allowed to return to the Site until he/she has been symptom free for 14 days.
- Clean and fumigate all the workplaces at Site on daily basis;
- Ask people to stay at home if they have fever, cough, difficulty in breathing, runny nose, sore throat as per organizational rules;
- An immediate replacement of solid soap with liquid anti-bacterial soap bottles may be appropriate.
- Provision of alcohol-based hand sanitizer need to available for all staff;
- Clean the religious places carpets and rugs. Have them washed in place over the weekend and then do regular cleaning;
- Have the cleaners/ maintenance crews regularly clean surfaces that are touched frequently by personnel with disinfectants such as in and out doors;
- Fresh medical tests of staff working should be carried out at Site;
- Dispose of all contaminated waste (gloves, paper, swab handles, etc.) into biohazard waste bags for disposal;
- Ensure that panic is not created. In fact the posters should start with statements such as do not panic and fear the virus but know and prevent; and
- Ensure proper ventilation system for all the personnel at Site.

Use of Personal Protective Equipment (PPEs)

- Necessary PPE should be available at Site all the times and are being issued to each personnel at Site;
- Practice of using masks is also being ensured by all parties at Site (a surgical or N95 masks);
- Re-usable PPE should be thoroughly cleaned after use and not shared between workers. Single use PPE should be disposed of so that it cannot be reused;

Outside Visitors

- Visitors should enter with strictly wearing visitors card;
- Ensure sanitization of hands;
- All parties should ensure that the sick persons should be wearing a surgical or N95 masks;
- Note down the complete information of outsiders before entrance;
- Proper screening should be carried out before entering the Site;
- Refrain from handshakes. Rather than shaking hands, visitors may explain why handshakes can contribute to the risk of spread;
- Attempt to maintain a general six (6) feet distance between themselves. This will be challenging to follow at all times but it is Engineer recommendation to follow;

- Refrain from and/or limit touching of workplace surfaces; and
- In addition to these on-site procedures, it is advised to follow their respective organizational instructions related to Site visits.

Annexure E

Archaeological 'Chance Find' procedure

Background

The purpose of this document is to address the possibility of archaeological deposits becoming exposed during ground altering activities within the project area and to provide protocols to follow in the case of a chance archaeological find to ensure that archaeological sites are documented and protected as required.

Archaeological sites are an important resource that is protected for their historical, cultural, scientific and educational value to the general public and local communities. Impacts to archaeological sites must be avoided or managed by development proponents. The objectives of this 'Archaeological Chance Find Procedure' are to promote preservation of archaeological data while minimizing disruption of construction scheduling It is recommended that due to the moderate to high archaeological potential of some areas within the project area, all on site personnel and contractors be informed of the Archaeological Chance Find Procedure and have access to a copy while on site.

Potential Impacts to Archaeological Sites

Developments that involve excavation, movement, or disturbance of soils have the potential to impact archaeological materials, if present. Activities such as road construction, land clearing, and excavation are all examples of activities that may adversely affect archaeological deposits.

Archaeological 'Chance Find' Procedure

If you believe that you may have encountered any archaeological materials, stop work in the area and follow the procedure below:

The following 'chance-find' principles will be implemented by the contractor throughout the construction works to account for any undiscovered items identified during construction works:

(i) Workers will be trained in the location of heritage zones within the construction area and in the identification of potential items of heritage significance.

(ii) Should any potential items be located, the site supervisor will be immediately contacted and work will be temporarily stopped in that area.

(iii) If the site supervisor determines that the item is of potential significance, an officer from the department of Archaeology (DoA) will be invited to inspect the site and work will be stopped until DoA has responded to this invitation.

(iv) Work will not re-commence in this location until agreement has been reached between DoA and IPIG as to any required mitigation measures, which may include excavation

and recovery of the item.

(v) A precautionary approach will be adopted in the application of these procedures.

Detailed Procedural Steps

- If the Director, department of Archaeology receives any information or otherwise has the knowledge of the discovery or existence of an antiquity of which there is no owner, he shall, after satisfying himself as to the correctness of the information or knowledge, take such steps with the approval of the Government, as he may consider necessary for the custody, preservation and protection of the antiquity.
- Whoever discovers, or finds accidentally, any movable antiquity shall inform forth with the Directorate within seven days of its being discovered or found.
- If, within seven days of his being informed, the Director decides to take over the antiquity for purposes of custody, preservation and protection, the person discovering or finding it shall hand it over to the Director or a person authorized by him in writing.
- Where the Director decides to take over an antiquity, he may pay to the person by whom it is handed over to him such cash reward as may be decided in consultation with the Advisory Committee.
- The Director or any officer authorized by him with police assistance may, after giving reasonable notice, enter into, inspect and examine any premises, place or area which or the sub-soil of which he may have reason to believe to be, or to contain an antiquity and may cause any site, building, object or any antiquity or the remains of any antiquity in such premises, place or area to be photographed, copied or reproduced by any process suitable for the purpose.
- The owner or occupier of the premises, place or area shall afford all reasonable opportunity and assistance to the Director.
- No photograph, copy of reproduction taken or made shall be sold or offered for sale except by or with the consent of the owner of the object of which the photograph, copy or the reproduction has been taken or made.
- Where substantial damage is caused to any property as a result of the inspection, the Director shall pay to the owner thereof reasonable compensation for the damage in consultation with the Advisory Committee.

- If the Director after conducting an inquiry, has reasonable grounds to believe that any land contains any antiquity, he may approach the Government to direct the Revenue Department to acquire such land or any part thereof and the Revenue Department shall thereupon acquire such land or part as for a public purpose.

Annexure F

Dust Management Plan

The purpose of this plan is to describe the measures that the project shall take to ensure that the risk of emissions from dust generated by site operations during construction are minimized and that best practice measures are implemented.

Dust emissions from construction can cause ill health effects to Contractor staff along with nuisance and annoyance to members of the local community. Dust will be controlled through:

- Elimination
- Reduction/Minimisation
- Control

This dust management plan shall be implemented based on the measures already provided in the Environmental Management Plan (EMP) relating to controlling dust emissions.

Methodology

The following methodology will be undertaken for each project section:

Step 1 – Identify the dust generating activities

Construction activities that are likely to produce dust will be identified. The activities that will be taken into account are:

Haulage Routes, Vehicles and Asphalt/Concrete Batching Plant

- Roads, surfaces and public highways
- Static and mobile combustion plant emissions
- Tarmac laying, bitumen surfacing and coating

Materials Handling, Storage, Spillage and Disposal

- Storage of material
- Stockpiles
- Spillages
- Storage of Waste

Site Preparation and Restoration after Completion

- Earthworks, excavation and digging
- Storage of spoil and topsoil

Demolition

Construction and Fabrication Processes

Step 2 – Identify Sensitive Receptors

Sensitive receptors have already been identified. The nature and location of the sensitive receptors will be taken into account when implementing control measures.

Step 3 – Implement Best Practice Measures to Control

Based on the nature of the activity producing the dust, the likelihood of dust being produced and the possible consequence of dust based on the sensitive receptors, the most effective control measure will be identified and implemented.

Step 4 – Monitor effectiveness of control

Construction Supervision Staff (CSC) will have the responsibility to ensure that dust control measures are being implemented and are effective.

Step 5 – Record and report result of monitoring

All inspections, audits and results of monitoring will be recorded and kept as part of the site filing system.

Method Statements and Risk Assessments

The Contractor's Risk Assessments and Method Statements will be required to be approved by the CSC prior to commencing work and will be required to contain environmental aspects of the task, including dust control measures where required.

Where dust has been identified within the risk assessment as a significant issue, the method statement will be required to cover the following:

- Methods and materials that will be used to ensure that dust generation is minimized.
- The use of pre-fabricated materials where possible.
- Optimum site layout:
  - Dust generating activities to be conducted away from sensitive receptors
  - Supply of water for damping down.
- Good housekeeping and management

All employees will be briefed on the Risk Assessment and Method Statement before starting work.

Training

All Contractor staff will be required to attend training seminars as already mentioned in the EMP document. A site-specific induction will also be required before being allowed to work on site. These will include site-specific sensitive receptors and details regarding dust control measures to be taken.

Toolbox talks on air pollution and minimizing dust emissions will be provided on a regular basis to Contractor staff.

Identification of Dust Generating Sources and Control Methods

Haulage Routes, Vehicles and Asphalt/Concrete Batching Plant	
Dust Source	**Dust Control Methods**
Major haul roads and traffic routes	Haul roads will be dampened down via a mobile bowser, as required.
Public Roads	Road sweeper will be used to clean public roads as required.
Site traffic management	▪ Site traffic will be restricted to constructed access roads as far as possible. ▪ Site speed limit will be set at 10 mph as this will minimize the production of dust.
Road Cleaning	A mechanical road sweeper will be readily available and used.
Handling, Storage, Stockpiling and Spillage of Dusty materials	
Material handling operations	The number of times a material will have to be handled will be kept to a minimum to prevent double handling and ensure dusty materials are not handled unnecessarily.
Transport of fine dusty materials and aggregates.	Closed tankers will be used or sheeted vehicles.
Vehicle loading/unloading materials on to vehicles and conveyors.	▪ Dusty materials will be dampened down ▪ Drop heights will be kept to a minimum and enclosed where possible.
Storage of Materials	
Bulk cement, bentonite etc.	This will be delivered in tankers and stored in dedicated enclosed areas.
Fine dry materials	These will be protected from the weather and by storing in appropriate containers and indoors, where necessary.
Storage location	Material will be stored in dedicated lay-down areas.

Storage of Stockpiles	
Stockpile location	Stockpiles will be placed so as to minimize double handling and facilitate the site restoration.
Building stockpiles	Stockpiles, tips and mounds will not be stored at an angle greater than an angle of repose of the material.
Small and temporary stockpiles	▪ Where possible, stockpiles will be placed under sheeting. ▪ Dusty material will be damped down. ▪ Wind barriers (protective fences) of a similar height to the stockpile will be erected, if required.
Large and long term stockpiles	▪ Long-term stockpiles will be vegetated and stabilized as soon as possible. ▪ Stock plies will be dampened down until stabilized, where necessary. ▪ Wind barriers (protective fences) of a similar height to the stockpile will be erected, if required.
Waste Material from Construction	
Disposal method	A dedicated lay-down area will be available for waste. Waste will not be allowed to build up and will be disposed off at the designated locations as per EMP.
Site Preparation and Restoration	
Earthworks, excavation and digging	These activity areas will be kept damp where required and if possible, will be avoided during dry and windy periods.
Completed earthworks	Surfaces will be stabilized by re-vegetation as soon as possible, where applicable.
Construction and Fabrication Process	
Crushing of material for reuse, transportation and disposal	▪ Authorization will be obtained from IPIG and ADB before using any mobile plant on site for activities such as crushing and screening. ▪ Any crushing or screening activities will be located away from sensitive receptors.
Cutting, grinding, drilling, sawing, trimming, planning, sanding	▪ These activities will be avoided wherever possible. ▪ Equipment and techniques that minimize dust will be implemented. ▪ Water will be used to minimize dust.

Cutting roadways, pavements, blocks	Water sprinkling to be used.
Angle grinders and disk cutters	Best practice measures will be used such as dust extraction.

Monitoring Arrangements

Monitoring will be conducted at sensitive receptor locations in the project area as provided in the EMP. Furthermore, at locations where PM levels are exceeding applicable guidelines, additional stringent measures will be implemented at the respective location(s) in the project area to ensure dust levels are controlled as far as possible.

ANNEXURE G

Site Specific EMP (SSEMP) Guide & Template for Guidance to Contractor

Guide for Development of SSEMP

Step 1: Define Boundaries

Step 2: Identify Sensitive Receptors

Step 3: Specify construction activities

Step 4: Conduct Risk Assessment

Step 5: Assign Environment Management measures

Step 6: Prepare Site Plans

Step 7: Prepare Environment Work Plans (if required)

Step 8: Monitoring

Step 1: The project area needs to be clearly defined.

Step 2: The mapping of sensitive receptors has already been conducted and needs to be presented clearly in a map.

Step 3: The tentative construction activities to be conducted are as follows:

- **Site Surveying and Vegetation (Trees and plants) Clearance**
- **Establishment of Work Camp, Batching and Asphalt plant and access roads**
- **Dismantling of Asphalt and existing structures including Utilities**
- **Preparation of ground for Asphalting**
- **Asphalting**
- **Landscaping**

Step 4: The Risk Assessment matrix template is provided in the table below.

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

Risk = Likelihood × Consequence

Likelihood Scale

Likelihood	Definition	Scale
Certain	Will certainly occur during the activity at a frequency greater than every week if preventative measures are not applied	5
Likely	Will occur more than once or twice during the activity but less than weekly if preventative measures are not applied	3
Unlikely	May occur once or twice during the activity if preventative measures are not applied	2
Rare	Unlikely to occur during the project	1

Consequence Scale

Consequence	Definition	Score
Catastrophic	The action will cause unprecedented damage or impacts on the environment or surrounding communities e.g. extreme loss of soil and water resources and quality from stormwater runoff extreme pollution of soil and water resources including major contamination from hazardous materials widespread effects on ecosystems with deaths of fauna/flora widespread community impacts resulting in illness, injury or inconvenience loss or destruction of archaeological or historical sites Occurrence will almost certainly result in the work being halted and a significant fine.	5

Major	The action will cause major adverse damage on the environment or surrounding communities e.g. major loss of soil and water resources and quality from stormwater runoff major pollution of soil and water resources including contamination from hazardous materials significant effects on ecosystems with isolated deaths of non-vulnerable flora and fauna significant annoyance or nuisance to communities major damage to or movement required to archaeological or historical sites Occurrence may result in work being halted and a fine	3
Moderate	No or minimal adverse environmental or social impacts e.g. no measurable or noticeable changes in stormwater quality. Water quality remains within tolerable limits little noticeable effect on ecosystems no or isolated community complaints no or unlikely damage to archaeological or historical sites no likelihood of being fined	2
Minor	No or minimal adverse environmental or social impacts e.g. no measurable or noticeable changes in stormwater quality. Water quality remains within tolerable limits little noticeable effect on ecosystems no or isolated community complaints no or unlikely damage to archaeological or historical sites no likelihood of being fined	1

Risk Score Table

		Consequence			
		Catastrophic	Major	Moderate	Minor
Likelihood	Certain	**25**	**15**	**10**	5
	Likely	**15**	**9**	6	3
	Unlikely	**10**	**6**	4	2
	Rare	5	3	2	1

Risk: **Significant: 15-25**
Medium: 6-10

Low 1-5

Any Medium to Significant risk requires an environmental management measure to manage the potential environmental risk. Judgement will be required concerning the application of an environmental management measure to mitigate low risk situations.

The higher the risk the more intensive the required mitigation measure will need to be; e.g. where site sedimentation is deemed to be low risk, then silt fences may be needed but as the risk increases, then sediment traps may be required. The selection of the appropriate mitigation measure will require judgement based on the level of risk and the specific site parameters.

Step 5: The Environmental Management measures are to be extracted from the IEE study for this project and should be added in the last column of the table below.

No.	Construction Activity	Hazards to Consider	Likelihood that the site or sensitive receptors will be affected?	Consequence of the site or sensitive receptors being affected?	Risk Score (consequence x likelihood)	Environmental Management Measures
i	**Site Surveying & vegetation clearance**	Damage to vegetation beyond project footprint				These can be taken from the EMP provided in the IEE report (If Risk Score is 6 or more)
		Erosion of exposed areas and sediment				
		Loss of topsoil				
		Dust generation				
		Noise				
ii	**Establishment of Work Camp, Batching plant etc.**	Soil deposited onto roads from tires				
		Stockpile erosion				
		Noise & Vibration				
		Traffic congestion				

		Fuel spills				
iii	**Dismantling of Asphalt and existing structures including Utilities**	Noise and vibration				
		Dust generation				
		Community safety				
		Worker safety				
		Traffic Congestion				
iv	**Preparation of Sub-Base**	Noise and vibration				
		Dust generation				
		Traffic Congestion				
v	**Asphalting**	Noise and vibration				
		Dust generation				
		Traffic Congestion				
		Community safety				

		Labor safety (PPEs)				
vi	**Landscaping**	Dust generation				
		Sediment runoff				
		Failure of vegetation to take root				

Step 6: The Site plans are a critical part of the SSEMP and will need to be prepared, otherwise the ADB will consider the document as incomplete.

The site plan will need to provide the following:

- **Indication of North and scale**
- **Existing and planned supporting infrastructure (e.g. access roads, water supplies and electricity supplies)**
- **Location of planned work**
- **Contours**
- **Drainage systems**
- **Locations of sensitive receptors**

Step 7 (if required)[18]: The completed SSEMP provides details of all the environmental management requirements for all stages of the construction process. For individual work teams who are responsible for only a small part of the overall construction works it can be confusing as to what is required for their particular work component. For example, the work team responsible for stripping soil for the construction areas are not going to be interested in the requirements for pouring concrete for footings and foundations. However, it is essential that the soil stripping team knows exactly what to clear and what to leave and where to put stockpiles of soil for later use.

In situations where different work activities are required at different times or at different locations, environmental work plans can be prepared. These are similar to the work method statements that are often produced for major construction projects.

Step 8: A detailed monitoring plan will be provided along with frequency and responsibilities to ensure all key environmental parameters are monitored to ensure compliance with both national and ADB requirements.

Template for SSEMP

1. **Introduction**
   1.1 Project Overview
   1.2 Scope of SSEMP

[18] ADB, Safeguards Unit for Central & West Asia Department, *Environmental Management for Construction Handbook*.

ANNEXURE H

Ambient Laboratory Monitoring

ESPAK

Environmental Services Pakistan

PAK EPA & PUNJAB EPD CERTIFIED

CHEMICAL ANALYSIS TEST REPORT (AMBIENT AIR)

Reference Number:	ESPAK/219/10/AA/1372/00097	**Date:**	20/08/2020
Name of Industry/Client:	Punjab Intermediate Cities Improvement Investment Program-PICIIP		
Address:	1st Floor, Metropolitan Corporation, Sahiwal		
Telephone No.:	—		
Nature of Sample:	Ambient Air	**Monitoring Location:**	Fateh Sher Road
Date of Sample Collection:	11/08/2020	**Grab / Composite:**	Continuous - 24 Hours
Sample Collected/Sent By:	Ameer Hamza, Field Officer, ESPAK		
Date of Completion of Analysis:	12/08/2020		

S. No	Parameters	Limit Values (PEQS)	Concentration	Method / Equipment Used	Remarks
1	Carbon Monoxide (CO)	10 mg/m³ (1 Hour)	0.4-1.3 mg/m³	Non Dispersive Infrared Absorption (NDIR)	Within Prescribed Limits
2	Carbon Monoxide (CO)	5 mg/m³ (8 Hours)	0.7-1.0 mg/m³	Non Dispersive Infrared Absorption (NDIR)	Within Prescribed Limits
3	Sulfur Dioxide (SO_2)	120 µg/m³	11.0 µg/m³	UV Fluorescence (UVF)	Within Prescribed Limits
4	Ozone (O_3)	130 µg/m³ (1 Hour)	2.3-34.9 µg/m³	Non Dispersive UV Absorption	Within Prescribed Limits
5	Oxides of Nitrogen as NO	40 µg/m³	10.5 µg/m³	Chemiluminescence Detection	Within Prescribed Limits
6	Oxides of Nitrogen as NO_2	80 µg/m³	16.0 µg/m³	Chemiluminescence Detection	Within Prescribed Limits
7	Particulate Matter $PM_{2.5}$	35 µg/m³	29.4 µg/m³	Particulate Sensor	Within Prescribed Limits
8	Particulate Matter PM_{10}	150 µg/m³	123 µg/m³	Particulate Sensor	Within Prescribed Limits
9	Suspended Particulate Matter (SPM)	500 µg/m³	336 µg/m³	High Volume Sampler (HVS)	Within Prescribed Limits

PEQS: Punjab Environmental Quality Standards for Ambient Air, 2016

Note:

- The report should be reproduced as a whole and not in parts.
- The responsibility of the ethical use of this report lies with the client.
- The values represent sample conditions when monitoring/testing was carried out.
- The report data is not intended to be used legally by the client.

1. **Sample Analyzed By:** Ameer Hamza, Field Officer
2. **Name of Chief Analyst with Seal:** Muhammad Arfan
3. **Signature of Incharge of the Environmental Laboratory:**

Name: Imran Malik
General Manager
Date: 20/08/2020

End of Report

Page 1 of 1

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ISO 9001:2015 ISO 14001:2015 ISO 45001:2018

ESPAK

Environmental Services Pakistan

PAK EPA & PUNJAB EPD CERTIFIED

NOISE MONITORING REPORT

Reference Number:	ESPAK/218/20/N/1373/00103	**Date:**	20/08/2020
Name of Industry/Client:	Punjab Intermediate Cities Improvement Investment Program-PICIIP		
Address:	1st Floor, Metropolitan Corporation, Sahiwal		
Telephone No.:	---		
Nature of Sample:	Noise		
Date of Sample Collection:	11/08/2020	**Grab / Composite:**	Continuous - 24 Hours
Sample Collected/Sent By:	Ameer Hamza, Field Officer, ESPAK		
Date of Completion of Analysis:	12/08/2020		
Method/Equipment Used:	Sound Level Meter		

S. No	Measurement Point	Limit Values	Noise Level in dB(A) Leq	Remarks
1	Fateh Sher Road - Day Time	Informative	62 dB(A)	---
2	Fateh Sher Road - Night Time	Informative	57 dB(A)	---

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ISO 9001:2015 ISO 14001:2015 ISO 45001:2018

Client Name	PICIC
Client address	1st Floor, Metropolitan Corporation, Sahiwal
Monitoring location	Fateh Sher Road
Nature Of Monitoring	Ambiant Air Monitoring
Equipment Used	Environnement SA, Kentech Noise Meter
Monitoring Date	11 August, 2020
Duration	24 hour
Coordinates	30.677559, 73.109268

ESP-219/20
1372

Date - Time	CO	SO2	O3	NO	NO2	PM2.5	PM10.0	Noise
	mg/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	dB
8/11/2020 13:18	1.043	14.333	27.949	11.066	16.02	33.045	142.92	64
8/11/2020 14:18	1.152	14.776	27.832	11.57	15.426	36.161	130.345	66
8/11/2020 15:18	1.067	12.659	33.887	11.435	15.635	35.321	121.22	61
8/11/2020 16:18	1.066	11.324	34.851	10.873	14.729	36.515	157.084	62
8/11/2020 17:18	1.169	13.408	30.645	11.751	15.95	37.269	141.562	60
8/11/2020 18:18	0.852	15.443	17.706	10.695	15.619	37.691	159.679	67
8/11/2020 19:18	1.047	7.592	12.263	12.66	18.48	30.854	120.845	59
8/11/2020 20:18	0.578	8.122	12.97	10.313	17.31	25.052	102.263	61
8/11/2020 21:18	1.265	9.115	24.241	14.578	18.294	21.125	118.143	60
8/11/2020 22:18	0.389	9.28	2.441	9.514	16.398	28.896	95.909	59
8/11/2020 23:18	0.569	10.702	2.255	13.571	17.292	32.883	137.85	60
8/12/2020 0:18	0.661	10.049	2.272	10.485	17.397	26.032	135.675	58
8/12/2020 1:18	0.529	8.866	4.323	8.353	16.773	27.899	95.174	56
8/12/2020 2:18	0.543	8.932	3.666	5.93	14.812	22.944	138.647	58
8/12/2020 3:18	0.687	9.721	5.409	7.447	14.825	23.013	112.331	57
8/12/2020 4:18	0.906	11.314	21.077	8.576	15.65	24.941	127.587	53
8/12/2020 5:18	0.988	11.804	16.299	10.052	16.041	25.855	118.661	54
8/12/2020 6:18	0.747	10.359	21.488	10.532	15.405	25.433	121.862	55
8/12/2020 7:18	1.007	11.917	16.676	9.068	16.444	28.697	115.511	58
8/12/2020 8:18	0.831	10.861	24.799	9.601	15.741	29.787	112.388	60
8/12/2020 9:18	1.077	11.494	10.247	10.234	15.206	34.779	112.702	56
8/12/2020 10:18	1.062	0.963	10.085	8.702	15.141	28.158	122.591	63
8/12/2020 11:18	0.853	11.431	8.511	10.268	15.23	26.721	120.35	68
8/12/2020 12:18	1.052	11.335	9.984	8.998	16.385	28.341	114.919	66
Average	0.881	10.971	15.909	10.278	16.068	29.353	123.162	60
Maximum	1.265	14.833	34.851	14.578	18.48	37.269	159.679	
Minimum	0.389	7.592	2.255	5.93	14.729	21.125	95.174	
CO 1st 8 Hours	0.999							
CO 2nd 8 Hours	0.694							
CO 3rd 8 Hours	0.949							
Day Noise	62							
Night Noise	57							

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Conducted BY Ameer Hamza, Field Officer

15/8/2020 17/08/2020

ESPAK

Environmental Services Pakistan

PAK EPA & PUNJAB EPD CERTIFIED

CHEMICAL ANALYSIS TEST REPORT (DRINKING WATER)

Reference Number: ESPAK/219/20/DW/1374/00232 **Date:** 20/08/2020
Name of Industry / Client: Punjab Intermediate Cities Improvement Investment Program-PICIP
Address: 1st Floor, Metropolitan Corporation, Sahiwal
Telephone No.: ----
Nature of Sample: Drinking Water from Water Filter Plant at Fateh Sher Road
Date Sample Received: 13/08/2020 **Grab / Composite:** Grab
Date of Sample Collection: 12/08/2020
Sample Collected / Sent By: Ameer Hamza, Field Officer, ESPAK
Date of Completion of Analysis: 19/08/2020

S. No	Parameters	Unit Values (PSQS)	Concentration	Method / Equipment Used	Remarks
1	pH	6.5-8.5	7.7	SMWW 4500H^B	Within Prescribed Limits
2	Total Dissolved Solids (TDS)	<1000 mg/L	635 mg/L	SMWW 2540C	Within Prescribed Limits
3	Chloride (as Cl⁻)	<250 mg/L	72 mg/L	SMWW 4500Cl⁻B	Within Prescribed Limits
4	Cadmium (Cd)	0.01 mg/L	ND	U.S. EPA-200.7	Within Prescribed Limits
5	Chromium (Cr)	≤0.05 mg/L	ND	U.S. EPA-200.7	Within Prescribed Limits
6	Copper (Cu)	2.0 mg/L	0.097 mg/L	U.S. EPA-200.7	Within Prescribed Limits
7	Lead (Pb)	≤0.05 mg/L	ND	U.S. EPA-200.7	Within Prescribed Limits
8	Manganese (Mn)	≤0.5 mg/L	0.012 mg/L	U.S. EPA-200.7	Within Prescribed Limits
9	Nickel (Ni)	≤0.02 mg/L	ND	U.S. EPA-200.7	Within Prescribed Limits
10	Zinc (Zn)	5.0 mg/L	0.068 mg/L	U.S. EPA-200.7	Within Prescribed Limits
11	Aluminum (Al)	≤0.2 mg/L	0.145 mg/L	U.S. EPA-200.7	Within Prescribed Limits
12	Arsenic (As)	≤0.05 mg/L	ND	U.S. EPA-200.7	Within Prescribed Limits
13	Boron (B)	0.3 mg/L	0.130 mg/L	U.S. EPA-200.7	Within Prescribed Limits
14	Barium (Ba)	0.7 mg/L	0.141 mg/L	U.S. EPA-200.7	Within Prescribed Limits
15	Mercury (Hg)	≤0.001 mg/L	ND	U.S. EPA-200.7	Within Prescribed Limits
16	Selenium (Se)	0.01 mg/L	ND	U.S. EPA-200.7	Within Prescribed Limits
17	E. Coli	Must not be detectable in any 100mL Sample	ND	SMWW 9221 F	Within Prescribed Limits
18	Fecal Coliform Bacteria	Must not be detectable in any 100mL sample	ND	SMWW 9221 F	Within Prescribed Limits
19	Total Coliforms	---	ND	SMWW 9221 B	---
20	Color	≤15 TCU	Nil	SMWW 2120 C	Within Prescribed Limits
21	Taste	Non Objectionable / Acceptable	Acceptable	Organoleptic	Within Prescribed Limits
22	Odor	Non Objectionable / Acceptable	Acceptable	Organoleptic	Within Prescribed Limits

Page 1 of 2

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ISO 9001:2015 ISO 14001:2015 ISO 45001:2018

ESPAK

Environmental Services Pakistan

PAK EPA & PUNJAB EPD CERTIFIED

CHEMICAL ANALYSIS TEST REPORT (DRINKING WATER)

Reference Number: ESPAK/219/20/DW/1374/DGE52 **Date:** 20/08/2020

Name of Industry / Client: Punjab Intermediate Cities Improvement Investment Program-PICIIP

S. No	Parameters	Limit Values (PEQS)	Concentration	Method / Equipment Used	Remarks
23	Turbidity	<5 NTU	0.44 NTU	SMWW 2130B	Within Prescribed Limits
24	Total Hardness as $CaCO_3$	<500 mg/L	252 mg/L	SMWW 2340C	Within Prescribed Limits
25	Cyanide (CN^-)	≤0.05 mg/L	0.04 mg/L	SMWW 4500 CN⁻ F	Within Prescribed Limits
26	Fluoride (F^-)	≤1.5 mg/L	0.16 mg/L	U.S.-EPA 9214	Within Prescribed Limits
27	Nitrate (NO_3^-)	≤50 mg/L	0.60 mg/L	SMWW 4500NO_3^- B	Within Prescribed Limits
28	Nitrite (NO_2^-)	≤3 mg/L	ND	SMWW 4500NO_2^- B	Within Prescribed Limits
29	Residual Chlorine	0.2-0.5 mg/L	ND	SMWW 4500-Cl B	—
30	Phenolic Compounds (as Phenols)	NGVS	0.01 mg/L	SMWW 5530 C	—

PEQS: Punjab Environmental Quality Standards for Drinking Water, 2016
SMWW: Standard Methods for the Examination of Water and WasteWater 23rd Edition, American Public Health Association, American Water Works Association, Water Environment Federation USA (2017)
USEPA: United States Environmental Protection Agency
NGVS: No Guideline Value Set
ND: Not Detected
Note:

- **The report should be reproduced as a whole and not in parts.**
- **The responsibility of the ethical use of this report lies with the client.**
- **The values represent sample conditions when monitoring/testing was carried out.**
- **The report data is not intended to be used legally by the client.**

1. **Sample Analyzed By:** Waqas Ahmad (Analyst), Musharaf Jabeen (Analyst), Muhammad Irfan (Deputy Analyst), Anwer Usama (Asst Microbiologist)
2. **Name of Chief Analyst with Seal:** Muhammad Arfan
3. **Signature of Incharge of the Environmental Laboratory:**

Name: Imran Malik
General Manager
Date: 20/08/2020

End of Report

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Top Priority
Through Email

No.LG&CD/PICIIP/CIU-SWL/29-12/2017
Government of the Punjab
Local Government & Community Development Department
Dated Lahore, the 27th April, 2021

To,

The Senior Project Officer
Urban, Water and Emergency Assistance
Asian Development Bank, Pakistan Resident Mission

Subject:- **INITIAL ENVIRONMENTAL EXAMINATION REPORT FOR UPGRADATION OF ROAD WORKS IN SAHIWAL**

Dear Mr. Umar,

Please find enclosed with this letter the Initial Environmental Examination (IEE) Report for Upgradation of Road Works in Sahiwal for Asian Development Bank review and approval.

Best regards,

27.4.21.
Omar Jahangir
Program Director (PICIIP)
LG&CD Department

No. & Date even:-

A copy is forwarded for information and further necessary action to:-

1. Deputy Program Director, PICIIP, LG&CD Department
2. Chief Engineer, PICIIP, LG&CD Department
3. Director (Procurement & Contracts) PMU, PICIIP, LG&CD Department
4. Director (Monitoring & Evaluation) PMU, PICIIP, LG&CD Department
5. Infrastructure Engineer, CIU Sahiwal, PICIIP, LG&CD Department
6. P.A to Program Director, PICIIP, LG&CD Department
7. Master File