Environmental Impact Assessment

Project Number: 48402-002
March 2016

PAK: National Motorway M-4 Gojra–Shorkot–Khanewal Section Project – Additional Financing

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ENVIRONMENTAL IMPACT ASSESSMENT

OF FAISALABAD-KHANEWAL MOTORWAY (M-4)

National Trade Corridor Highway Investment Program

(NTCHIP)
National Motorway M-4 Gojra-Shorkot-Khanewal Section Project

Submitted to

ASIAN DEVELOPMENT BANK

by

NATIONAL HIGHWAY AUTHORITY (NHA)

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&

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List of Abbreviations

Abbreviation	Description
˚C	Degree Centigrade
AD	Assistant Director
ADB	Asian Development Bank
AADT	Average Annual Daily Traffic
APs	Affected Persons
BDL	Below Detectable Level
CC	Construction Contractor
CBO	Community Based Organization
CO	Carbon Mono Oxide
COI	Corridor of Impact
dB(A)	Decibel
DCR	District Census Report
DC	Design Consultant
DD	Deputy Director
DDO	Deputy District Officer
DFO	Divisional Forest Officer
EDO	Executive District Officer
EIA	Environmental Impact Assessment
EIRR	Economic Internal Rate of Return
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
Ft.	Feet
GM	General Manager
GoP	Government of Pakistan
IEE	Initial Environmental Evaluation

Abbreviation	Description
IP's	Indigenous People
IUCN	International Union for Conservation of Nature
JBIC	Japan Bank for International Cooperation
JICA	Japan International Cooperation Agency
Km	Kilometers
LAA	Land Acquisition Act, 1894
LAR	Land Acquisition and Resettlement
M-4	Motorway (Faisalabad-Khanewal)
Mm	Millimeter
MC	Monitoring Consultant
M&E	Monitoring and Evaluation
NEQS	National Environmental Quality Standards
NESPAK	National Engineering Services Pakistan, (Pvt) Ltd.
NGO	Non Governmental Organization
NHA	National Highway Authority
NH&MP	National Highway and Motorway Police
NOx	Nitrogen Oxides
NWFP	North West Frontier Province
OM	Operation Manual
O&M	Operation and Maintenance
PAPs	Project Affected Persons
PEPA	Pakistan Environmental Protection Act
PHV	Peak Hourly Volume
PM_{10}	Particulate Matter (10 Micron)
PTCL	Pakistan Telecommunication Company Limited
RoW	Right of Way
RAP	Resettlement Action Plan

Abbreviation	Description
RPF	Resettlement Policy Framework
Rft.	Running Feet
Sft.	Square Feet
SPM	Suspended Particulate Matter
SC	Supervision Consultant
SNGPL	Sui Northern Gas Pipe Line
SOx	Sulphur Oxides
TA	Technical Assistance
USEPA	United States Environmental Protection Agency
WHO	World Health Organization

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EXECUTIVE SUMMARY

Background of the Project

1. The Government of Pakistan (GOP) gives major emphasis to improving the existing roads and building new motorways and expressways to improve and expand the country's road network. The National Highway Authority (NHA) under the Federal Ministry of Communications is responsible for the 12,500 kms long National Highway Network and Motorway systems, which carries 75% to 80% of the total commercial traffic. The road network in Pakistan is expanding rapidly and the pace of this development is gradually accelerating which is continuing till now. In spite of overall resource constraints in the country, Government of Pakistan (GOP) has been making substantial investments to develop National Trade Corridor by linking major urban centres.

2. National Highway Authority (NHA) intends to construct Faisalabad-Khanewal Motorway (M-4) as part of National Trade Corridor (NTC) Projects. The proposed Motorway Project with other NTC Projects will provide a reliable, safe and throughway for transportation of goods between central Asian parts and China to Karachi and Gawadar ports. This Project will uplift in the trade activities and in turn increase the economic growth rate of the country. This Motorway will also provide easy access to residents of Faisalabad, Toba Tek Singh, Khanewal and Multan districts and will make easy transportation towards Islamabad, Rawalpindi and Lahore, and will provide a safe, congestion free and high speed facility to commuters of the project area as well.

3. After initial screening criteria based on the ADB's Safeguard Policy Statement, 2009 and Environmental Assessment Guidelines, the Project is categorized as "Category A" for which EIA is required as Project may affect an area larger than the sites or facilities subject to the physical works involved; likely to permanently convert large productive area into non productive and large number of people to be displaced.

4. The Most of the land of the right of way (RoW) of the Project is agricultural; however a small quantity of residential and commercial land will also be acquired. The major towns and cities near RoW are Faisalabad, Gojra, Painsara, Shorkot, Toba Tek Singh and Khanewal.

Objectives and Schedule

5. The prime objective of the proposed Project is to improve trade flows and lower transit costs and time by providing a high speed, safe and reliable access controlled Motorway system.

6. The construction of M4 (section I) tranche 1 of the MFF completed in December 2014. Civil works for Section-II started in December 2015 and is expected to be completed in December 2018. Section – III of M-4 (i.e. Shorkot – Khanewal) is currently in the engineering design and environmental approval stage.

Project Components

7. The proposed Motorway Project comprises the construction of four lane dual carriageway from Faisalabad to Khanewal and construction of ten Interchanges at different road crossings. Two Bridges will be constructed one at Sadhnai Spill channel and other on Ravi River. Nine meter wide section of land will be raised with plantation in between two carriageways; this will be utilized in future to construct one lane of 3.65 meters on both carriageways. The carriageway will include paved shoulders at inner and outer sides. The proposed Motorway will be divided in the three construction Packages

- Package-I: Faisalabad-Gojra Section (58 Km);
- Package-II: Gojra - Shorkot Section (62 Km); and
- Package-III: Shorkot -Khanewal Section (64 Km);

Relevant Legislation and Guidelines

8. To carry out the present EIA Study, the environmental legislation and Guidelines enforced by the Pakistan Environmental Protection Agency and Asian Development Bank's (ADB) Safeguard Policy Statement (SPS) 2009 have been followed.

Components of the EIA Report

9. The Report contains the identified environmental impacts and their mitigation measures. Besides, the Report also includes the preparation of Environmental Management and Monitoring Plan to cover the mitigation measures, monitoring requirements and institutional responsibilities (during design, construction and operation phases of the proposed Project).

Description of the Project

10. The proposed second portion of M-4 is the construction of 64 km long road, which will start at end point of M-4 Section-II (Gojra-Shorkot) and ends at Khanewal. It will be four lane dual carriageways with each lane 3.65m wide. The proposed second section of M-4 consists of five (05) interchanges at different road crossings. The underpasses will be constructed at suitable locations. The RoW of the proposed project is100m wide; where as it will be 40 m extra at the locations where interchange is constructed. Construction of first section of M-4 i.e. from Faisalabad-Gojra was completed in December 2014 and the second portion i.e. Gojra-Shorkot which is 62 km, is under construction while the Section – III (Shorkot – Khanewal) is currently in the engineering design and environmental approval phase. The Asian Development Bank is providing financial assistance for the construction of this project. For catering Environmental and Social aspects of section III ADB's Safeguard Policy Statement (2009) will be followed. 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 to receive application and facilitate resolution of affected peoples' concerns, complaints, and grievances about the project's environmental performance will also establish.

Description of the Environment

11. Baseline conditions were studied for the physical, ecological resources and for socioeconomic environment. This alignment of this Motorway passes through Faisalabad, Toba Tek Singh, Jhang and Khanewal Districts. The terrain is quite flat and levelled. All the four districts have mostly agricultural fields with flat and levelled terrain throughout the alignment strip. The climate of the Project Area touches two extremes, characterised by hot summers and mild winters. From April onwards, the summer season continuous usually up to the middle of October after which it becomes cool and the day temperature also begins to recede. May, June and July are the hottest months. The winter season on the other hand starts from November and continues till March. December, January and February are the coldest months.

12. In Kharif, crops such as sugarcane, fodder, maize and rice are cultivated in Faisalabad and Toba Tek Singh districts. In Jhang district beside agricultural land barren land is also present. Sugarcane, Maize, and rice are the main Kharif crops of this district. Flooded areas were also seen nearby the alignment but none of these areas falls into the Project RoW. In Khanewal district kharif season crops are Cotton, Rice and Sugarcane. Wheat is predominantly Rabi season crop of all areas.

13. Faisalabad is for its textile industries but no textile unit is presently situated along the route. In districts of Toba Tek Singh and Jhang, very little commercial units i.e. only a few sugar mills and spinning units but none of them is along the RoW of the proposed Project. In Khanewal district Roshe Power Plant, a hatchery and pesticide factory are situated at a distance of 5 km from the Project RoW.

14. In order to get true picture of the environmental condition of the Project Area, consultants carried out water, air and noise monitoring by taking services of SGS Pakistan (Pvt) Limited in 2007 and Solution Environmental & Analytical Laboratory has done analysis of ambient air, water, and noise in July 2014 where as in 2015, environmental monitoring was conducted by ECTEC Environment Consultants. Ten locations were analysed for air, noise and groundwater. Surface watermonitoring was done at three locations.

15. Socio-economic environment of the Project Area was studied in detail for developing the baseline information about the affected people of the Project.

Project Alternatives

16. Options were considered for this Project that included “No project” and Alternate transport modes. These have been discussed in Section 4 of this Report. Finally this option was selected because it fulfils the future Project requirements in the best way.

Environmental Impacts and Mitigation Measures

17. Various probable impacts on the existing resources due to the proposed Project and vice versa were studied under the parameters of resettlement/ land acquisition, change of land use, dismantling of structures, relocation of existing utilities, soil erosion, water bodies, air pollution, noise, flora and fauna etc.

18. The most significant impact of the project is resettlement of residents and taking about 4715 acres of agricultural land out of production. The loss in production can be met with by increasing the yield from fields in the agricultural sector. Orchards lost to the project will also have to be raised by the private owners of land. However, the owners of land whose land is to be acquired and the neighbouring farmers can be helped to gain access to modern technology to increase production from their land. Similarly the deficiency in livestock feed/fodder will have to be met from the adjoining areas.

19. Construction activities will result in relocation/rearrangement of various utilities within the RoW, including culverts, PTCL cable, electrical poles, transmission, telephone lines and wells.

20. Mitigation measures to eliminate/minimize those negative impacts have been proposed to bring them to an acceptable level through implementation of the Environmental Management and Monitoring Plans. Proper compensation will be given to the Project affectees in a judicious manner. Mitigation measures have been suggested for the pre-construction, construction and operational stages of the Project, taking into consideration the environmental impacts of the proposed Project.

Economic Assessment

21. The Economic Assessment describes economic benefits of the proposed Project. Economic Internal Rate of Return (EIRR) is also provided. EIRR comes out as 13.2%, which is above 12% the assumed opportunity cost of capital in Pakistan.

Environmental Management Plan (EMP)

22. The EMP provides an approach for managing and monitoring environment related issues and describes the institutional framework and resource allocation. An Environmental management and monitoring plan has accordingly been devised to monitor various activities during the construction and operational phases of the Project, considering all the sensitive issues during the execution. The EMP will be implemented by NHA with the assistance of consultants. NHA will depute Deputy Director Environment to deal with the environmental related issues. Total estimated environmental mitigation cost will be around Rs. 4,058 Million for the whole 184 Km. While for section-III of M-4, total environmental cost has been worked out in year 2015 will be Pak Rs. 96.42 Million.

23. Site Specific Environmental Management Plan (SSEMP) would be prepared by Environmental Engineer (EE) of contractor in coordination with Environmental Engineer of Supervision Consultant (SC) and that would be approved by EALS and ADB. The

SSEMP will focus on site specific features and will adopt a risk based approach to selecting specific mitigation measures.

24. The implementation of the proposed SSEMP involves inputs from various functionaries as EEs of contractor and SC. The contractor will be primarily responsible for ensuring implementation of the mitigation measures proposed in the EMP, which will be part of the contract documents. It is suggested that provision of the environmental mitigation cost will be made in the total cost of project, for which contractor will be paid on the basis of compliance reports. However, if the contractor fails to comply with the implementation of EMP and submission of the compliance reports, deductions will be made from the payments to the contractor claimed under the heads of environmental components.

Public Consultation and Information Disclosure

25. Consultant's EIA team identified the stakeholders of the proposed Project and discussed the Project with them during the detailed field visits. Their views and concerns were noted and have been incorporated in section 8 of this Report. After reviewing their concerns, mitigation measures have been suggested for giving them the due compensation.

26. Stakeholders of section-III of M-4 were also contacted in December 2015 during the detail project visits, their views and concerns were noted and have been incorporated in section 9 of this report. After reviewing their concerns, mitigation measures have been suggested for giving them the due compensation.

Grievance Redress Mechanism

27. In order to receive and facilitate the resolution of affected people's (AP) concerns, complaints and grievances about the Project's environmental performance, a Grievance Redress Mechanism (GRM) will be established at the Project. The GRM will address the APs' concerns and complaints proactively and promptly, using an understandable and transparent process that is gender responsive, culturally appropriate, and readily accessible to all segments of the APs at no costs and without retribution.

Conclusion

28. The proposed Motorway will enhance the trade activities of the country and provide smooth and safe travelling corridor. The proposed Motorway will involve some negative environmental impacts, which are mostly related to pre-construction and construction stages of the Project and are however manageable by properly implementing the EMP. No long-term and significant adverse environmental impacts are however envisaged for the operation stage of the Project. Hence, the Project is environmentally feasible provided that the mitigation measures are properly implemented during the project execution.

SECTION 1

INTRODUCTION

1.0 General

29. National Highway Authority (NHA) plans to construct (M-4) Motorway from Faisalabad to Khanewal. To comply with IEE/EIA regulations 2000, NHA entrusted NESPAK with the assignment of carrying out an Environmental Impact Assessment Study of the complete Motorway (M-4) alignment proposed.

30. Earlier, the EIA report for addressing the impacts on Section-II of M-4 was updated in June 2014 with aim to address all the details of Asian Development Bank's Safeguard Policy Statement 2009 and Punjab Environment Protection (Amendment) Act 2012. The NTCHIP Program is financed by ADB through a Multi-tranche Financing Facility (MFF-0016) which was approved in 2007. The MFF consists of several tranches; each covering several subprojects. However, Section-II of M-4 was implemented as a separate standalone loan. Now, the report is being updated for addressing the impacts for Section –III of M-4 i.e. from Shorkot-Khanewal.

31. The first section of the project from Faisalabad-Gojra was completed in December 2014 while the construction of the second section has been started in December 2015. The second section starts from Gojra and ends at Shorkot, the total length of this section is 62 km, ROW of the section-II of M-4 will be 100m, it will be four lane carriageway with each lane 3.65m. As per design the total pavement width of the road will be 14.6m. The total length of Section–III will be 64Km. It will consist of a four-lane dual carriageway.

32. The National Highway Authority (NHA) will be the Executing Agency (EA) for the project. The Project will provide a dependable road transport network to promote interprovincial connectivity, reduce transportation time to economize the costs, provide all weather roads to the community, and improve the developmental pace in the area. Safeguard Policy Statement 2009 of ADB's will be implemented on section-III of M-4 as well, for taking care of all Environmental and social issues.

33. The construction of the proposed Motorway (M-4) will facilitate and enhance the trade activities in the country and will provide time saving and safe and speedy access to various parts of the country. M-4 is the extension of M-3 and will start from the end point of the existing Faisalabad – Pindi Bhattian Motorway (M-4) near Sargodha Road, Faisalabad. Figures 1.1 and 1.2 indicate the National Highway Network and location plan of the Project Area.

34. The proposed Motorway (M-4) is a part of the National Trade Corridor. The road will provide easy access to the traders and farmers for transportation of goods to other parts of the country by reducing the time required for transportation.

1.1 Proponent of the Project

35. National Highway Authority (NHA) is the proponent of the proposed Project with the following address:

National Highway Authority
27 Mauve Area, G-9/1,
Islamabad
Ph: 051-9032506

1.2 Overview of the Project

36. The length of this Motorway Project is about 184 Km starting from the end point of Faisalabad-Pindi Bhattian Motorway (M-3) near Faisalabad and ending at National Highway Multan- Khanewal Road (N-5). This Project section consists of the following major components:

- Construction of a 4 lane dual carriageway;
- Construction of Interchanges at various road crossings; and
- Construction of bridges at the Ravi River and Sadhnai Canal.

1.3 Scope of Study

37. The scope of the EIA Study aimed at the identification of the possible impacts of the proposed Project on its immediate surroundings on both short and long term basis. Then based on the nature and levels of those impacts, proper mitigation measures were delineated and cost for inclusion into this EIA Report. Upon approval of this report, the Project Proponent and the Contractor will be bound to follow the recommendations of the Report during the execution of engineering activities on site. In order to investigate the environmental, geological and social features of the Project Area, the Consultants carried out detailed site visits for collecting primary and secondary data to identify and establish the Corridor of Impact (CoI) and various mitigations required to minimise the adverse impacts. In addition to assessing the direct impacts of the operation, a cumulative environmental impact assessment (CEIA) was also conducted independently; this study is appended as Annexure V.

38. Literature research and consultations were conducted with the community and institutional stakeholders within the corridor of impact of the project to identify Valued Environmental and Social Components (VECs) considered as significant in assessing risk associated with the cumulative impacts. Key VECs identified included air quality and noise that can impact public health, access to livelihood opportunities, access across Right of Way, and availability of land for agriculture. The overall perception of stakeholders in the long term perspective was highly positive and they considered it as an important development for the local economy. While the project will meet the National Environmental Quality Standards (NEQS) for air quality, mitigation of noise will be

required to meet the night-time NEQS for noise in the corridor of impact. An environmental management and a monitoring plan was included to provide guidelines to NHA for management of the impacts, including a framework for adaptive management to respond to concerns of the community during project operation.

1.4 Project Categorisation

39. Pakistan Environmental Protection Agency (Review of IEE/EIA) Regulations 2000, Schedule II, lists down the projects requiring an EIA study as under:

40. "The Projects in schedule-II are generally major Projects and have the potential to affect a large number of people. They also include Projects in environmentally sensitive areas. The impact of such Projects may be irreversible and could lead to significant changes in landuse and the social, physical and biological environment."

41. Schedule-II describes the requirements of EIA for transportation Projects as follows: "Federal or Provincial Highways or major roads greater than 50 Million Rupees in value. Maintenance (rebuilding or reconstruction of existing roads) is exempted from the requirement of an EIA".

42. As per EPA Guidelines, the present Project is classified as "Schedule II" that requires an EIA study and approval from the concerned authority, prior to construction (Attached as Annexure -I).

43. Asian Development Bank's Safeguard Policy Statement (SPS) 2009 classify the projects requiring an EIA in Category A as follows: "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 lager than the sites or facilities subject to physical works. An environmental impact assessment (EIA) is required".

44. The present Project requires an EIA as it involves significant environmental impacts, i.e. resettlement of people and structures, cutting of trees, change in land use etc.

1.5 Standards and Guidelines

45. Environmental issues and control in Pakistan are governed by the Pakistan Environmental Protection Act, 1997. The necessary Guidelines and Procedures for preparing EIA Reports have been published by EPA in the form of "Pakistan Environmental Assessment Package".

46. The applicable requirements of the Government of Pakistan and Asian Development Bank (ADB) that are to be met before commencement of the Project are as follows:

- Pakistan Environmental Protection Act (1997);
- Pakistan Environmental Assessment Procedures (1997);
- Policy and Procedures for Filing, Review and Approval of Environmental Reports
- Guidelines for the Preparation and Review of Environmental Reports Attached as Annexure-I
- Sectoral Guidelines: Roads
- Pakistan Environmental Protection Agency (Review of IEE/EIA) Regulations (2000);
- National Environmental Quality Standards (2000) for discharges of municipal and industrial wastewater and gaseous emissions;
- The need for an EIA as part of the Government of Pakistan PC-1 planning approval process for this Project; and
- ADB Guidelines for Environmental Assessment.

1.6 Components of the Report

47. This EIA Report has been prepared following the Pakistan Environmental Protection Agency (EPA) Guidelines for environmental assessment and Asian Development Bank (ADB) Environmental Assessment Guidelines. The format of the Report consists of the following components:

Section 1: Introduction

48. This section represents an introduction of the entire EIA Report. It provides information about the Project location and its benefits to the public. It contains the scope of study and overview of the Project. The section also includes the Project categorization as per EPA criteria. Besides, it provides information about the standards and guidelines that have to be followed.

Section 2: Policy and Legal Frame Work

49. This section provides an overview of the policy framework and national legislation that applies to the proposed project. The project is expected to comply with all national legislation relating to environment in Pakistan, and to obtain all the regulatory clearances required.

Section 3: Description of the Project

50. In this section salient features of the Project are presented. It provides information about the following:

a) Overview of the proposed Project;
b) Location of the Project;
c) Project components including geometric design standards;

d) Project Right of Way (RoW);

e) Construction material;

f) Schedule of construction;

g) Construction camps; and

h) Workforce and machinery requirements.

Section 4: Description of the Environment

51. It provides an overview of the present environment of the Project area/site. It discusses the following:

a) Methodology of the study;

b) Physical environment;

c) Ecological resources; and

d) Socio-economic environment.

Section 5: Alternatives

52. This section discusses the Alternatives of the proposed Project.

Section 6: Environmental Impacts and Mitigation Measures

53. This section identifies the overall impacts of construction/operation works on the physical, biological and socio-economic environment of the Project Area. This assessment also includes the impact of traffic volume due to improved road conditions. In addition, it also narrates the measures that will mitigate the Project's adverse environmental effects.

Section 7: Economic Assessment

54. This section describes both tangible and intangible benefits of the proposed Project. It consists of detailed economic analysis of the Project.

Section 8: Environmental Management Plan

55. This section provides an approach for managing and monitoring environment related issues and describes the institutional framework for environmental management and resource allocations to be carried out by the National Highway Authority (NHA) for mitigating negative impacts of the proposed Faisalabad-Khanewal Motorway (M-4) Project.

56. This section describes the measures suggested for executing the Environmental Management Plan (EMP) at the Project site. It elaborates the following in detail:

- Objectives of EMP;
- Key Environmental and social components;
- Role of functionaries;
- Specific implementation responsibilities;
- Environmental monitoring;
- Environmental management plan;
- Environmental mitigation cost;
- Environmental technical assistance and training plan; and
- Environmental monitoring, mitigation and training costs.

Section 9: Public Consultation and Information Disclosure

57. This section consists of the information based on public consultation and information disclosure to them about the Project. It comprises of the following:

- Identification of the main stakeholders;
- Details of scoping sessions;
- Stakeholders' concerns;
- Proposed measures for incorporating the stakeholders' concerns;
- Village meetings; and
- Future information disclosure plan.

Section 10: Public Consultation and Information Disclosure (Section-II, 2014) and (Section III, 2015) M-4

58. This section deals with the information disclosure to the public and consultation sessions held with the different stakeholder groups that are likely to be affected by the implementation/construction of section-II (2014) of M-4 Project. The consultation process was carried out as per the guidelines of ADB and EPA.

Section 11: Grievance Redress Mechanism

59. This section describes the Grievance Redress Mechanism that is to be established at the Project to address and resolve the complaints of the affected people (APs)

Section 12: Conclusions

60. This section presents the conclusion of the whole study. It explains the following in detail:

- Identification of the main issues and concerns;
- Proposed mitigation measures;
- Benefits of the Project; and

Surveillance and Monitoring of the Motorway after Construction

SECTION 2

POLICY AND LEGAL FRAMEWORK

2.1 General

61. This section provides an overview of the policy framework and national legislation that applies to the proposed project. The project is expected to comply with all national legislation relating to environment in Pakistan, and to obtain all the regulatory clearances required.

2.2 National Policy and Legal Framework

62. The Climate Change Division is the responsible authority for environmental protection policy making in Pakistan.

63. 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 project are pollution prevention and abatement, restoration of rangelands, increasing energy efficiency, conserving biodiversity, supporting forestry and plantations, and the preservation of cultural heritage.

64. 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. Subsequently, the Punjab government amended PEPA 1997 as Punjab Environmental Protection (Amendment) Act 2012, and the Punjab Environment Protection Department (EPD) is responsible for ensuring the implementation of provisions of the Act in Punjab's territorial jurisdiction. Punjab EPD is also required to ensure compliance with the NEQS and establish monitoring and evaluation systems.

2.3 Regulations for Environmental Assessment, Pakistan EPA

65. 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

66. In accordance with provincial regulatory requirements, an IEE/EIA satisfying the requirements of the Punjab Environmental Protection (Amendment) Act 2012 which was earlier submitted to Punjab EPA in 2007 for review and approval, and received NOC well before the commencement of construction of M-4.

2.5 Guidelines for Environmental Assessment, Pakistan EPA

67. 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 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

68. 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;

69. These standards apply to the gaseous emissions and liquid effluents discharged by batching plants, campsites and construction machinery. The standards for vehicles will apply during the construction as well as operation phase of the project. Standards for ambient air quality and noise have also been prescribed.

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

70. The Asian Development Bank's Safeguard Policy Statement (SPS) 2009 requires that environmental considerations be incorporated into ADB's funded project to ensure that the project will have minimal environmental impact and be environmentally sound. The occupational health and safety of the local population should also be addressed as well as that of the project workers. A Grievance Redress Mechanism to receive application and facilitate resolution of affected peoples' concerns, complaints, and grievances about

the project's environmental performance is also established and provided in Chapter 10.

71. 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:

- 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 lager than the sites or facilities subject to physical works. An environmental impact assessment (EIA) is required.

- 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.

- 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.

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

2.8 Interaction with other Agencies

72. NHA is responsible for ensuring that the project complies with the laws and regulations controlling the environmental concerns of highway construction and operation, and that all preconstruction requisites, such as permits and clearances are met.

2.9 Provincial EPAs

73. NHA will be responsible for providing the complete environmental documentation required by the Punjab EPA and remain committed to the approved project design. No deviation is permitted during project implementation without prior and explicit permission of the Punjab EPA.

2.10 Provincial Departments of Forests and Wildlife

74. The clearing and grubbing for the Project road will involve clearing and uprooting of trees falling under construction limits within the right of way (ROW). However, any removed

trees or vegetation under private ownership will be compensated. If there is some disruption to vegetation or trees the project contractor will be responsible for acquiring a 'No-Objection Certificate' (NOC) from the concerned federal or provincial forest department. The application for an NOC will need to be endorsed by the NHA.

2.11 Provincial Governments

75. The NHA and its contractors must ensure that the project meets the criteria of provincial/district governments as related to the establishment of construction camps and plants, and the safe disposal of wastewater, solid waste, and toxic materials. NHA will coordinate and monitor environment-related issues.

2.12 Other Environment Related Legislations

76. **Table 2.1** gives a summary of all legislations, guidelines, conventions and corporate requirements:

Table 2.1: Environmental Guidelines and Legislations

Sr. No.	Legislation/guideline	Description
1	Punjab Environmental Protection (Amendment) Act, 2012	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. Subsequently, the Punjab government amended PEPA 1997 as Punjab Environmental Protection (Amendment) Act 2012, and Punjab EPD is responsible for ensuring the implementation of provisions of the Act in Punjab's territorial jurisdiction. Punjab EPD is also required to ensure compliance with the NEQS and establish monitoring and evaluation systems.
2	Pakistan Environmental Protection Act (PEPA) 1997	Basic legislative tool empowering the Government of Pakistan to frame and enforce regulations for the protection of environment. The PEPA 1997 is broadly applicable to air, water, soil, marine and noise pollution, and handling of hazardous wastes. Penalties have been prescribed for those contravening provisions of the Act. Under section 12 of the PEPA 1997, no project involving construction activities or any change in the physical environment can be undertaken unless an IEE or EIA is conducted and a report submitted to the federal or provincial EPA.

3	Pakistan Environmental Protection Agency Review of IEE and EIA Regulations, (2000)	The Regulation classifies projects on the basis of expected degree of adverse environmental impacts and lists them in two separate schedules. Schedule I lists projects that may not have significant environmental impacts and therefore require an IEE. Schedule II lists projects of potentially significant environmental impacts requiring preparation of an EIA. The Regulations also require that all projects located in environmentally sensitive areas require preparation of an EIA. It also lists Projects not requiring either an EIA or an IEE.
4	National Environmental Quality Standards (1993 and 2000)	The NEQS specify standards for industrial and municipal effluents, gaseous emissions, ambient air requirements and emission levels for Sulfur dioxide and Nitrogen oxide, vehicular emissions and noise levels. The PEPA specifies the imposition of a pollution charge in case of non-compliance with the NEQS. The standards were last revised in 2000.
5	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.
6	Land Acquisition Act, 1894 Including Later Amendments	The Land Acquisition Act, 1894, is a "law for the acquisition of land needed for public purposes and for companies and for determining the amount of compensation to be paid on account of such acquisition". The exercise of the power of acquisition has been limited to public purposes. The principles laid down for the determination of compensation, as clarified by judicial pronouncements made from time to time, reflect the anxiety of the law-giver to compensate those who have been deprived of property, adequately. The land needed for the construction of road will be acquired under normal conditions based on prevailing market prices or negotiated prices between NHA and the owners of land. Section 17(4) of the LAA will not be used in the absence of an emergency. Instead, the land will be purchased under willing-seller willing-buyer deal at agreed upon market rates and the seller will have the option not to sell the land, in case an acceptable deal for both the parties is not reached.

7	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.
8	Canal and Drainage Act (1873)	This Act prohibits corruption or fouling of water in canals (defined to include channels, tube wells, reservoirs and watercourses), or obstruction of drainage.
9	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.
10	Protection of Trees and Brushwood Act, 1949	This Act prohibits cutting or lopping of trees and brushwood without permission of the Forest Department. The Forest Department will be approached for permission to cut trees along the road alignment.
NATIONAL ENVIRONMENTAL AND CONSERVATION STRATEGIES		
11	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.
12	Biodiversity Action Plan	The plan recognizes EIA as an effective tool for identifying and assessing the effects of a proposed operation on biodiversity
INSTITUTIONAL FRAMEWORK		
13	Environment and Conservation	There is a well-established framework for environmental management in Pakistan. The Ministry of Environment deals with environment and biological resources. Within the ministry, the NCS unit established in 1992 is responsible for overseeing the implementation of the strategy. Two organizations, The Pakistan Environmental Protection Council (PEPC) and the Pak EPA are primarily responsible for administering the provisions of the PEPA, 1997. The PEPC oversees the functioning of the Pak EPA. Its members include representatives of the government, industry, non-

		governmental organizations, and the private sector. The Pak EPA is required to ensure compliance with the NEQS, establish monitoring and evaluation systems, and both identify the need to and institution of legislations whenever necessary. It is thus the primary implementing agency in the hierarchy. The Provincial Environmental Protection Agencies are formed by the respective provinces.
INTERNATIONAL CONVENTIONS		
14	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 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 Project.
15	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.
16	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 Larkana
INTERNATIONAL ENVIRONMENTAL GUIDELINES		
17	ADB's Safeguard Policy Statement (SPS), 2009	ADB's Safeguard Policy Statement (SPS), 2009 provides guidelines for environmental assessments of development projects. These guidelines help prospective projects identify impacts they will have on various environmental receptors. The guidelines call for carrying out EIAs or IEEs of projects based on severity of their impacts.

SECTION 3

DESCRIPTION OF THE PROJECT

3.0 General

77. The Faisalabad-Khanewal Motorway (M-4) Project will be a crucial Motorway link as it will enable trade and transportation linkage among major cities of the country. The proposed Project will also facilitate residents of Faisalabad, Toba Tek Singh, Khanewal and Multan and will provide easy access towards Multan, Lahore and onward to Islamabad.

78. Prime objectives of the proposed Project are as follows:

- Enhance trade activities in the country;
- To provide in future the Trade linkage of Central Asian Republics with Pakistan.
- Provide safe, high speed and time saving corridor to the travellers;
- Enhance the efficiency of road network; and
- Reduce the number of accidents.

79. The traffic increase in speed with/without proposed Motorway is enlisted in **Table 3.1.**

Table-3.1: Vehicle Operating Speeds (Km/h)

Description	Car	Mini Buses/ Coasters	Buses	Truck-Tractors
Without Project	55	50	45	40
With Project	120	110	110	110

Source: *NESPAK*

80. Number of vehicles will increase annually and it will reach up to 26,000 passenger car unit by the year 2035. The increase in traffic volume will result in more travel time fuel consumption due to reduced traffic speed, traffic jams and accidents.

81. The design of the proposed Motorway will be carried out on the basis of latest traffic counts. Therefore it is imperative to construct the proposed Motorway Project so that the future traffic and travel safety problems can be encountered.

3.1 Location of the Proposed Project

82. The proposed Project falls under the administrative jurisdiction of Faisalabad, Toba Tek Singh, Jhang and Khanewal Districts. The proposed Project will start at the end point of (M-3) near Faisalabad and will end at N-5 near Khanewal.

83. The cities and towns falling en-route the proposed Project are Faisalabad, Painsara, Gojra, Toba Tek Singh, Shorkot, Makhdoompur, Abdul Hakim, Kabirwala and Khanewal. Presently the RoW of the proposed Project contains mostly agricultural land.

3.2 Project Components

84. The proposed Motorway Project components include construction of four lanes dual carriageway from Faisalabad to Khanewal and construction of ten Interchanges at different local road crossings. Two main Bridges will be constructed one at Sadhnai Spill Channel and the other on Ravi River. However twenty small bridges will be constructed on drain and canal crossings. The total width of both carriage ways including land reserved for plantation will be 31.8 meters. Nine meter wide section of land will be raised with plantation in between two carriageways and this section will be utilized in future to construct one lane of 3.65 meters on both carriageways.

85. The proposed project will be divided into three construction Packages

- Package-I: Faisalabad-Gojra Section(58 Km);
- Package-II: Gojra - Shorkot Section (62 Km); Implemented under a standalone project.
- Package-III: Shorkot - Khanewal Section (64 Km); Implemented under a standalone project.

3.2.1 Interchanges

86. The proposed Project will contain ten interchanges; these will be constructed at Faisaabad-Chiniot Road, Painsara-Jhang Road, Gojra-Jhang Road, Toba Tek Singh-Jhang Road, Toba Tek Singh-Warriam Road, Shorkot Cantt-Shorkot City Road, Bagar-Abdul Hakim Road, Makhdoompur-Kabirwala Road, Kabirwala-Khanewal Road and Khanewal-Multan Road. The interchange will be provided with two lanes each lane of 3.5 meters wide with one meter shoulder at outer sides.

3.2.2 Bridges

87. The proposed Motorway will cross two main surface water bodies i.e., Ravi River (chainage145+250) and Sadhnai Canal (chainage145+850). Two separate bridges will be constructed to run across these two water bodies. These bridges will be located near Abdul Hakim-Baghar interchange. In addition to the above, other small bridges will be constructed on the following canal and drain crossings:

- Khai Distributary, 8 m wide (at1+500);
- Drain, 15 m wide (at 6+650);
- Nasrana Distributary, 20 m wide (at 9+900);
- Paharang Drain, 30 m wide (at 10+500);
- Sem Nullah, 30 m wide (at 28+300);
- Jhang Branch Canal, 40 m (32+600);
- Dijkot Branch Drain, 40 m (43+700);

- Dhaular Distributary, 30 m (44+600)
- Nawabwala Distributary, 10 m (48+500);
- Titranwala Distributary, 20 m (54+250);
- Bhango Distributary, 20 m (73+500);
- Small Distributary, 3 m (80+000);
- Khewra Distributary, 3m (82+200);
- Distributary, 20 m (95+500);
- Trimo Link Canal, 150 m (111+000);
- Haweli Canal, 80 m (112+200);
- Darkhana Distributary, 3 m (131+350)
- Sadhnai Drain, Nakasu 250 m (140+00);
- Goraga Distributary, 20 m (144+900); and
- Canal, 8 m (169+600).

3.2.3 Flyovers

88. The Flyovers will be constructed at various road crossings. The link roads across the RoW of the proposed Project will pass through these flyovers. For these flyovers the width of the land strip shall follow the toe of embankment with a maximum width of 60 meters near flyover embankments and a minimum width of 30 meters near lower ends of the flyover ramps where it meets with the existing carriageway.

3.2.4 Rest Areas

89. Rest Areas will be provided after a certain distance on the proposed Motorway to facilitate travelers. For these rest area locations, a strip of 150 meters width and 200 meters length will be reserved on either side of the Motorway.

3.2.5 Service Area

90. These locations will be provided to facilitate travelers. The restaurants and Petrol pumps will be located there to provide comfort to people using the proposed Motorway. A strip of 250 meters width and 700 meters length will be reserved for the Service Area. The toilets in the service areas will be equipped with septic tanks of sufficient capacities. Sewage of the septic tanks will be disposed of at the designated waste disposal sites.

3.3 Project Right of Way

91. The Right of Way (RoW) of the proposed Motorway Project is 100 meters wide, while it will be 300 meters at the locations where interchanges will be constructed. Major construction work will generally remain confined within the RoW. About 4800 acres of land will be acquired for the proposed Project.

3.4 Construction Materials

92. The materials used in construction and up-gradation of the Motorway would include coarse aggregates (crush), fine aggregates (sand), soil, water, asphalt, reinforcement, cement etc. Almost all these raw materials are locally available in the country. The construction material quarries are already available in the area, which have been approved by the Mines and Mineral Department, Punjab. The construction material for M-4 will be procured from these approved quarries and no new quarry will be dug by the contractor.

(i) Crushed Aggregate

93. A well developed source of crushed aggregate is available at Chiniot and Sargodha. Several medium size crushers are exploiting these quarries. The quantities available are quite large; however, mining leases have already been obtained by various parties.

(ii) Fine Aggregate (sand)

94. This is also available in abundant quantity in the nearby areas of the proposed Project. Good quality sand is available in the River bed of Ravi and Chenab and it is the main source of superior sand for construction needs. The Chenab River sand has some superiority over the River Ravi sand.

(iii) Sub-grade Material

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

(iv) Embankment Material

96. The embankment material will be borrowed in huge quantities in the vicinity of the Project Area. In most cases, the contractors will lease private land in the vicinity on short term basis for the purpose of acquiring earth material, after the approval of NHA designated engineer.

(v) Water

97. Groundwater is available throughout the proposed Motorway alignment. Intensive pumping is done on large scale in the vicinity of the Project Area. The surface water present in the vicinity is generally of good quality. The surface water bodies such as Ravi River and canal water is available in Project Area. The quality of the ground and surface water has been analysed in the Project Area. The laboratory results (Annexure II) show that water from both the sources is suitable for all construction requirements.

(vi) Asphalt, Reinforcement and Cement

98. Asphalt, reinforcement and cement will be transported from Khoshab, D.G. Khan, Rawalpindi, Islamabad and Karachi etc.

3.5 Engineer's Cost Estimate

99. The Engineer's Cost Estimate for the proposed Project is presented in **Tables 3.2 and 3.3.**

Table-3.2 Engineer's Cost Estimate

ENGINEER'S COST ESTIMATE (Package I-IV)						
Bills	**D e s c r i p t i o n**	**Amount Based on**	**Amount Based on**	**Amount Based on**	**Amount Based on**	**Total Amount**
		CSR 2006 (Rs.)	**CSR 2006 (Rs.)**	**CSR 2006 (Rs.)**	**CSR 2006 (Rs.)**	**(Rs.)**
		Package-I	**Package-II**	**Package-III (i)**	**Package-III (ii)**	**Packages I – III**
1	**Earth Work**	2,316,586,885.26	2,177,131,685.55	1,680,190,876.71	201,847,304.08	6,375,756,751.60
2	**Sub Base & Base**	1,572,995,596.92	1,728,153,189.46	1,735,350,876.60	44,975,977.71	5,081,475,640.69
3	**Surface Course & Pavement**	489,554,466.50	522,942,977.70	508,203,874.20	16,820,572.99	1,537,521,891.39
4	**Structures**	-	-	-	-	-
4a	**Subways & Box Culverts**	262,703,161.45	213,681,069.48	238,302,275.68	21,698,947.56	736,385,454.17
4b	**Pipe Culverts**	63,688,409.65	43,309,464.55	58,343,152.76	2,604,028.83	167,943,055.79
4c	**Bridges**	404,121,807.63	283,353,643.91	235,683,688.51	712,734,993.72	1,635,894,133.77
4C-A	**Soil Investigation For Bridges**	2,062,410.00	1,409,100.00	2,357,040.00	589,260.00	6,417,810.00
4C	**Flyovers**	1,124,305,222.10	332,467,066.54	546,550,371.60	-	2,003,322,660.24
4C-1	**Soil Investigation For Flyovers**	4,124,820.00	1,178,520.00	2,062,410.00	-	7,365,750.00
4C	**Interchanges**	824,917,975.18	496,154,011.33	301,488,539.14	-	1,522,566,525.65
4C-1	**Soil Investigation For Interchanges**	1,178,520.00	589,260.00	589,260.00	-	2,357,040.00
5	**Drainage And Erosion Works**	157,285,978.76	173,283,655.77	151,151,731.19	12,495,188.23	494,216,553.96

ENGINEER'S COST ESTIMATE (Package I-IV)						
Bills	**D e s c r i p t i o n**	**Amount Based on**	**Amount Based on**	**Amount Based on**	**Amount Based on**	**Total Amount**
		CSR 2006 (Rs.)	**CSR 2006 (Rs.)**	**CSR 2006 (Rs.)**	**CSR 2006 (Rs.)**	**(Rs.)**
		Package-I	**Package-II**	**Package-III (i)**	**Package-III (ii)**	**Packages I – III**
5A	**Installation And Commissioning Of A Complete Pumping Stations**	15,640,367.08	16,617,890.02	16,617,890.02	977,522.94	49,853,670.06
5B	**Laying Of Feeder Line, Mainline, And Sub mains Of UPVC Pipes**	8,894,048.30	9,342,091.87	9,333,811.87	532,734.41	28,102,684.45
5C	**Laying Of Uv Resistant Lope Drip Lines With 4 Ltr/Hr Drippers**	8,951,112.17	9,372,156.44	9,372,156.44	302,208.08	27,997,733.13
5D	**Trenching And Back Filling, Puncturing Of Culverts/Utilities, Testing**	2,264,606.37	2,376,464.63	2,378,464.63	119,243.40	7,140,779.03
5E	**Ground Cover**	6,440,000.00	6,842,500.00	6,842,500.00	402,500.00	20,527,500.00
5F	**Operation & Maintenance**	10,914,460.00	10,874,060.00	10,874,060.00	643,215.29	33,305,795.29
6	**Ancillary Works**	976,999,941.33	1,019,456,984.38	911,961,044.30	29,024,584.26	2,937,442,554.27
6A	**Miscellaneous Works**	153,315,000.00	156,315,000.00	156,315,000.00	3,105,000.00	469,050,000.00
7	**General Items**	83,860,000.00	83,860,000.00	72,860,000.00	64,240,000.00	304,820,000.00
		8,490,804,788.70	7,288,710,791.63	6,656,829,023.65	1,113,113,281.50	23,449,463,983.49

Table-3.3 Engineer's Cost Estimate for Section-II of M-4

Bills	Description	Amount Based on CSR 2014 (Rs.)
1	Earth Work	6,215,719,718
2	Sub Base & Base	4,958,930,717
3	Surface Course & Pavement	2,487,782,526
4A	Structures	2,384,649,025
6	Ancillary Works	2,582,671,223
4B	Pipe Culverts	558,507,657
4C	Bridges	647,084,290
6A	Misc Items	2,649,529,636
7	General Items	249,438,750
	Total	23,253,899,503
	*Provisional Sum	581,347,488
	Grand Total	23,835,246,990

The work not contained in the contract and required to be executed on urgent basis may be executed and paid through the Provisional Sum after the approval of Contractor's Quotation by the Employer which quotation by the Employer which quotation shall be complete in all respect including Contractor's overheads and profit.

3.6 Construction Schedule

100. The construction work at section-I of M-4 project completed in December 2014. The implementation/construction of the section-II of M-4 has been started in the December 2015 and the estimated completion date will be the end of 2018. The construction of Section – III will start after the completion of Section- II.

3.7 Construction Camps

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

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

3.8 Workforce and Machinery Requirements

103. The workforce and the machinery requirements are presented in **Tables 3.4 and 3.5** below:

Table-3.4 Workforce Requirement for Construction (Packages I-III)

No.	Contractors Staff	Workforce Required
A. Managerial Staff		
1	Project Manager	1
2	Deputy Project Managers	4
3	Office Managers	4
4	Accountants	4
5	Purchasers	4
6	Quantity Surveyors	4
7	Computer Operators	4
B. Site Staff		
1	Material Engineers	2
2	Site Engineers	10
3	Surveyors	10
4	Foremen	12
5	Skilled Labourers	80
6	Semi-skilled Labourers	120
7	Labourers	200
Total		459*

***** This figure is valid in case of all the construction packages are initiated at the same time.

Table-3.5 Estimated Machinery Requirements (Packages I-III)

S. No.	Machinery	Nos.
1	Dump trucks	20
2	Graders	8
3	Dozers (D-8)	8
4	Vibratory rollers	8
5	Water boozers	12
6	Loaders	8

S. No.	Machinery	Nos.
7	Asphalt plant	2
8	Asphalt distributor	2
9	Crushing plant	2
10	Air compressors	2
11	Broomers	2
12	Asphalt Paver	4
13	PTR	4
14	Static steel tyred rollers	8
15	Sheep foot rollers	8
15	Generators (10 KV)	4
16	Concrete batching plant	2
17	Vibrators	12
18	Concrete transit mixers	4
19	Rig (and accessories)	4
20	Tri pod	4
21	Welding plants	8
22	Concrete Bucket & Funnel	1 (each)
23	P.C Girder launcher	1
24	Form work	4 sets

*****This figure is valid in case of all the construction packages are initiated at the same time.

SECTION 4

DESCRIPTION OF THE ENVIRONMENT

4.0 General

104. The existing environment in the Project Area has been studied with respect to physical, ecological, cultural and socio-economic aspects. The data presented in this section has been gathered during December 2006 to February 2007 and updated in June to October 2014 in order to address SPS 2009. The latest data has been added below for the baseline studies of Section – III of M-4.

105. The direct "Corridor of Impact" (CoI) due to construction of the Motorway is 328 ft. (100 meters), which is within Right of Way (RoW) of the proposed Motorway Project. However effect of loads generating from the moving traffic will be felt beyond the designed RoW. Therefore indirect CoI is beyond the proposed RoW.

106. There is no existing road along the proposed Motorway Project, i.e., the M4 alignment is a new project, of which section-I is now operational. Therefore, at the time of conducting the original EIA the baseline environment of the Project Area was free from environmental pollution such as dust, noise or vehicular emissions, which remains true for the areas falling under Section-II. This will allow the determination of baseline conditions against which the incremental impact of the proposed Project will be assessed. Human impacts such as road safety, traffic noise, vehicular emissions and other types of associated pollution are taken into consideration for the operational stage of the proposed Project. These factors are therefore discussed as part of the environmental conditions in the Project Area.

4.1 Methodology

107. The existing information to establish a baseline of the Project Area was collected from different Government Departments/Public Sector agencies. Further, detailed field visits to the site were also carried out in order to have first hand information about the social and environmental conditions/issues of the Project Area.

108. The potential impacts of the proposed Project were ranked on the basis of their magnitude, severity and reversibility.

109. In order to assess the impacts of the proposed Project on the people living in the vicinity of the Project Area, detailed surveys were conducted and existing environmental/socio-economic conditions and salient features of the area were duly observed. In addition, the relevant secondary data was also obtained from the District Census Reports for Faisalabad, Toba Tek Singh, Jhang and Khanewal. During the detailed site visit, relevant government agencies/ departments (Annexure III) were also consulted for the relevant data. To establish baseline ambient air, noise and surface and groundwater conditions of the area; air and water samples for laboratory analysis were

collected from locations in all four districts, whereas noise levels were measured at various locations.

110. Locations for air quality, water quality and noise sampling were selected keeping in view their vulnerability to the proposed Project related impacts. These locations were distributed equally in all four districts. In June 2014, in order to update the EIA report for section-II, four different locations along section-II of M-4 were selected as the sensitive receptors during the detailed field visits, these locations were based on their vulnerability to being negatively impacted during construction and operational phases of the project. The analysis of noise, air and water were carried out in order to attain the baseline data/information which in future (during construction and operation phase) will be used as the reference data. Detail analysis reports are attached Annexure-II. For the environmental testing the samples of air, noise and water were collected from following under mentioned locations and villages.

i. RD 59+200 Adjacent to water course in Chak No. 305/JB near RoW
ii. RD 86+700 Adjacent to Govt. Elementary School for girls and community houses in Chak No.396 JB
iii. RD 119+500 At Water course in Mouza Rakh Kotla..
iv. RD 120+200 Near the community houses at the end point of Section-II (Mouza 7-Ghag)

111. In December 2015, in order to update EIA report for Section – III (Shorkot – Khanewal) ten (10) locations for environmental monitoring were identified in Section - III, The locations were selected as sensitive receptors based on their distance from the proposed alignment of M-4 Section III. These locations were found within 500-1000 meters radius of the Project Area. In future during the construction and operational stage these location were carefully monitored and reported. The locations of sensitive receptors are shown in **Figure-4.1.**

4.2 Physical Environment

4.2.1 Meteorology

112. The climate of the Project Area touches two extremes, characterized by hot summers and mild winters. From April onwards, the summer season continues usually up to the middle of October after which it becomes cool and the day time temperature also begins to recede. May, June and July are the hottest months. The winter season on the other hand starts from November and continues till March. December, January and February are coldest months.

113. The mean maximum and minimum temperature in summer are 41^{o}C and 27^{o}C respectively and in winter 19^{o}C and 4^{o}C respectively.

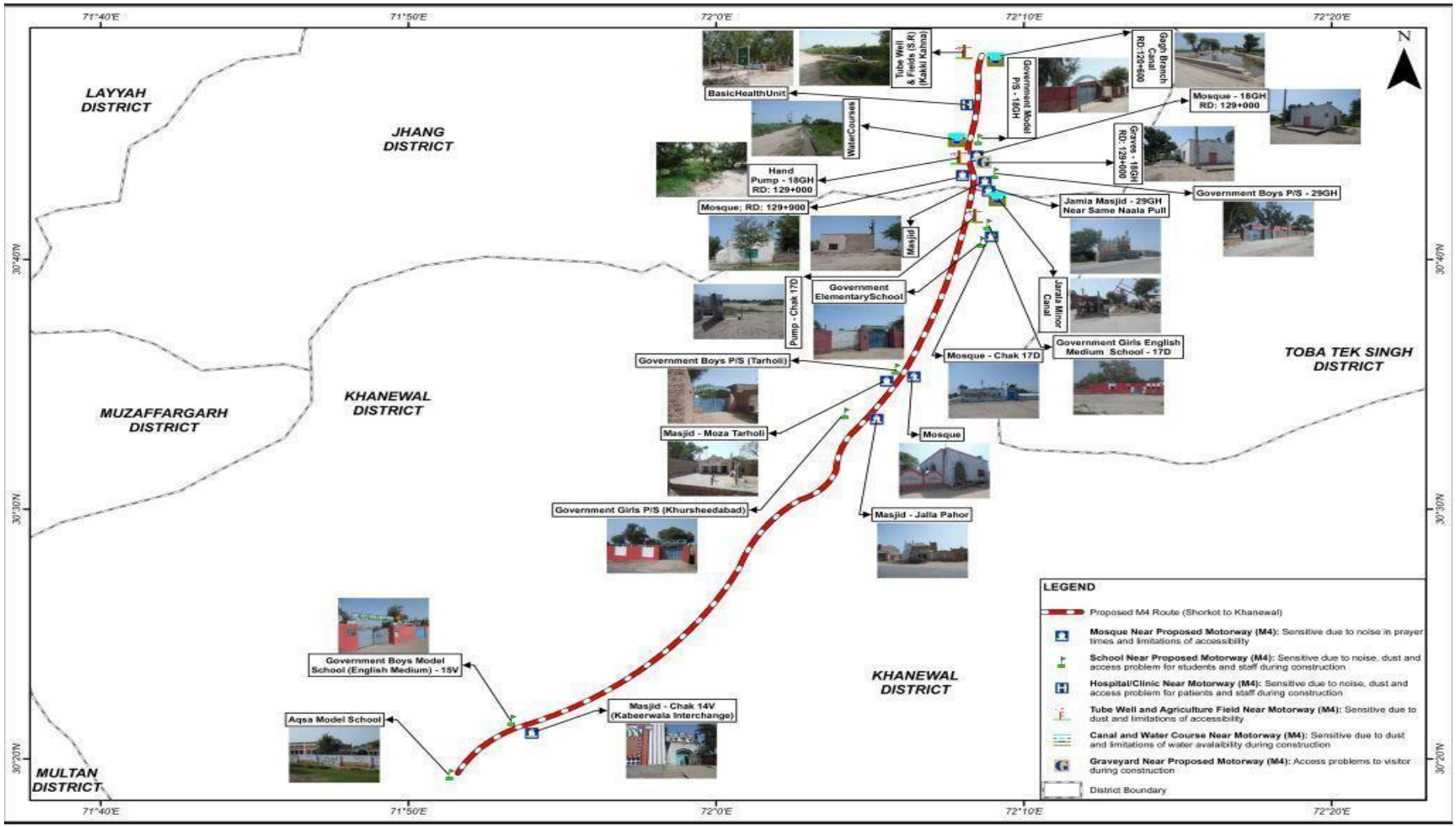


Figure 4.1: Sensitive Receptors Map of Section III (Shorkot – Khanewal)

114. **Table 4.1** shows the temperature, precipitation and relative humidity recorded at Faisalabad for the period of 30 years.

Table 4.1: Month-Wise 30 Year Mean Maximum and Minimum Temperature, Precipitation and Humidity Data (Faisalabad, Toba Tek Singh and Jhang)

Month	Mean Temperature (^oC)		Precipitation (Millimeters)	Relative Humidity (%)
	Maximum	Minimum		
January	19.4	4.1	11.5	66.0
February	21.9	7.1	20.1	61.2
March	26.7	12.3	25.7	58.2
April	33.5	18.0	16.9	46.5
May	38.4	22.7	16.1	37.5
June	40.5	26.9	27.9	41.7
July	37.1	27.0	115.0	61.5
August	36.1	26.6	89.8	65.9
September	35.7	23.7	28.6	59.9
October	33.0	17.0	3.8	54.7
November	27.2	10.1	3.0	62.7
December	21.4	5.1	8.6	66.5
Annual (Average)	30.9	16.7	372.3	56.8

Source: *Data Processing Centre, Pakistan Meteorological Department, Karachi, 1961 – 90 (District Census Reports – Faisalabad, Toba Tek Singh and Jhang)*

115. The above data represent the temperature, precipitation and relative humidity for Faisalabad, Toba Tek Singh and Jhang as they are close to one another therefore data given in District Census report is same. The mean maximum and minimum temperatures in June (the hottest month) are 40.5^{o}C and 26.9 ^{o}C respectively and in January (the coldest month), 19.4^{o}C and 4.1^{o}C respectively as per records for the 30 year period (1961-1990).

116. The Project Area experiences very light rainfalls. The summer season continues from July to September and the winter season from December to April. The bulk of the monsoon precipitation occurs in July and August, with monthly averages of 115.0 and 89.8 mm respectively. Minimum rainfall occurs in the month of November, which is 3.0 mm.

Table 4.2: Month-Wise 30 Year Mean Maximum and Minimum Temperature, Precipitation and Humidity Data (Khanewal)

Month	Mean Temperature (^{o}C)		Precipitation (Millimeters)	Relative Humidity (%)
	Maximum	Minimum		
January	21.0	4.5	7.2	62.3
February	23.2	7.6	9.5	56.4
March	28.5	13.4	19.5	51.6
April	35.5	19.5	12.9	40.1
May	40.4	24.4	9.7	33.2
June	42.3	28.6	12.3	39.9
July	39.2	28.6	61.3	56.0
August	38.0	28.0	32.6	59.7
September	37.2	24.9	10.8	56.3
October	34.6	18.2	1.7	51.6
November	28.5	10.9	2.4	61.4
December	22.8	5.5	6.9	66.6
Annual (Average)	33.6	17.8	186.8	52.9

Source: *Data Processing Centre, Pakistan (District Census Report Khanewal)*

4.2.2 Air Quality

117. The air quality in the Project Area is mostly free from pollutions except dust on the roads where interchanges and flyovers are proposed. A lot of dust occurs due to the dry atmosphere and the situation gets aggravated by the human activity. Large amount of suspended particulate matter (SPM) is generated due to vehicle movement on unpaved shoulders of these roads. The proposed Project will not cause any dust problem due to smooth road surface and paved shoulders; it will actually improve the situation.

118. For establishing baseline ambient air quality conditions, seven monitoring sites were selected. The air sample collection locations are as under:

1. Faisalabad-Sargodha Road (starting point of M4)
2. Painsera-Jhang Road (Chainage: 34+600)
3. Gojra-Jhang Road near Bhatta Stop (Chainage: 58+100)
4. Toba-Wariam Road (Chainage: 93+700)
5. Cantt. Road Shorkot near Shorkot Rice and General Mill (Chainage: 118+700)
6. Near Bank of Ravi River; (Chainage: 145+200) and
7. Khanewal-Multan Road, N-5 (Chainage: 184+000)

119. Sampling was conducted for 24 hour period. Samples were taken at downwind side and from 5 – 10 metres from the edge of the road. Sampling locations and laboratory reports are provided in Annexure II (a). Results of laboratory analysis of ambient air quality parameters are given in **Table 4.3 (a).**

Table 4.3 (a): Ambient Air Quality Monitoring

Sr.#	Parameter	Average Test Results at Sampling Locations							Unit	Duration (hours)	USEPA Standards
		Location 1	Location 2	Location 3	Location 4	Location 5	Location 6	Location 7			
1.	CO	1.20	0.33	0.70	0.40	0.58	0.33	1.04	ppm	24	35 (one hour average)
2.	NO_2	0.02	<0.01	0.02	<0.01	0.01	<0.01	0.02	ppm	24	0.053 (annual arithmetic mean
3.	SO_2	0.02	<0.01	0.01	<0.01	0.01	<0.01	0.01	ppm	24	0.14
4.	PM_{10}	**266.30**	142.66	**228.50**	111.52	135.24	142.66	287.80	$\mu g/m^3$	24	**150**
Location 1: Faisalabad – Sargodha Road						**Location 2:**Painsara – Bhawana Road					
Location 3: Gojra – Jhang Road (near Bhatta stop)						**Location 4:** Toba – Warriam Road					
Location 5: Shorkot City – Shorkot Cantt Road						**Location 6: MozahShahadat Kundala**					
Location 7: Khanewal-Multan Road											
Source: SGS Laboratory Test Results 2007											

120. **Table 4.3 (a)** indicates that the value of PM_{10} exceeds the USEPA Standard on: Faisalabad – Sargodha Road, Gojra – Jhang Road and Mauza Shahadat Kundala. This may be due to the PM_{10} emissions from the vehicular traffic and dispersion of dust (deposited on these roads) due to running of the vehicles.

121. In year 2014 during the updation of the EIA report for establishing baseline ambient air quality conditions, four monitoring sites were selected. The air samples collection locations are as under. The results of air quality monitoring for Section – II as summarized in **Table 4.3 (b)** below.

i. RD 59+200 Chak 305/JB was selected because few community houses and water course was 35 meters away from proposed alignment.
ii. RD 86+700 Chak 396/JB was selected because Govt. Elementary School for girls, was just 21 meters away from RoW.
iii. Thick population lived at RD 119+500 Mouza Rakh Kotla .
iv. RD 120+200 Mouza 7 Ghag few community houses and hand pumps found near RoW

Table 4.3 (b): Ambient Air Quality Monitoring (2014)

S.No	Locations	Parameters	Unit	Method used	Results	Pak NEQS
1	Chak 305 JB (59+200)	PM_{10}	($\mu g/m^3$)	Integrated method	51	150
2	Chak 396 JB Adjacent to GES(86+700)	PM_{10}	($\mu g/m^3$)	Integrated method	48	150
3	At water course in MouzaRakhKotla. (119+500)	PM_{10}	($\mu g/m^3$)	Integrated method	48	150
4	Near end point of Section-II (Mouza 7-Ghag)	PM10	($\mu g/m^3$)	Integrated method	64	150

122. Sampling locations were selected in section-II of M-4 these were collected near from RoW of the proposed motorway i.e. near community houses, schools and agriculture fields. Sampling was conducted once in 24 hour period. Samples were taken at downwind side and from 5 – 10 meters from the edge of the road. During sampling, average temperatures were 35 to 40^0C respectively. Sampling locations and laboratory reports are provided in Annexure II (b).

123. Ambient air quality standards developed in Pakistan is 150µg/m3, therefore for the analyses done in July 2014 were compared with, PAK NEQS standards.

124. **Table 4.3 (b)** indicates that the value of PM_{10} remain within the NEQS standards on all four locations This may be due to the reason that the sites at present are away from any road and construction activity.

In December 2015, the air quality was again monitored for the updation of EIA for Section – III (Shorkot –Khanewal). Ten points were selected as shown in **Figure 4.2** and the results are summarized in **Table 4.3 (c).**

Table 4.3 (c): Ambient Air Quality Monitoring (2015)

Sr. No.	Location	Parameter			
		Date of Sampling (09-12-15 to 12-12-15)			
		Carbon Monoxide (CO)	Sulfur Dioxide (SO_2)	Nitrogen Dioxide (NO_2)	Particulate Matter (PM_{10})
1	Kakki Kahna	0.59 mg/m^3	22.8 µg/m^3	16.2 µg/m^3	42.9 µg/m^3
2	BHU	0.59 µg/m^3	27.1 µg/m^3	17.3 µg/m^3	38.5 µg/m^3
3	Gov.Boys P/S Tarholi	0.61 mg/m^3	29.7 µg/m^3	18.6 µg/m^3	73.6 µg/m^3
4	Jamia Masjeed-29 near Same Naala Pull	0.59mg/m^3	23.4 µg/m^3	17.4 µg/m^3	62.5 µg/m^3
5	Govt Girls Eng Medium school 17D	0.47 mg/m^3	24.0 µg/m^3	16.3 µg/m^3	59.3 µg/m^3
6	Near Mosque-18 GH R.D 129+000	0.49 mg/m^3	21.9 µg/m^3	18.5 µg/m^3	50.7 µg/m^3
7	Govt Model P/S 18 GH	0.58 mg/m^3	20.9 µg/m^3	17.12 µg/m^3	56.6 µg/m^3
8	Masjeed-Jalla Pahor	0.74 mg/m^3	37.6 µg/m^3	21.3 µg/m^3	56.1 µg/m^3
9	Masjid – Kabirwala Interchange 14V	0.75 mg/m^3	42.0 µg/m^3	17.06 µg/m^3	40.5 µg/m^3
10	Aqsa Model School	0.74 mg/m^3	60.9 µg/m^3	20.6 µg/m^3	87.3 µg/m^3
Duration					
NEQSAA-2010		**5 mg/m^3**	**120 µg/m^3**	**80 µg/m^3**	**150.0 µg/m^3**
IFC/WHO Standards		**---**	**125 µg/m^3 (24 hr avg.)**	**40 µg/m^3 (1 year avg.)**	**150.0 µg/m^3 (24 hr avg.)**

Table 4.3 (c) indicates that all the tabulated parameters monitored are within prescribed permissible limits of NEQS and WHO or IFC. The air sampling locations for Section III are shown in **Figure 4.2** below.

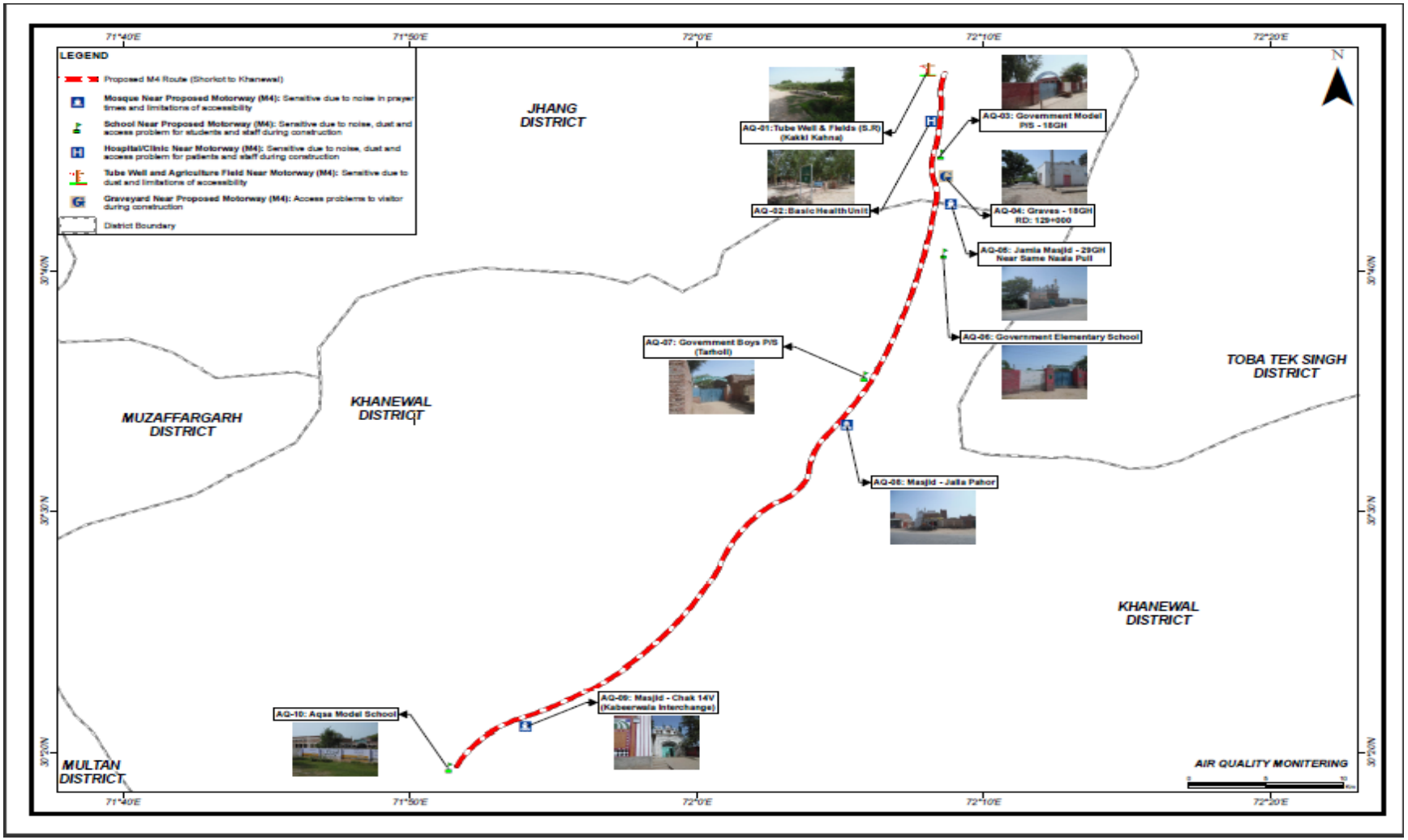


Figure 4.2: Sampling Locations for Ambient Air Quality Monitoring of M4 Section - III (Shorkot – Khanewal)

4.2.3 Noise

125. As the existing status of the Project area is mostly agricultural fields and some road crossings therefore noise is serious issue only at road crossings. The average value of noise along the road crossings close to NEQS and World Bank/IFC EHS guidelines and is expected that in the construction and operation phase this will go beyond limits. Roadside noise levels were measured from the edge of the road (about 7.5 m from the source). Average noise level along the road is between 40 – 67 dB(A), whereas peak noise level is between 61 – 100 dB(A). Table 3.4 and 3.5 presents the maximum, minimum and average noise levels recorded at different locations. Average values for the section are all well within the NEQS i.e. 85 dB(A). The NEQS and WB/IFC EHS guidelines are the same therefore, the national standards (NEQS) will be used for monitoring purposes.

Table 4.4: Noise Levels at Various Locations

								Gojra Jhang Road							
		Faisalabad Sargodha Road			Painsera-Bhawana Road			near Bhatta Stop			Toba-Jhang Road			NEQS	WHO
Sr.		Noise Level dB(A)			Noise Level dB(A)			Noise Level dB(A)			Noise Level dB(A)			dB(A)	dB(A)
No.	Time	Min.	Max.	Average	Min.	Max.	Average	Min.	Max.	Average	Min.	Max.	Average		
1	12:00	76.6	70.3	56.5	67.6	73.3	56.5	76.3	91.4	52.2	66.3	82.5	55.3	85 (7.5 from the source)	70 (for Industrial, commercial, shopping and traffic areas) 55 (for residential areas, schools and hospita
2	13:00	65.5	72.4	58.6	65.5	72.4	58.6	75.8	90.2	49.5	63.2	77.5	51.2		
3	14:00	78.8	92.8	60.8	65.4	77.4	47.8	72.1	88.2	50.0	65.3	79.7	50.2		
4	15:00	79.7	95.4	59.6	60.6	75.5	5.5	78.4	84.4	50.2	61.2	79.5	45.7		
5	16:00	77.6	93.2	58.5	63.3	72.3	53.4	76.2	91.0	50.3	60.1	73.2	44.5		
6	17:00	78.1	96.8	60.1	62.2	71.2	49.3	74.7	91.2	52.2	59.2	71.5	43.2		
7	18:00	70.6	80.4	55.7	65.8	62.1	50.0	76.3	90.5	49.5	59.7	70.5	43.7		
8	19:00	76.3	96.4	61.6	55.9	60.7	51.9	60.2	74.1	43.6	-	-	-		
9	20:00	80.0	98.5	64.7	57.9	63.3	49.1	65.0	79.0	40.0	-	-	-		
10	21:00	79.0	98.0	63.0	58.7	64.2	48.3	70.0	90.0	44.0	-	-	-		

11	22:00	89.0	99.0	59.3	61.6	64.0	47.7	62.1	77.0	48.0	-	-	-		ls)
12	23:00	75.1	100.0	60.2	59.1	60.0	45.5	64.0	78.0	42.6	-	-	-		
13	24:00	77.3	87.1	62.7	55.2	59.0	43.9	70.4	82.0	52.3	-	-	-		
14	01:00	76.5	86.3	61.9	57.9	61.1	48.4	63.3	74.0	47.9	-	-	-		
15	02:00	83.7	85.4	63.0	59.8	62.4	45.2	64.4	84.0	42.1	-	-	-		
16	03:00	80.9	75.6	65.1	58.7	62.5	44.1	60.1	78.0	49.7	-	-	-		
17	04:00	81.8	72.6	67.7	54.0	64.2	45.7	65.0	82.1	50.9	-	-	-		
18	05:00	78.9	70.7	63.9	56.1	65.1	47.8	72.7	90.2	56.3	-	-	-		
19	06:00	79.0	65.5	62.3	63.3	67.0	48.9	72.1	86.6	53.5	-	-	-		
20	07:00	72.1	63.9	59.2	67.7	70.8	53.7	69.8	84.4	52.6	64.1	79.5	53.3		
21	08:00	75.3	77.2	60.4	68.8	69.7	51.1	77.3	92.4	55.1	64.5	80.1	54.2		
22	09:00	77.5	94.1	63.6	66.7	70.9	55.3	76.1	92.4	53.7	62.3	78.9	53.3		
23	10:00	80.7	95.6	65.1	67.6	70.3	56.5	76.3	91.4	52.2	58.3	74.5	50.3		
24	11:00	78.3	90.3	67.9	65.5	72.4	58.6	75.8	90.2	49.5	69.3	82.1	55.1		

Source: *SGS Pakistan (Pvt.) Limited*

Table 4.5: Noise Levels at Various Locations

		Toba-Warriam Road			Mozah Shahadat Kundala			NEQS	WHO
Sr.		Noise Level dB(A)						dB(A)	dB(A)
No.	Time	Min.	Max.	Average	Min.	Max.	Average		
1	12:00	76.6	91.4	64.7	47.8	65.0	52.5	85 (7.5 m from the source)	70 (for Industrial, commercial shopping and traffic areas) 55 (for residential areas, schools and hospitals)
2	13:00	76.3	91.5	59.2	48.1	62.7	55.3		
3	14:00	76.6	90.8	64.7	49.5	60.9	54.2		
4	15:00	76.8	91.0	64.7	47.3	66.3	54.8		
5	16:00	78.3	91.0	66.7	46.7	65.1	53.1		
6	17:00	76.6	91.4	64.3	43.5	62.3	52.7		
7	18:00	75.3	89.2	62.2	42.1	60.3	50.2		
8	19:00	78.3	92.4	63.1	-	-	-		
9	20:00	75.1	89.6	67.4	-	-	-		
10	21:00	71.6	84.8	64.3	-	-	-		
11	22:00	76.1	92.4	61.4	-	-	-		
12	23:00	73.4	85.1	66.0	-	-	-		
13	24:00	73.2	84.4	67.1	-	-	-		
14	01:00	75.8	82.6	64.4	-	-	-		
15	02:00	77.6	90.0	70.2	-	-	-		
16	03:00	76.5	83.4	63.1	-	-	-		
17	04:00	74.0	80.1	60.0	-	-	-		
18	05:00	75.1	84.2	65.5	-	-	-		
19	06:00	73.3	80.1	62.1	-	-	-		
20	07:00	79.9	85.5	64.3	45.1	64.1	57.1		
21	08:00	70.3	83.2	66.7	44.9	63.3	52.4		
22	09:00	71.2	82.5	65.9	47.6	62.2	53.6		
23	10:00	73.7	85.5	67.2	52.7	61.6	54.7		
24	11:00	73.2	86.5	62.4	50.1	70.0	56.9		

126. Noise along the Section II from Gojra to Shorkot of M-4 is not a serious issue as it is a new alignment. Noise levels monitoring were carried out at four different locations where ambient air quality was monitored keeping in view the distance from the community of proposed alignment. The monitored data for noise is presented in Annexure-II (a). Environment Team of EALS NHA will ensure the implementation of EMP in order to mitigate the negative impacts if arise.

Table 4.6 (a): Noise Levels at Various Locations (2014)

(i) Project Location: Adjacent to community in Chalk No. 305/JB (Pre- Construction Phase)

Sr. No.	Location	Noise Level (dBA) Mint.	Noise Level (dBA) Max.	Average Noise Levels (Leq)
1	Left side of RD	35.6	47.1	41.4
2	Extreme Left side of RD	34.9	47.4	41.2
3	Right side of RD	33.3	39.7	36.5
4	Extreme Right side of RD	35.2	42.2	38.7
5	Left side of road	36.4	44.0	40.2
6	Right side of road	34.8	40.2	37.5
NEQS				**Commercial Area Day Time: 65 dB A**

(ii) Project Location: Adjacent to Govt. Elementary School for girls in Chalk No. 396 JB (Pre-Construction Phase)

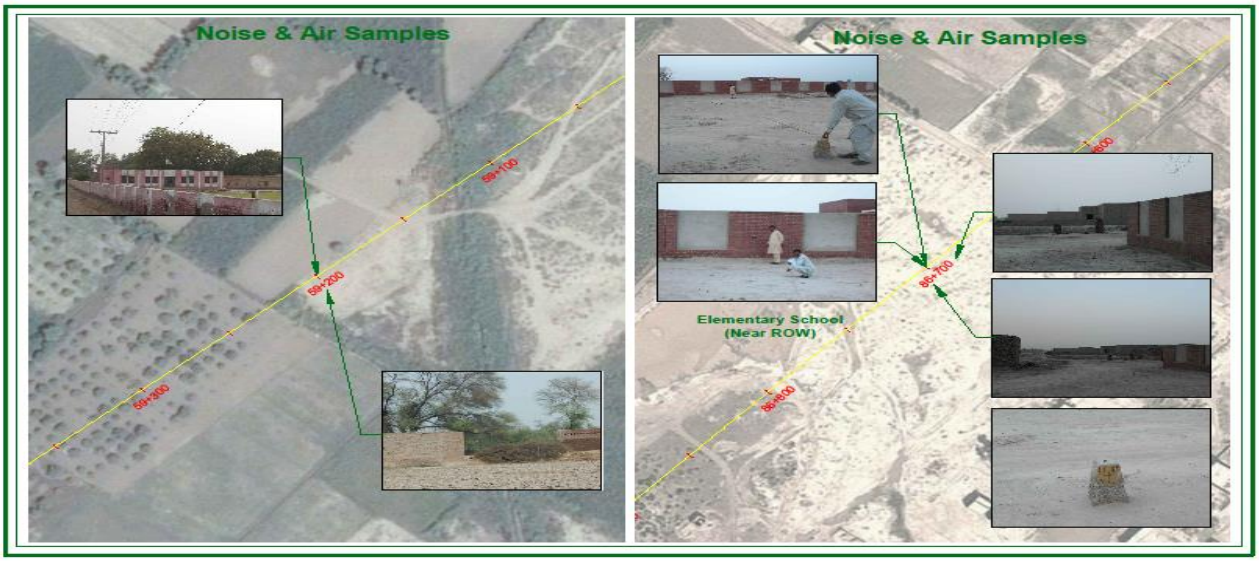
Sr. No	Location	Noise Level (dRA) Min.	Noise Level (dBA) Max	Average Noise Levels (Leq)
1.	Left side of RD	36.1	41.9	39.0
2.	Extreme Left Side RD	39.7	51.6	45.6
3.	Right side of RD	40.2	50.9	45.6
4.	Extreme Right Side RD	39.2	42.6	40.9
5.	Left side of RD	37.8	52.6	45.2
6.	Right side of RD	36.2	46.4	41.3

(iii) Project Location: At water Course in Mouza Rakh Kotla (Pre-Construction Phase)

Sr. No	Location	Noise Level (dBA) Min.	Noise Level (dBA) Max	Average Noise Levels (Leq)
1.	Left side of RD	38.7	51.3	45.0
2.	Extreme Left Side RD	42.2	45.2	43.7
3.	Right side of RD	36.8	44.6	40.7
4.	Extreme Right Side RD	39.3	48.9	44.1
5.	Left side of RD	36.4	50.8	43.6
6.	Right side of RD	38.4	49.3	43.8

(iv) Project Location: Near end point of section –II Mouza 7

Sr. No	Location	Noise Level (dRA) Min.	Noise Level (dBA) Max	Average Noise Levels (Leq)
1.	Left side of RD	41.7	55.3	48.5
2.	Extreme Left Side RD	35.2	58.6	46.9
3.	Right side of RD	38.8	53.2	46.0
4.	Extreme Right Side RD	36.2	48.2	42.2
5.	Left side of RD	38.6	59.8	49.2
6.	Right side of RD	39.7	54.3	47.0



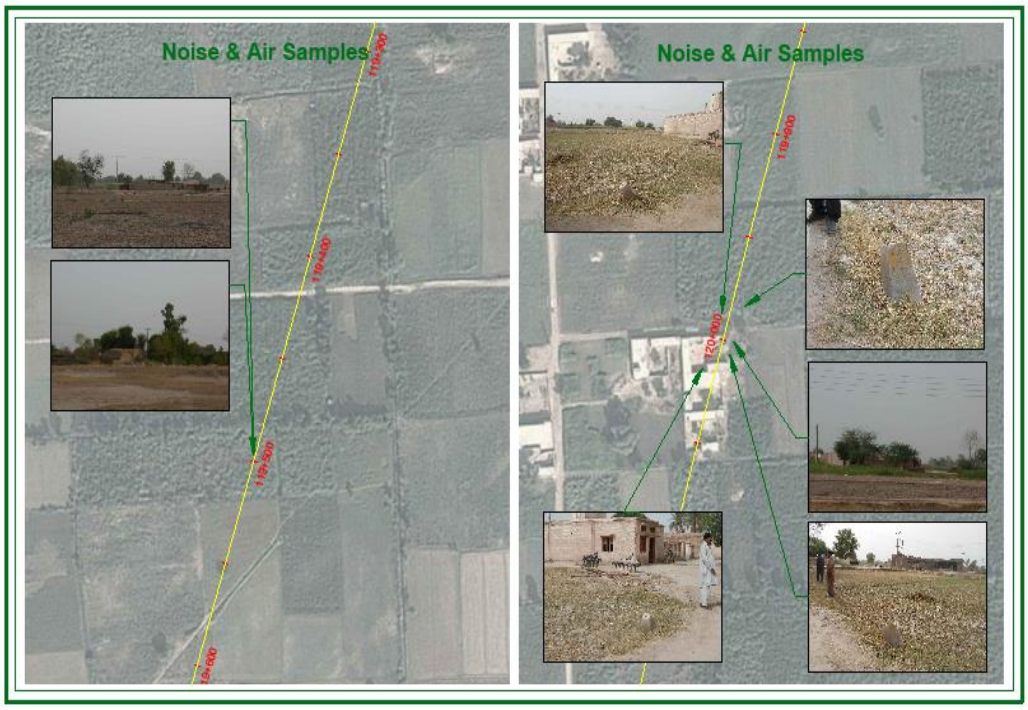


Figure 4.3: Shows the locations of samples collected for Air and Noise (2014)

Table 4.6(b): Noise Levels at Section – III Shorkot –Khanewal (2015)

Sr. No.	Location	Equivalent Noise Level (L_{eq}) dB(A) Average Value of 24 Hour	NEQS Recommended Noise Level (L_{eq}) dB(A)	IFC Guidelines
Date of Noise Monitoring (09-12-15 to 12-12-15)				
1	Kakki Kahna	37.87	55 db (A) for day & 45 db (A) for night for Residential Area 65 db (A) for day & 55 db (A) for night for Commercial Area	55 db (A) da & 45 db (A) for night for Residential Area 70 db for industrial and commercial for both day and night
2	BHU	39.77		
3	Govt. Boys P/S Tarholi	41.04		
4	Jamia Masjeed-29 near Same Naala Pull	46.06		
5	Govt Girls Eng Medium school 17D	42.06		
6	Near Mosque-18 GH R.D 129+000	40.5		
7	Govt Model P/S 18 GH	47.95		
8	Masjeed-JallaPahor	45.52		
9	Masjid –Kabirwala Interchange 14V	55.5		
10	Aqsa Model School	66.89		

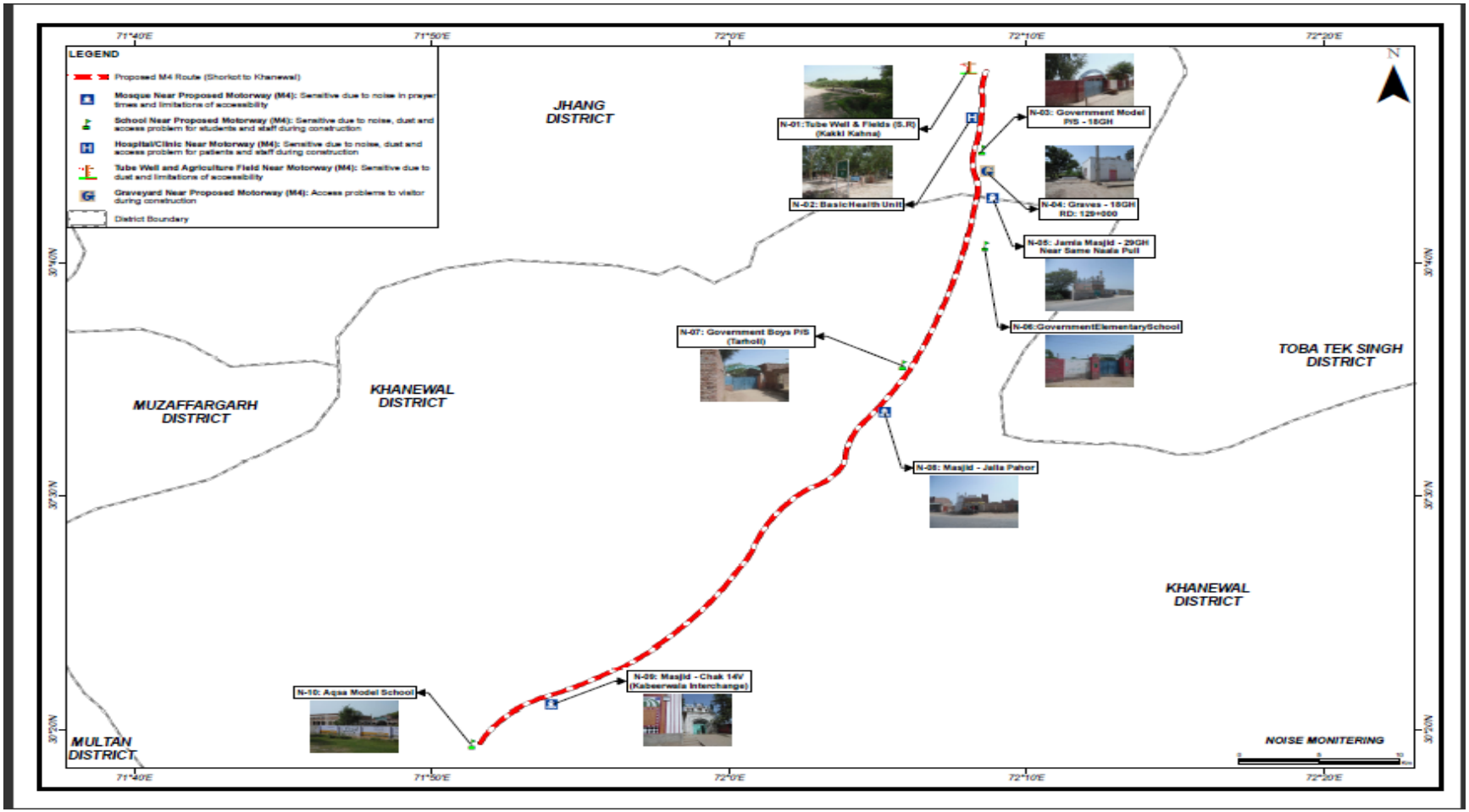


Figure 4.4: Sampling Locations for Noise Monitoring (2015) of M4 Section III (Shorkot – Khanewal)

4.2.4 Surface Water and Groundwater

Surface Water

127. The main sources of water in the Project Area are Ravi River and Chenab River. The canals and water courses system from these two sources is the main irrigation system in the Project Area. The Jhang Branch, Guggera Branch and Burala Branch are the major irrigation system for the Project area. This system irrigates the land of the Project Area in Faisalabad, Jhang and Toba Tek Singh districts, whereas the Project Area in Khanewal district is irrigated through Sadhnai canal and Abdul Hakeem distributary. The Sadhnai canal and Abdul Hakeem Distributary are very important sources of irrigation in Khanewal district. The proposed Motorway will cross Ravi River and Sadhnai Canal at 145+250 Km and 145+900 Km respectively. Two bridges on these locations are also proposed to be constructed.

128. Jhang Branch, Guggera Branch and Burala Branch, Sadhnai Canal system and Abdul Hakeem distributary are the major irrigation source for all four districts. The land is also irrigated by tube wells in the Project Area.

129. Small scale water logging and salinity problems were also observed in the Project Area in Khanewal district, but none of these areas comes in the Motorway alignment. These waterlogged and saline areas are more than one kilometer far from the Motorway alignment.

Table 4.7 – Surface Water Analysis

Sr.No.	Parameters	AmeenPur near Check Post	Tama Bangla Canal (Gojra Jhang Road)	Toba Wariam Road Chak No.400	Bank of Ravi River (near Gas Station)	NEQS Limits
A. Chemical Parameters						
1	pH (mg/L)	8.83	8.93	8.86	7.58	06-09
2	Biochemical Oxygen Demand (BOD_5)	7	9	12.5	29	80
3	Chemical Oxygen Demand (COD)	15	16	20	68	150
4	Total suspended solids (TSS)	20.5	31	45	323	200
5	Total dissolved Solids (TDS)	175.5	175	170	410	3500
6	Chloride (Cl)	10.64	10.64	9.75	60.8	1000
7	Fluoride (F)	ND	0.21	0.28	0.07	10
8	Dissolved Oxygen (DO)	4	4.5	5.6	11.2	-
9	Conductivity	309.5	293	288	595	-
10	Nitrates (NO_3)	4.2	4.3	4.3	0.1	-
11	Nitrites (NO_2)	ND	ND	ND	-	-
12	Sodium	7	7	8	1.0	-
13	Taste	Tasteless	Tasteless	Tasteless	-	-
14	Odor	Odorless	Odorless	Odorless	-	-
15	Total Alkalinity	115	110	125	-	-

16	Color	Colorless	Colorless	Colorless	-	-
17	Turbidity	10	15	28	-	-
18	Hardness	130	140	150	-	-
B. Micro-Biological Parameters						
1	Total Colony Count	TNTC/ ml	TNTC/ ml	780/ ml	-	*
2	Total Coli Forms	TNTC / 100 ml	TNTC / 100 ml	TNTC / 100 ml	-	*
3	Faecal Coliforms (E.Coli)	24/ 100 ml	6/ 100 ml	3/ 100 ml	-	*
4	Faecal Streptococci/Enterococci	Absent/ 100 ml	Absent/ 100 ml	Absent/ 100 ml	-	*

Table 4.8– Surface Water Analysis (2014)

Sr. No.	Parameters	Adjacent to water course in Chak 305/JB RD (59+200)	At water course in Mouza Rakh Kotla RD (119+500)	WHO Limits
1	pH	8.5	8.5	6.5 - 8.5
2	Total dissolved Solids (TDS) (mg/L)	390	89	1000
3	Chloride (Cl) (mg/L)	34	14	250
4	Ca Hardness (mg/L)	62	10	NS
5	Nitrates (NO_3) (mg/L)	11	8	50
6	Sodium (mg/L)	130	30	200
7	Turbidity (NTU)	0	0	5

Sr. No.	Parameters	Adjacent to water course in Chak 305/JB RD (59+200)	At water course in Mouza Rakh Kotla RD (119+500)	WHO Limits
8	Fluoride (F) (mg/L)	0.27	0.17	1.5
9	Nitrites (NO_2) (mg/L)	0.08	0.06	3
10	Chromium (mg/L)	BDL	BDL	0.050
11	Temperature (^oC)	24	24	-
12	Total Hardness $CaCo_3$ (mg/L)	82.58	15.33	500
1	Total Coli Forms Number/100 ml	0	0	0/100ml
2	Faecal Coliforms (E.Coli) Number/100 ml	0	0	0/100ml
3	Chemical Oxygen Demand (COD) (mg/L)	118	132	150
4	Biological Oxygen Demand (BOD) (mg/L)	54	58	80

130. **Table 4.9** presents sources of surface water sample and the water quality testing results. These values will serve as baseline to compare water quality conditions during the construction and the operation stages of the proposed project.

Table 4.9: Surface Water Analysis (2015) of Section III (Shorkot – Khanewal)

Sr.No.	Parameters	Unit	Locations of Sampling Date of Sampling 11-12-15			NEQS	WHO Standards
			Gagh Branch Canal R.D 120+600	Ravi River	Sidhnai Canal		
1	Temperature	^{O}C	24*	23*	24*	=<3	-
2	Color	TCU	3	2	1	≤15	-
3	pH	------	7.9	7.6	7.5	6.5-8.5	6.5 – 8.5
4	BOD	mg/l	86.4	69.3	95	80	80
5	COD	mg/l	121	97	133	150	150
6	Total Dissolved Solids	mg/l	247	243	259	3500	1000
7	Total Suspended Solids (TSS)	mg/l	98	141	157	200	-
8	Oil & Grease	mg/l	1.8	1.93	2.15	10	-
9	Total Fecal Coliform	------	N.D	N.D	N.D	0/100ml	0/100ml
10	Phenolic Compounds	mg/l	N.D	N.D	N.D	0.1	-
11	Chloride (Cl)	mg/l	121	108	117	1000	-
12	Fluoride (F)	mg/l	0.8	0.19	2.1	10	1.5
13	Cyanide	mg/l	N.D	N.D	N.D	1.0	-
14	An-ionic reagents	mg/l	N.D	N.D	N.D	20	-
15	Sulphates	mg/l	102	132	113	600	-
16	Sulphides	mg/l	0.2	0.25	0.17	1.0	-

Sr.No.	Parameters	Unit	Locations of Sampling Date of Sampling 11-12-15			NEQS	WHO Standards
			Gagh Branch Canal R.D 120+600	Ravi River	Sidhnai Canal		
17	Ammonia	mg/l	11.1	12.8	9.3	40	-
18	Calcium	mg/l	2.15	2.63	1.53	------	NS
19	Cadmium	mg/l	0.092	0.073	0.106	0.1	-
20	Chromium	mg/l	0.002	0.023	0.007	1.0	0.05
21	Copper	mg/l	0.27	0.40	1.00	1.0	-
22	Lead	mg/l	0.02	0.05	0.03	0.5	-
23	Mercury	mg/l	N.D	N.D	N.D	0.01	-
24	Selenium	mg/l	N.D	N.D	N.D	0.05	-
25	Nickel	mg/l	0.03	0.02	0.04	1.0	-
26	Silver	mg/l	N.D	0.07	N.D	1.0	-
27	Zinc	mg/l	2.14	2.73	2.81	5.0	-
28	Arsenic	mg/l	0.010	0.025	0.005	1.0	-
29	Barium	mg/l	0.19	0.73	0.28	1.5	-
30	Iron	mg/l	0.16	0.21	0.19	8.0	-
31	Manganese	mg/l	0.70	0.62	0.15	1.5	-
32	Boron	mg/l	0.52	0.23	0.80	6.0	-
33	Chlorine Total	mg/l	0.37	0.29	0.33	1.0	-

131. The surface water monitoring results shows that all the parameters are well within the permissible limits of NEQS except for the BOD which is slightly high (86.4 in Gagh branch canal and 95 in Sidhnai canal). The reason for high BOD level in these surface water bodies is due to contamination of wastewater from nearby sewer lines or direct disposal of waste water into these water bodies. The surface and ground water sampling points are shown in **Figure 4.3** below. As can be seen the NEQS are more detailed and in mostly more stringent in comparison with the WHO standards, therefore for monitoring purposes the NEQS will be used.

Ground Water

132. Ground and surface water samples from the Project Area were collected and analysed in laboratory. According to the ground water results, most of the water in the area does not meet drinking water quality as prescribed in WHO standards. The concentration of Total Dissolved Solids (TDS), Chloride (Cl) and Sodium (Na) quite high and in Ameenpur, Faecal Coliform (E.Coli) was also found in ground water. The surface water in the Project Area is good for agricultural and all the parameters are within the limits prescribed in NEQS. The people of the Project Area use ground and surface water for their drinking and other needs of life. The surface and ground water present in the area will be used for construction works, however for drinking needs, filtered water will be provided to workers at those locations, where water is not suitable for drinking. The results of ground and surface water analysis are presented in **Tables 4.7 & 4.8** respectively. Following are the surface water channels in the Project Area:

1. Jhang Branch Canal (32+600);
2. Dhaular Distributary m (44+600)
3. Nawabwala Distributary (48+500);
4. Titranwala Distributary (54+250);
5. Bhango Distributary (73+500);
6. Khewra Distributary (82+200);
7. Trimo Link Canal (111+000);
8. Haweli Canal (112+200);
9. Darkhana Distributary (131+350);
10. Goraga Distributary (144+900); and
11. Ravi River (145+250).

133. The depth of water table varies from 100–150ft in the proposed Motorway route. In order to evaluate the water quality for Section III, the groundwater and surface water monitoring was carried out between December 9 -12, 2015. The water samples were analyzed for chemical and microbiological parameters. The analysis results of groundwater samples are compared with NEQS. **Table 4.10** shows the groundwater analysis.

Table 4.10: Ground Water Analysis

Sr.No.	Parameters	Faisalabad Sargodha Road	Painsera Bhawana Road	Gojra Jhang Road	Toba Wariam Road	Cantt Road Shorkot	Bank of Ravi River	Khanewal Multan Road	WHO Limits
A. Chemical Parameters									
1	pH (mg/L)	7.95	7.73	8.51	8.42	7.88	7.69	8.13	6.5 - 8.5
2	Total dissilved Solids (TDS) (mg/L)	2023	369	3915	34.98	1495	243	947	1000
3	Chloride (Cl) (mg/L)	524.7	10.86	825.9	740.91	489.2	37.4	159.1	250
4	Hardness (mg/L)	330	300	137.5	90	465	155.5	366.7	NS
5	Nitrates (NO_3) (mg/L)	6.7	5.5	14	11	5.7	-	-	50
6	Sodium (mg/L)	541	16	1040	1090	286	-	-	200
7	Turbidity (NTU)	ND	ND	ND	ND	ND	4	22	5
8	Fluoride (F) (mg/L)	0.91	0.31	1.04	0.54	0.6	-	-	1.5
9	Nitrites (NO_2) (mg/L)	ND	ND	ND	ND	ND	-	-	3
10	Arsenic (As) (mg/L)	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	0.01
B. Micro-Biological Parameters									
1	Total Colony Count	TNTC/ ml	3510/ ml	TNTC/ ml	TNTC/ ml	1812/ ml	-	-	*
2	Total Coli Forms	01/100 ml	Absent/100 ml	Absent/100 ml	TNTC/ 100 ml	53/100 ml	-	-	*
3	Faecal Coliforms	Absent/100 ml	Absent/100	Absent/100	Absent/100	Absent / 100	-	-	*

Sr.No.	Parameters	Faisalabad Sargodha Road	Painsera Bhawana Road	Gojra Jhang Road	Toba Wariam Road	Cantt Road Shorkot	Bank of Ravi River	Khanewal Multan Road	WHO Limits
	(E.Coli)		ml	ml	ml	ml			
4	Faecal Streptococci/Enterococci	Absent/100 ml	Absent/100 ml	Absent/100 ml	Absent/100 ml	Absent / 100 ml	-	-	*

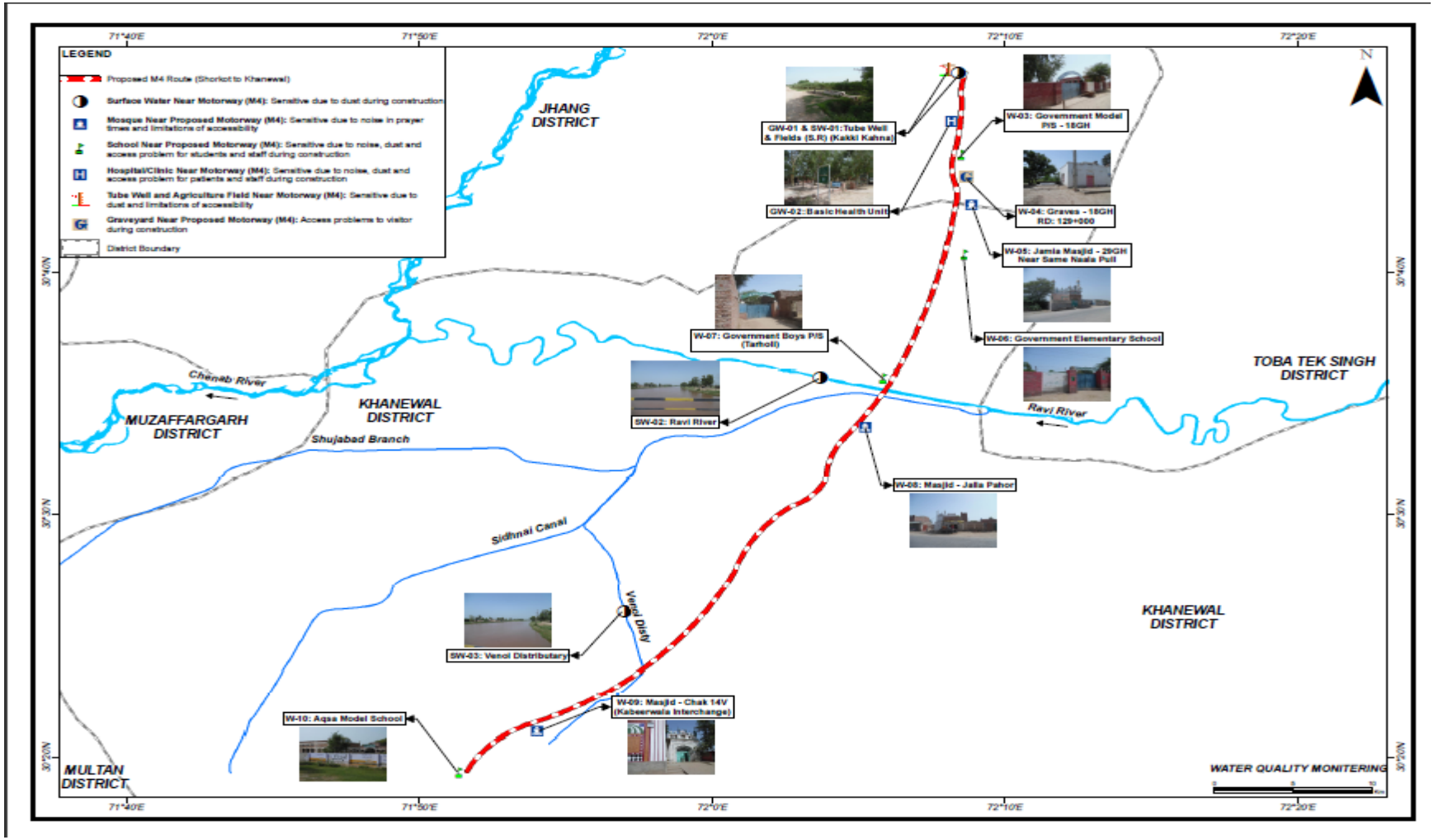


Figure 4.5: Sampling Locations for Surface and Ground Water Quality Monitoring of M4 Section III (Shorkot – Khanewal)

134. In June 2014 samples for the groundwater were collected from Chak 396 JB adjacent to Government Elementary School (86+700) and near end point of Section-II (Mouza 7-Ghag) at RD 120+200 community use hand pumps and tube wells as a source for drinking water and other domestic use in these areas. For the surface water, samples were collected from RD 59+200 Chak 305/JB and RD 119+500 in Mouza Rakh Kotla, the water channels at these locations are being presently used by the community for the irrigation purposes. Sample collection locations are shown in **Figure 4.5.**

135. **Table 4.11** shows the quality of surface water and **Table 4.12** shows the quality of ground water is being used for domestic purpose whereas surface water is used for agriculture requirements.

The main sources of drinking water in the Project area are wells whereas hand pumps are also used at some locations for domestic purpose.

Table 4.11 – Ground Water Analysis (2014)

Sr.No.	Parameters	Adjacent to Govt. Elementary School for girls in Chak No.396 RD (86+700)	Near end point of Section-II (Mouza 7-Ghag) RD (120+200)	WHO Limits
1	pH	9.91	8.25	6.5 - 8.5
2	Total dissolved Solids (TDS) (mg/L)	1201	89	1000
3	Chloride (Cl) (mg/L)	68	14	250
4	Hardness (mg/L)	279.2	10	NS
5	Nitrates (NO_3) (mg/L)	11	8	50
6	Sodium (mg/L)	130	30	200
7	Turbidity (NTU)	0	0	5
8	Fluoride (F) (mg/L)	0.27	0.17	1.5
9	Nitrites (NO_2) (mg/L)	0.08	0.06	3
10	Chromium (mg/L)	BDL	BDL	0.050
11	Temperature (^oC)	26	24	-
1	Total Coli Forms Number/100 ml	0	0	0/100ml
2	Faecal Coliforms (E.Coli) Number/100 ml	0	0	0/100ml

Table 4.12 – Groundwater Analysis of M4 Section III (Shorkot – Khanewal) – 2015

Sr. No	Parameters	Unit	Test Results (Drinking Water)											
			KakkiKahna (Hand pump)	BNU (Hand pump)	Govt. Model School P/S 18 GH (Hand pump)	Near Mosque - 18 GH R.D. 129+000 (Hand pump)	Jamia Masjid-29 GH Hand pump)	Govt. Girls English Medium School 17D (Hand pump)	Govt. Boys P/S Tarholi (Hand pump)	Masjid-JallaPahor (Hand pump)	Masjid-Kabirwala Interchange Chak 14V	Near Aqsa Model School (Hand pump)	NEQS	WHO
1	**Total Coliform Bacteria**	-----	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	0/100ml	0
2	**Color**	TCU	1	2	1	2	1	1	2	1	1	1	Non objectionable/acceptable	15 cu
3	**pH**	-----	7.3	7.7	7.9	7.6	7.4	8.1	7.7	7.5	7.8	7.2	6.5-8.5	6.5-8.5
4	**Taste**	-----	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Non objectionable/acceptable	-
5	**E.coli**	-----	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	0/100ml	0
6	**Turbidity**	NTU	2	1	2	1	2	1	1	2	1	2	5	5 NTU
7	**Total Hardness**	mg/l	63	52	37	49	68	69	73	83	51	42	<500	-

8	**Odour**	-----	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Non objectionable/acceptable	-
9	**Aluminium**	mg/l	0.04	0.03	0.07	0.07	0.05	0.03	N.D	0.05	0.07	0.09	≤0.2	0.2
10	**Phenolic Compounds as Phenols**	mg/l	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	-------	
11	**Chlorides**	mg/L	123	125	91	87	133	97	57	99	127	133	250	250
12	**Flourides**	mg/l	0.8	0.5	0.07	0.09	0.071	0.02	0.031	0.017	0.091	0.09	<1.5	1.5
13	**Cyanides**	mg/l	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	0.05	0.07
14	**Residual Chlorine**	mg/l	0.003	0.002	N.D	0.012	0.005	0.31	0.39	0.41	0.31	0.27	0.2-0.5	-
15	**Pesticides**	-----	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	-------	
16	**Nitrite**	mg/l	0.91	0.73	0.82	0.61	0.13	0.97	0.76	0.62	0.57	0.29	3	-
17	**Total Dissolved Solid**	mg/l	548	749	234	384	745	779	522	435	819	716	<1000	1000
18	**Fecal Coliform**	-----	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	-------	0
19	**Cadmium**	mg/l	N.D	N.D	0.007	N.D	N.D	0.002	N.D	N.D	0.003	N.D	0.01	0.003
20	**Chromium**	mg/l	N.D	N.D	N.D	0.019	N.D	0.002	0.02	N.D	N.D	N.D	0.05	0.05
21	**Copper**	mg/l	0.3	0.4	0.7	0.2	0.1	0.9	1.3	0.7	0.5	0.2	2	1-2

22	**Lead**	mg/l	0.02	0.031	0.21	N.D	N.D	N.D	N.D	0.002	0.031	0.039	0.05	0.01
23	**Mercury**	mg/l	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	0.001	0.001
24	**Selenium**	mg/l	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	0.01	0.01
25	**Nickel**	mg/l	0.007	0.013	0.018	0.009	0.006	0.017	0.013	0.018	0.011	N.D	≤0.02	0.02
26	**Antimony**	mg/l	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	≤0.005	0.005
27	**Zinc**	mg/l	0.31	0.13	0.17	0.025	0.072	1.23	1.09	1.7	N.D	N.D	5.0	3.0
28	**Arsenic**	mg/l	0.005	0.025	N.D	0.005	0.050	0.025	0.005	0.025	N.D	0.005	<0.05	0.01
29	**Barium**	mg/l	0.16	0.031	N.D	0.23	0.099	1.25	1.31	1.49	0.019	0.13	0.7	0.7
30	**Nitrate**	mg/l	5	N.D	10	N.D	10	N.D	N.D	N.D	N.D	N.D	<50	-
31	**Manganese**	mg/l	0.071	0.013	0.081	0.16	0.17	0.05	0.07	N.D	N.D	N.D	0.5	0.1 - 0.5

136. **Table 4.4** reveals that all the analyzed parameters are within the prescribed limits of NEQS & WHO guidelines and ground water is safe for drinking and other domestic purposes. **Figure 4.6** sampling locations for water quality monitoring.

4.2.5 Topography and Geology

137. Topography of the Project Area is totally flat with mild slope from North to South. Project Area is 500 meter above the mean sea level. The soil of all four districts is fertile. The soil in the Project Area is rich alluvial loam. In Jhang district soil is part of Sandal Bar except rock that is not in Project Area. The sand is abundant in Ravi and Chenab river bed and this sand is superior for building material.

4.2.6 Seismicity

138. According to the seismic zoning map of Pakistan, the Project Area lies in Zone 1 of Modified Mercalli (M.M.) intensity scale, i.e. minor damage. Distant earthquakes may cause damage to structures with fundamental period greater than 1.0 second, corresponds to intensity V and VI of the M.M.

4.2.7 Agriculture and Crop Pattern

139. Agriculture along M-4 is predominantly irrigated agriculture. The Project Area depends on perennial canals from Sagir Head Works and Abdul Hakeem Head Works. The shortage of water is generally experienced in winter and in sowing season it greatly hampers Kharif cultivation.

140. The Project Area of M-4 Motorway passes through four districts. Cropping patterns in these districts are different from each other. In Faisalabad Sugarcane and Fodder is Kharif crop. In Toba Tek Singh Sugarcane, Maize, and Rice are Kharif crops. In Khanewal district Kharif season crops are Cotton, Rice and Sugarcane. Wheat is predominantly Rabi season crop of all areas. **Table 4.13** represents the major crops and respective Tehsils of the Project Area. Cotton is also grown in some areas of Khanewal and Toba Tek Singh. Vegetables are grown in some areas of Faisalabad and Toba Tek Singh. Citrus orchards are found in district Toba Tek Singh and mango orchards are found in district Khanewal.

Table 4.13: **Major Crops/ Cropping Pattern in the Project Areas**

S. No.	Tehsil	Cropping Pattern	
		Rabbi	**Kharif**
1	Faisalabad	Wheat, Fodder	Sugarcane, Fodder, Rice, Potato
2	Gojra(District Toba Tek Singh)	Wheat, Vegetables	Sugarcane, Cotton, Fodder, Potato
3	Toba Tek Singh	Wheat, Fodder	Sugarcane, Cotton, Fodder
3	Shorkot	Wheat, Fodder	Rice, Sugarcane, Cotton
4	Kabirwala (District Khanewal)	Wheat, Gram	Rice, Cotton, Fodder, Vegetable
5	Khanewal	Wheat, Gram	Cotton, Rice, Sugarcane, Maize

Courtesy: *Agriculture Extension Departments (Faisalabad, Toba Tek Singh, Jhang and Khanewal)*

4.2.8 Industrial and Commercial Activities

141. The route of M-4 has been designed through agriculture fields therefore chances of commercial units along the route are negligible. Faisalabad the starting point of M-4 is famous all over the world for its textile industries but no textile unit is presently situated along the route. In districts of Toba Tek Singh and Jhang, very little commercial units i.e. only a few sugar mills and spinning units but none of them is along the RoW of the

proposed Project. In Khanewal district Roshe Power Plant, a hatchery and pesticide factory in the vicinity of the route where the route crosses Kabirwala-Khanewal road.

4.3 Biodiversity and Natural Resources

142 An initial reconnaissance of the project area was carried out from 7 - 11 of December, 2015. There is no protected area located within or in the vicinity of the project area.

4.3.1 Flora

143. The project area is part of the Indus basin. As the climate of the tract is arid, subtropical, the original flora of the area consists of tropical thorn forest type vegetation, in which thorny usually hard wooded species predominate, acacia species being particularly characteristic. The trees have usually short holes and low branching crowns, which rarely meet except on exceptionally favorable spots. The usual height of trees is 6-9 meter. However the natural vegetation has long ago been replaced completely by agricultural crops and exotic tree species. At present, there is generally a mixture of species found in the tract. The area has been used for agricultural purposes for almost a century; the natural flora has been completely replaced by cultivated species.

144. The number of anthropogenic activities in the area is very high. About 90% of the area is under cultivation, leaving little room for natural flora

Trees

145. Citrus and guava orchards are common towards the north eastern side, replaced by mango orchards towards south western end. Tree plantation campaigns have motivated the farmers to grow trees along the field borders or along the water channels. A total of 91,661 trees were estimated to be growing in the project area. Out of these trees, 61,842 trees are fruit trees, consisting of part of Citrus, Mangoes and Guava Orchards. Non fruit or Forest trees are 29,819 in number, consisting of two main species, Shisham (Dalbergiasissoo) and Kikar (Acacia nilotica). Other species growing in the area are Eucalypts (Eucalyptus camaldulensis), Semal (Bombaxceiba), Bakain / Dharek (MeliaAzedarac), Jaman (Syzigiumcumini), Sukh chain (Pongamiaglabra), Mulberry (Morusalba), Beri (Ziziphusmauritiana) and Khajoor (Phoenix dactylifera). Roadside plantations running parallel or across the project area include Shisham, Kikar, Farash (Tamarixaphylla) and Eucalyptus. Bohr (Ficusbengalensis), Neem (Azadiractaindica), Ber and Bakain are commonly planted at the farm houses.

Natural Vegetation

146. Natural vegetation including Karir (Capparisaphylla), Aak (Calotropisprocera), Kana (Saccharumbengalensis), Khabbal (Cynodondactylon), Lamb (Aristidadepressa), Gorkha (Lasiurussindicus) is present only in the graveyards or at open areas along the existing roads and canals. Mesquit (Prosopisglandulosa) has invaded many open areas. Koondar (Typhaangustata) grows along water ponds and wet places.

Plate 4.1: A View of Floral Species present in the Project Area

147. **Table 4.14** shows common trees in project area.

Table 4.14: Common in Project Area

Sr. No.	Name of Tree	Scientific Name
1	Kikar	Acacia nilotica
2	Shisham	Dalbergiasissoo
3	Ber	Zyzyphusjujuba
4	Sufaida	Eucalyptus camaldulensis
5	Toot	Morusalba
6	Neem	Azadirachtaindica
7	Sirris	Albizzialebbek
8	Jand	Prosopisjuliflora
9	Sohanjna	Moringapterygosperma
10	Lahura	Tecoma undulate
11	Bakain	Meliaazadarach

a) Shrubs and Herbs

148. Shrubs and herbs which are commonly found in the study area are Jawan (Alhajimaurorum), Bhakra (Tribulusterrestis), AK (Calatropisprocera) Lana (Suedafruticosa), Phogs (Calligonumpolygonides) Jantar (Sesbaniaaculeata) and Tumba (Citrulluscolocyntbus). Juntar, Tumba and Bathu are found mostly grown in left over agricultural fields, while Arind is present mostly along the water channels. The remaining shrubs and herbs grow in open places.

b) Grasses

149. The most common grass of the tract is Khabbal (Cynodondactylon). It is a useful fodder grass. Other grasses found along the water courses or in moist places.

150. Grasses noticed and reported in the project area are given in **Table-4.15.**

Table 4.15: Grasses in Project Area

Sr.No.	Common Name	Scientific Name
1	Khabbal	Cynodondactylon
2	Khawi	Cymbopoganjawarnica
4	Kana	Saccharummunja
5	Dib	Typhaangustatum
6	Sinn	Elionorushirsutus
8	Gam	Panicumantidotale

c) Aquatic Flora

151. The aquatic flora in the Project Area consists of species usually found in the standing water along the canals and fish ponds including *Typhaangustata, Polygonumflaccidum, Vallisneriaspiralis, Potamogetongraminea, P. crispus, Hydrillaverticillata, Monochoriavaginalis.* No rare or endangered species occur in the Project Area.

d) Endangered Flora

152. Original flora of the tract consists of trees like Jand (Prosopisspicigera), Wan or Peelu (Salvadoraoleoides) and Karir (Capparisaphylla). The original vegetation was cleared for raising crops at the advent of irrigation system through canals. These trees now exist only in graveyards or barren places and as their further propogation is discouraged.

4.3 Fauna

153. The tract is rich in natural fauna and especially the avi-fauna is well diversified and colorful. Fauna and flora are an essential part of the environments and depend on each other in many ways and as the flora is not only plentiful, but also enriched with lush green crops. The fauna of the area comprises mammals, reptiles and birds etc.

154. The details are given as under:

a) Mammals

155. Naturally occurring mammals have also been eradicated with the removal of natural Tropical Thorn Forests only the agriculture associated species remain.Important mammals which are still in abundance

156. Important Mammals which are reported in the project area are enlisted in **Table 4.16**

Table 4.16: Mammals in Project Area

Sr. No.	Common Name	Scientific Name
1	Jackal	Canisaureus
2	Porcupine	Hystrixindica
3	Squirrel	Funambuluspennanti
4	Mouse	Musmusculus

Sr. No.	Common Name	Scientific Name
5	Mongoose	Herpestesauropunctatus
6	Hare	Lepusnigricollis
7	Fox	Vulpusvulpus
8	Indian Hare	Lepusnigricollis

157. Domestic livestock include buffalo, cattle, goats and sheep. Donkeys are kept to pull carts in the area. Some farmers are also engaged in horse breeding. Camel may be found occasionally. Livestock are mainly farm fed. Goats and sheep herds may be raised by feeding on wastelands

b) Reptiles

158. Reptiles reported in the project area and its vicinity are given in **Table 4.17**.

Table 4.17: Reptiles in Project Area

Sr.No.	Common Name	Scientific Name
1	Cobra	Najanaja
2	Indian Krait	Bungaruscaerueus
3	Spiny Tailed Lizard	Uromastixhardwickii
4	Fringed Toed Lizard	Acanthodactylus cantoris
5	Brown Turtle	Kachugasmithii

c) Amphibians

159. Amphibians found in the project area are given in **Table 4.18.**

Table 4.18: Amphibians in Project Area

Sr.No.	Common Name	Scientific Name
1	Frog	Ranatigrina
2	Common Toad	Bufobufo

d) Birds

160. Avifauna of the tract consists of small and medium sized birds of different colors, flying from one tree to the other or from crop to crop. Most common birds are House Sparrow, House Crow and Mynah.

161. Birds like Cuckoo, Bulbul, Hoopoe, Parrots, Blue Birds, Little Egrets etc were frequently sighted.**Table 4.19** shows list of birds listed noticed or reported in the project area.

Table 4.19: Birds in Project Area

Sr.No.	Common Name	Scientific Name
1	House Sparrow	Passer domesticus
2	House Crow	Corvussplendons
3	Mynah	Acridotherisginginianus
4	Parrot	Psittaculakrameri

Sr.No.	Common Name	Scientific Name
5	Pigeon	Columba livia
6	Koel	Eudynamysscolopacea
7	Red Vented Bulbul	Pycnontuscafer
8	Common Teal	Anascrecca
9	Owl	Bubo bubo
10	Mallard	Anus plantyrhynchos
11	Hoopoe	Upupaepops
12	Indian Robin	Coraceusbengalensis
13	Grey Partridges	Francolinuspondicerianus
14	Black Partridges	Francolinusfrancolinus
15	Falcon	Falco perginus
16	Shikra	Accipeterbadius
17	Tillor	Houbara bustard
18	Eagle	Aquillarapax
19	JalKookri	Fulicaatra
20	Indian Roller or Blue Jay	Coraceasbengalensis
21	Indian Robin	Saxicoloidesfulicata

e) Endangered Fauna

Mammals

162. Some mammalian species which were once common in the tract have been reduced on account of excessive shooting, hunting and loss of habitat to such an extent that these are now extinct or near extinction. These include Blue bull, Wolf, Wild boar, Hog dear and Chinkara.

Birds

163. Birds like Tillor, (Houbara bustard), Marbled Teal, (MarmaronettaAngustirostris) Black partridge, (Francolinusfrancolinues), JalKookri (FulicaAtra) and Falcon (Falco peregrinus). These birds have been subjected to excessive hunting and catching, on account of their good quality and tasty meat or their commercial value as a prey bird.

4.3.1 Wildlife Sanctuaries and Game Reserves

164. No wildlife sanctuary or Game Reserve is located in the project area or in the vicinity of the study area. The nearest Protected Areas in the vicinity of the Project Area are Shorkot and Khanewal Irrigated Forest Plantations both located eight and ten kilometers from the alignment of the Project Area. Shisham and Eucalyptus are grown as commercial crops. Both the plantations have been declared as Wildlife Sanctuaries. Black and Grey partridges, song birds, birds of prey, Wild boar, Jackal, Wild cat, Desert hare, Mongoose and Porcupine commonly occur. While different species snakes such as Cobra, Viper, Krait and Coluberids are also present in the project area. Hunting is not allowed in the Wildlife Sanctuaries but poaching is common.

Fishing in the Project/Study Area

165. Fishing is common in the tract. The river Ravi, which flows almost in the centre of this section of M4, Carps found in River Ravi and major canals, are Indian carps, such as Rahu (LabeoRohita), Thela, (Cattacatta), Singhari (Aorichthysaor), and Khaga (Rita rita) are the other main varieties.

166. Out of these varieties, Rahu and Singhari are the most delicious, but their catches are being reduced every year on account of lesser quantities of water and pollution.

Fish farms also exist in the study area and are doing a profitable business. Fish seed (Poong) is introduced in these ponds. Varieties usually introduced in these fish farms are Gulfam (Cyprimiscarpio), Silver Carp (Hypophthalmichthysmolitrix), Rahu (LabeoRohita), Thela (Cattacatta) and Grass Carp (CtenopharngdonIdella).

Migratory Birds

167. Migratory Birds from Siberia visit the plains of Punjab and Sindh during winter. Majority of these birds land on major wetlands and pond areas of various headwork including Sidhnai Headwork on River Ravi and TrimmuHeadwork on Chenab River. However, some of these birds visit the study area/project area, along the banks of River Ravi These birds include Pelicans, Herons, Storks, Flamingos, Ducks and Terns.

4.4 Socio-economic Environment

168. Motorway passes from rural areas of the Districts of Punjab namely; Faisalabad, Toba Tek Singh, Jhang & Khanewal and socio cultural conditions of all districts are almost same. Most of the people living in the surrounding villages are farmers, Punjabi is their mother tongue. In some areas Saraiki is also spoken as mother tongue. In almost all areas dress patron is same, Shalwarkameez and dothikurta are the common dresses of males and females. Some modern young males also wear pants and shirts. The history of colonization exercised a profound influence on socio-economic pattern of the areas. People belong to different races but due to frequent inter-marriages, these castes have intermingled and it is now difficult to distinguish their entity and thus tribal system is no more dominated in the culture. In fact a common culture has emerged. Most of the people are engaged in agriculture or agro based businesses. Almost all the land holders have landholding size around 10 Acres therefore they belong to lower middle class. The information given in this section is collected in the socioeconomic survey conducted between January 2007 and February 2007. For the updation of the EIA report for section-II of M-4 new survey was conducted in June and October 2014 the gathered information shows the same scenario as it was in 2007.

Likewise, for the updation of EIA report for section-III of M-4 a socio-economic survey was conducted in August & December 2015 along the villages falling in the corridor of section-III in order to gather information about the general characteristics of nearby communities, their socio-economic status, cultural traditions, social issues and religious affiliations. During the survey it was observed that a new settlement namely 15-V has been included in the ROW due to the provision of interchange for section-III.

4.4.1 Demographic Profile based on 2007

(a) Faisalabad Tehsil

169. Total population of Faisalabad Sadar Tehsil was 924,110 with a growth rate of 1.94% as recorded in 1998 Census. Population composition was 108 females as compared to 100 males. 97% of the population resided in rural areas and just 3% lived in rural areas. Average household size was 7.4.

(b) Gojra

170. This Tehsil had a population of 495,096 with a growth rate of 1.94%, as recorded in 1998 Census. Population composition was 105 females compared to 100 males. 24% population resided in urban areas and 76% lived in rural areas. Average household size was 7.2.

(c) Toba Tek Singh

171. Total population of the Tehsil was 617,035 with a growth rate of 2.07% as recorded in 1998 Census. Population composition was 107 females compared to 100 males. 90% of population resided in rural areas and just 10% lived in urban areas. Average household size was 5.6.

(d) Shorkot

172. Tehsil had a population of 670,255 with a growth rate of 2.23% as recorded in 1998 Census. Male to female ratio was 108:100. Eighty five (85) % of population resided in rural areas and 15% lived in urban areas. Average household size was 6.9.

(e) Kabirwala

173. Total population of the Tehsil was 659,612 with a growth rate of 2.19% as recorded in 1998 Census. Population composition was 107 females compared to 100 males. 15% population resided in urban areas and 85% lived in rural areas. Average household size was 7.3.

4.4.2 Settlement Patterns

174. M-4 starts from Faisalabad district and ends in Khanewal district. It passes from tehsil areas of Faisalabad, Gojra, Toba Tek Singh, Shorkot, Kabirwala and Khanewal. In tehsils of Faisalabad, Gojra and Toba Tek Singh, people live in villages and a few people live in their farm houses (Bhanis, Deras), therefore very few house and civic structures is coming in the Row. On the other hand in tehsils of Shorkot, Kabirwala and Khanewal, there is no formal pattern of villages establishing and people make their homes in their agriculture lands which is colloquially called Dera or Bhani, in this portion of road many houses and residences are coming in the RoW.

4.4.3 Races and Tribes

175. The population of these all districts is derived from Semitic or from indo-Aryan races. Most of these tribes are predecessors of different tribes who came with different attackers from Afghanistan and Central Asia and remained here. In colonial age British government developed canal command systems in these districts and did first land reforms in 1902. At that time British government allotted agricultural land to different

farmer tribes and settled them here by bringing them here from different central districts of the combined Punjab like Sialkot, Amratsar, Gurdaspur, Gujranwala, Gujrat and other areas. At the time of partition in 1947 (the largest migration of human history) many refugees from Indian Punjab also settled in these areas. These tribes who came here from different regions were also of same clan who used to already live here. By living here side by side from centuries, homogeneity of culture and races has been developed among these people because of blood relations with each other. Generally these tribes can be divided in two classes, farmer tribes and non farmer tribes. Farmer's tribes are those who are mainly involved in farming and non farmer's tribes are those who are engaged in allied agro professions.

4.4.4 Indigenous People

176. Although people living around the project areas belong to different races and tribes and have different cast pattern but there is no community identified who has close culture, close economy and close community (Confined to a limited area). Therefore no any indigenous community exists and there is no danger of elimination or affecting negatively of any community by the proposed project execution.

4.4.5 Caste System

177. Project Area lies in rural areas of the Punjab. Following caste and tribes were identified during the field survey.

Table 4.20: List of Different Castes in Respective Tehsils

S. No.	Tehsils	Castes
1	Faisalabad	Sayyed, Jatt, Arain, Malik, Rajput,Sheikh
2	Gojra	Sayyed, Jatt, Arain, Malik, Rajput, Sheikh
3	Toba Tek Singh	Sayyed, Jatt, Arain, Malik, Rajput, Sheikh
4	Shorkot	Sayyed, Naul, Supra, Sheikh
5	Kabirwala	Sayyed, Haraj, Gill, Mohanas, Wahlas, Noon, Rajput Sanghara, Bandash, Mughal, Sheikh
6	Khanewal	Sayyed, Haraj, Gill, Sanghara, Bandash, Mughal, Sheikh

Source: *EIA Field Survey Team (NESPAK)*

4.4.6 Religion

178. Religion plays a vital role in people's life. Majority of the Project Area population is Muslim. Cultural festivals are mostly related with religious traditional events. The visit to shrines (termed as Ziarat) is a very common among people. Only minority identified are Christian in the areas which are less than 1 percent.

4.4.7 Socio-economic Survey

179. The information regarding socio-economic conditions is derived from primary and secondary sources. Methodology adopted for survey was based on collection of comprehensive information by utilization of all available resources with time effectiveness. The detailed socioeconomic survey was conducted from 19.01.2007 to 27.01.2007 to analyse the socioeconomic impacts and the concerns of the people of the Project Area. Following methodology was opted for socioeconomic survey, census of all affectees and development of baseline socio-economic conditions.

4.4.8 Methodology

180. To study the socioeconomic condition of the project area all available resources were utilized for this purpose first of all reconnaissance survey was conducted by the Consultant team. Then a comprehensive field survey was carried out afterward. During this survey, primary data was collected through following data collection tools:

(i) Village Profile

(ii) Household census survey

(iii) Survey of all commercial structures

(iv) Socio-economic survey

(v) Women survey

181. Village profile, which contained comprehensive socio-economic information regarding village was filled for all the villages situated along the route. Household survey forms and commercial forms were filled by all the houses and commercial units which were falling within the RoW. To develop the socio-economic baseline, socio-economic survey and women survey were carried out from 200 males and 100 females randomly from all areas along the Project route.

182. Beside this primary information collected directly from the field. Information from secondary sources was also collected. For this purpose all available documents were studied i.e. (District Population Census Reports 1998 for the concerned districts, Design utility folders, prepared by the design Engineering consultants, IUCN literature and Asian Development Bank Guidelines for socio-economic survey. Meetings were done with the officials of revenue, agricultural and irrigation departments; feedback of all these meetings is also kept in view in study of socio-economic environment.

4.4.9 Analysis of the Respondents

183. Totally 200 questionnaires were filled from males and 100 from females at different locations in the Project Area. In these respondents people from all walks of life was included like residents of surrounding localities, passengers, key influential persons, protagonists of the village communities, women and all possible potential stakeholders. These respondents were representative of all walks of life with different professional back grounds. These people are also consulted regarding problems forecasted by them

by the construction of M-4. Beside this focus group sessions were also carried out in the villages adjacent to the RoW to know the view point of general public.

4.4.10 Population Composition

184. Following population composition: male to female population ratio is based on the finding of data collected from the field.

Table 4.21: Population Composition

S. No.	Tehsils (Talukas)	Male(%age)	Female(%age)	Total
1	Faisalabad	52	48	100
2	Gojra	49	51	100
3	Toba Tek Singh	51	49	100
4	Shorkot	52	48	100
5	Kabirwala	52	48	100
6	Khanewal	51	49	100

Source: EIA Field Survey Team (NESPAK)

4.4.11 General Profile

185. Out of the 200 male respondents, 71% were married, 29% were unmarried, 55% were literate, 45% were illiterate, 63% were employed and 37% were unemployed (including students). **Table 4.22** presents the general demographic profile of the Project Area.

Table 4.22: General Profile of Male Respondents

S. No.	Respondents	No.	Percentage (%)
1	Married	142	71
2	Unmarried	58	29
3	Literate	111	55
4	Illiterate	89	45
5	Employed	126	63
6	Unemployed	74	37

Source: EIA Field Survey Team (NESPAK)

186. Out of the 100 female respondents, 67% were married, 31% were unmarried, 31% were literate, 69% were illiterate, 26% were employed and 74% were unemployed (including students). Table **4.23** presents the general demographic profile of the Project Area.

Table 4.23: General Profile of Female Respondents

S. No.	Respondents	No.	Percentage (%)
1	Married	67	67
2	Unmarried	33	33
3	Literate	31	31
4	Illiterate	69	69
5	Employed	26	26
6	Unemployed	74	74

Source: EIA Field Survey Team (NESPAK)

4.4.12 Respondents' Age Group

187. Respondents were selected from various age groups. 18% of the respondents were less than 25 years old, 20% belonged to age group between 26 to 35 years, 22% fell in the age group between 36 to 45 years, 20% between 46 to 55 years and 20% of the respondents were more than 56 years old. **Table 4.24** presents the distribution of respondents according to age group.

Table 4.24: Respondents' Age Group

S. No.	Age Group	Both Sexes	Percentage	Male	Percentage	Female	Percentage
1	15-25	54	18	40	20	14	14
2	26-35	60	20	34	17	26	26
3	36-45	66	22	38	19	28	28
4	46-55	60	20	36	18	24	24
5	56-65	60	20	52	26	8	8
		300	**100**	**200**	**100**	**100**	**100**

Source: EIA Field Survey Team (NESPAK)

4.4.13 Education Level

188. Literate respondents had different education levels. Out of 142 literate respondents: 30% had primary level of education, 28% had education up to Matriculation and 24% had qualification up to intermediate and 26% were graduate or postgraduate. Educational status of the respondents is shown in the **Table 4.25.**

Table 4.25: Educational Status

S. No.	Education level				
1	Respondents	Primary	Middle/ Secondary	Intermediate	Graduation/ Graduation
2	Male	32	32	27	20
3	Female	10	8	7	6
Total		**42**	**40**	**34**	**26**
Percentage		**30**	**28**	**24**	**18**

Source: EIA Field Survey Team (NESPAK)

4.4.14 Social Amenities

199. During socio-economic survey to develop the social baseline of the Project Area, the respondents were inquired about the utilities in their homes. Almost all the respondents had electricity in their homes whereas 95% had the facility of water supply in their homes. On the other hand 54%, 23% and 15% of the respondents respectively had the facility of sewerage system, landline phone and Sui gas at their homes. **Table 4.26** presents the social amenities available in the area.

Table 4.26: Social Amenities

S. No.	Social Facility	Number	Percentage (%)
1	Electricity	190	95
2	Sewerage(open Drains)	109	54
3	Telephone(Land	46	23

S. No.	Social Facility	Number	Percentage (%)
	Line)		
4	Water Supply	30	15
5	Sui Gas	17	9

Source: *EIA Field Survey Team (NESPAK)*

4.4.15 Professional Status

200. **Table 4.27** presents the professional status of the respondents. 29 % of the respondents were farmers. Among the respondents "economically active", 29 % were farmers, 16 % were businessmen and 10 % were laborers. 17% respondents were engaged in allied agriculture professions, like cattle farming, milk selling etc., 17% respondents were unemployed.

Table 4.27: Professional Status

S. No.	Profession	Number of Respondents	Percentage (%)
1	Agriculture	58	29
2	Business	33	16
3	Labor work	19	10
4	Service	14	7
5	Agro based Business	42	21
6	unemployed	34	17
		200	**100**

Source: EIA Field Survey Team (NESPAK)

4.4.16 Household Income Levels

201. During the socio-economic survey, respondents were inquired about their total monthly income from all sources. **Table 4.28** shows the income levels of the respondents. Majority of the respondents i.e. 23% had their income ranging between Rs.10000-15000/month. 19% had income below Rs.5000/month. 22 % respondents belonged to the income group ranging between Rs.5000-10000/month, 19% between Rs.15,000 to 20,000/month and just 17% had an income more than Rs.25,000/month.

Table 4.28: Income Levels

S. No.	Monthly Income Group (Pak Rs.)	Number	Percentage
1	1,000-5,000	39	19
2	5,000-10,000	44	22
3	10,000-15,000	46	23
4	15,000-20,000	38	19
5	25,000+	33	17
		200	100

Source: EIA Field Survey Team (NESPAK)

4.4.17 Land Holding

202. During the survey it was identified that about 29% of the respondents belonged to the agricultural sector and some of those respondents had leased out their lands as a second business/ source of income. Majority of the respondents had very small land holdings; almost 83% of the respondents had landholdings of less than 10 acres. Only 2% had landholdings of more than 20 acres. The land holding status of the respondents is shown in **Table 4.29.**

Table 4.29: Land Holding

S. No.	Land in Acres	No.	Percentage (%)
1	1-5	30	52
2	5-10	18	31
3	10-15	6	10
4	15-20	3	5
5	20+	1	2
		58	**100**

Source: EIA Field Survey Team (NESPAK)

4.4.18 Borrowing Status

203. During the public consultation it was identified that a reasonable proportion of the respondents, i.e. 37 % had borrowed money from different sources such as Agriculture Bank, feudal lord, or relatives. **Table 4.30** shows the barrowing status of the respondents.

Table 4.30: Borrowing Capacity

S. No.	Borrowing Status	Number	Percentage (%)
1	Under debt	81	37
2	Without any debt	119	63
		200	**100**

Source: EIA Field Survey Team (NESPAK)

4.4.19 Housing Characteristics

204. 29% of the respondents live in kacha houses, 45% respondents have semi pacca houses and 26% live in kacha (mud) houses. **Table 4.31** shows the characteristics and percentage of houses in the Project Area.

Table 4.31: Types of Construction

S. No.	Construction Type	Number	Percentage
1	Kacha	58	29
2	Semi Pacca	90	45
3	Pacca	52	26
		200	**100**

Source: EIA Field Survey Team (NESPAK)

4.4.20 Gender Component

205. Gender is a critical issue that is connected to any sustainable development process, which is usually perceived as woman specific issues. In order to assess the socio-economic condition of the women of the area, a Gender component survey was conducted by taking a reasonable sample of women. A total of 100 women from the project area were interviewed by the female staff, so that they could feel comfortable. Regarding the level of awareness about the project, mostly the women were aware about the construction of Road project.

206. **Table 4.32** shows the condition of women surveyed according to the table 23% women surveyed had access to school 45% had access to college level education and only 32% ladies had access to university level education this shows that they were free in getting education if they like and these educational facilities were in their surroundings. On the other hand 26% women consult leady health visitor, 18% consult government doctor, 32% consult private doctor and 24% consult quacks in case of sickness.

Table 4.32: **Social Condition of Women of the project Area**

Age Group	Access to Education Facility			Access to Health Facility			
	School	College	University	Lady Health Visitor	Doctors	Private Doctors	Quacks
16-25	12	11	6	6	4	4	2
26-35	8	6	5	5	2	4	4
36-45	2	11	7	7	6	6	4
46-55	1	9	8	5	2	10	6
ɔove	-	8	6	3	4	8	8
	23	**45**	**32**	**26**	**18**	**32**	**24**
	23	**45**	**32**	**26**	**18**	**32**	**24**

Source: EIA Field Survey Team (NESPAK)

4.4.21 Culture and Tradition

207. The food of the inhabitants is very simple. Maize, wheat and rice are eaten in the project area. The use of Desi ghee and lassi is very popular in the rural area. Milk is also available in sufficient quantity. The people of the area are fond of meat especially various forms of beef. The use of ornaments among the females is also common. The females decorate themselves with ear-ring and bangles with rare use of cuba (egg like cups), connected by chains or a flat circle shaped gold hanging on fore-head.

4.4.22 Education Facilities

208. Educational facilities in the Project Area are not inadequate, but quality of education is not up to the merit. Respondents showed their apprehensions about the quality of education. In total 103 villages situated along the road totally 88 government schools for boys and 98 schools for girls beside this there was 92 private schools were also found in

these villages during field survey. **Table 4.33** below shows the status of educational institution along the CoI.

Table 4.33: **Education Facilities in the Project Area**

S. No.	Govt. Schools	Male	Female	Private School (Male+Female)
1	Primary	54	61	58
2	Middle	25	27	26
3	High	9	10	8
Total		88	98	92

Source: EIA Field Survey Team (NESPAK)

4.4.23 Roads and Communication

209. Communication network is a fundamental prerequisite for economic activity to take place. The surrounding villages of the project area are well connected with main road and district headquarters through metalled roads.

4.4.24 Concerns Regarding the Project

210. During the field survey people were inquired about their views regarding the proposed Project. People have positive thinking and hopes about the project but fears and doubts for unforeseen issues are also in their minds. Almost all the people showed their concerns regarding the proposed Project. Respondents had multiple choices and they gave more than one response. The frequency of the responses of the respondents is shown in **Table 4.34** below

Table 4.34: Stakeholders Concerns

S. No.	Concerns	No. of Respondents
1	Livelihood will be disturbed in case loSingh agriculture land and businesses	287
2	People will never given judicious compensation against land acquired	273
2	Residential area will be affected	102
3	No compensation payment is given to affectees, especially tenant	162
4	Jobs will not be provided to local people during construction	130
5	Privacy will be disturbed due to construction work	132

Source: EIA Field Survey Team (NESPAK)

4.4.25 Resettlement Issue

211. During the detailed field visit resettlement issues were critically observed. During the survey it was identified that designer has tried to avoid the settlements. During the detailed field visit it was found no archaeological site or graveyard, no any other structure of religious value or cultural importance is going do be demolished due to the execution of the proposed project. Only one Jamia mosque in Shorkot tehsil adjacent to a farm house needs relocation. Almost 200 house and 20 shops will need relocation for execution of the project. 80% of these houses are pacca (cement and brick masonry) and 20% of these house are made of mud and bricks.

4.4.26 Non-Governmental Organizations (NGO's)

212. In these districts and particularly in rural areas of these districts no international NGO's is working. The only non government organization working in these rural communities is Punjab Rural Support Programme. The main focus of this organization is on agriculture, health and infrastructure.

4.4.27 Socio-Economic Environment Conditions Prevailing in 2015 (Shorkot – Khanewal)

213. This section provides baseline information and description of socio-economic and cultural environment of the project area. It presents information on the project area's locations, population distribution, socio-economic conditions and livelihood activities, state of education and health facilities. The purpose of this socio-economic survey was to gather information about the general characteristics of nearby communities, their socio-economic status, cultural traditions, social issues and religious affiliations. It also presents the public consultation outcomes during the field survey. The approach used during data collection was interviews, focus group discussions and rapid rural appraisal techniques to qualitative data collection. Socio-economic and cultural data were collected through semi structured questionnaire and focus group interviews with all the major stakeholders including local community members, village heads, land owners & NGOs in the project area.

214. The proposed Section–III (Shorkot – Khanewal) of Faisalabad- Khanewal Motorway (M-4) starts near Shorkot and passes from villages located in Tehsil Shorkot, Kabirwala and Khanewal. Most people living in the surrounding villages of project area are farmers. Shalwar Kameez and Doti Kurta are common dresses of male and female. Shalwar Kameez with coarse chaddar during winter season is common.

215. Estimated current population in the year 2015, based on latest District Census Report 1998, of the Tehsils through which the road passes is as under.

a) Shorkot: Total population of Shorkot Tehsil of District Jhang is 975152 with a growth rate of 2.23% and urban and rural distribution of population is 15% and 85% respectively. The women/men ratio is 108:100 and average household size is 6.9. Overall literacy rate for both sexes is 37.12.

b) Kabirwala

216. Total population of the Tehsil was 953304 with a growth rate of 2.19% as recorded in 1998 Census. Population composition was107 females compared to100 males.15% population resided in urban areas and85% lived in rural areas. Average household size was 7.3.

c) Khanewal

217. Total population of Khanewal is 818813 with 2.45% growth rate. Urban rural distribution of population is 18% and 82% while women/ men ratio is 108/100 with. Average household size is 7.0 and overall literacy rate for both sexes is 39.94%. As recorded in 1998 census.

218. **Table 4.35** shows demographic characteristics of the tehsils in project area.

Table 4.35: Population of Project Corridor (Gender Segregated)

District	Tehsil	Population	Female	Male
Jhang	Shorkot	975152	506330	468824
	Kabirwala	953304	492771	460533
Khenewal	Khanewal	818813	425153	393660

Source: Census and Socioeconomic Survey of the Project Area by NHA Consultant

4.5 Socio-Economic Survey of Project Affectees

219. The information regarding socio-economic conditions is derived from primary data collection and from secondary sources i.e. District Census Reports 1998 for the concerned districts, village profiles, Design utilities folders prepared by design engineering consultants, focus census, women profile survey, building valuation survey, scoping sessions and personal field observations. As per census of project affected persons total affected population representing- 3429 affected households facing loss of their assets (land and land based assets including structures, trees and crops) and livelihood opportunities is 23186 with the average household size comprising of 6.75 members. It was not possible to consult all the affectees. Representative samples were taken during consultation process.

4.5.1 Consultation and Participation Process held in 2015 for Section III (Shorkot – Khanewal)

220. About two hundred (200) persons at different locations in project area were contacted. Methodology selected for selection of respondents was random sampling of respondents from all villages, towns, cities situated along the proposed route. These respondents were from all walks of life with different professional backgrounds. The socio-economic survey was conducted in all 35 villages. Efforts were made to consult people from all localities along the entire stretch of proposed area of villages coming in ROW. **Plate 4.2** shows Socio-economic Survey interview being conducted in Village.

Public meeting at KakkiKahna

Public meeting at Sahi Sahoo

Public meeting at 13 V

Public meeting at 8V

Plate 4.2 Socio Economic Interview being conducted in Village

4.5.2 Demographic Profile based on Survey Results of 2015 for Section III (Shorkot – Khanewal)

i) Ratio of Respondents

221. **Table 4.36** shows that 200 of the respondents contacted were male.

Table 4.36: Respondents Gender Ratio

Sr. No.	Description of Respondent	Number	Percentage
1	Male	200	100
Total		**200**	100

ii) Age Group of Respondents

222. **Table 4.37** shows that 03% respondents were between the age group of 15-25, 17% were between age group of 26-35 and 33%, were between age group of 36-45 and 47% respondents fall between the age group 46 & above respectively. These age groups of respondents indicate that the people contacted were mature enough to have better understandings of the proposed expressway.

Table 4.37: Respondents Age Group

Sr. No.	Age Group	Number	Percentage
1	15 – 25	6	3
2	26 – 35	34	17
3	36 – 45	66	33
4	46 and above	94	47
Total		**200**	**100**

iii) Caste

223. **Table 4.38** shows that 03% respondents were Baleem by caste, 06% were between Chadar, 12%, were between Malik, 26% respondents were Jutt, 02% respondents were Kamboh, 05% were Bhatti, 02%, were Khokhar , 03% respondents were Butt ,04% were Chisti, 11% respondents were Haraj by caste, 05% were between Noon, 01%, were between Pahtan, 03% respondents were Rajput, 08% respondents were Sahoo, 07% were Sial, and 02%, were Sargana.

Table 4.38: shows caste of people.

Sr. No.	Caste/Ethinic Groups	Numbers	Percentage
1	Baleem/Bismah	6	3
2	Chadrar	12	6
3	Malik	24	12
4	Jutt	52	26
5	Kamboh	4	2
6	Bhatti	10	5
7	Khokhar	4	2
8	Butt	6	3
9	Chisti/Faqir	8	4
10	Haraj/Hanjra	22	11
11	Noon/Kumhar	10	5
12	Pathan	2	1
13	Rajpoot	6	3
14	Sahoo	16	8
15	Sail	14	7

Sr. No.	Caste/Ethinic Groups	Numbers	Percentage
16	Veedh/Sargana	4	2
Total		200	100

iv) Religion

224. The predominant religion in Jhang and Khanewal is Islam, with 98% and 97% of the population respectively. A negligible proportion of the population belongs to other religions, including Christianity and Qadiani / Ahmadi. However, the census results of the project affected population reflect that entire population is Muslim by religion.

v) Educational Status and Facilities

225. Basic level educational facilities both for males & females available in the villages located along the proposed expressway. But these facilities are not sufficient to meet the educational requirements of the people of the project area. From survey results (**Table 4.39**), it was found that 33% of the respondents were Illiterate, 33% were educated up to primary level, 20% were up to middle level 4% were up to metric level, only 5% were educated up to intermediate level. Small percentage i.e. 1 & 2% includes those respondents which were educated upto more than intermediate level.

Table 4.39: Education Status of the Respondents

Sr. No.	Educational Level	Number	Percentage
1	Illiterate	66	33
2	Primary	66	33
3	Middle	40	20
4	Metric	8	4
5	Intermediate	10	5
6	Graduation	2	1
7	Masters & Above	4	2
8	N/A	4	2
Total		**200**	100

Source: Socioeconomic Survey of the Project Area by NHA Consultant

vi) Status of Educational Facilities along the Proposed Project Area

226. The project area lacks educational facilities. The institutions for primary and middle level education seem functioning satisfactorily but these need to be increased in numbers particularly for girl students. In 35 villages situated along Section-III of the Motorway, there are 33 government schools for boys and 39 schools for girls. There are also 41 private schools in these villages. **Table 4.40** below shows the status of educational institutions along the project route.

Table 4.40: Education Facilities along the Project Area

Sr. No.	Govt. Schools	Male	Female	Private School (Male + Female)	Total
1	Primary	13	18	17	48
2	Middle	13	12	22	47
3	High	07	09	02	18
Total		**33**	**39**	**41**	**113**

vii) Available Social Amenities in the Project Corridor

227. During socio-economic survey, to develop the social baseline of the Project Area, the respondents were inquired about the utilities in their homes. Most of the respondents (95%) had electricity in their homes. 01% of the respondents were enjoying the facilities of sewerage and (03%) had landline telephone in their homes. Water supply facility is available to 09% of the respondents and Gas facility is available to the remaining 9%. **Table 4.41** presents the social amenities available in the project area.

Table 4.41: Social Amenities.

Sr. No.	Social Facility	Available	%	Not Available	%
1	Electricity	190	95	10	5
2	Gas	18	9	182	91
3	Telephone	6	3	194	97
4	Water Supply	18	9	182	91
5	Sewerage	2	1	198	99

Source: Socioeconomic Survey of the Project Area by NHA Consultant

viii) Major Occupations of Respondents

228. The project corridor passes through rural settlements with agricultural farming as major source of income. Detailed socio economic survey of respondent population reflected that project affected households have multiple income sources and their dependency on land as income source is limited. The income analysis do not include women population interviewed during sample survey as they are not involved in income generating activity and their role is mainly limited to the household work. **Table 4.42** details the respondents' major income earning sources. Among the respondent households 07% are engaged with Business/ Shop, while, 77% involved in agro-based business including trading of agricultural inputs and produce etc. 1% are drivers, 06 % involved in labour,02 % are Govt Employee , 02% are Teacher/student and 05% are unemployed. Major income source analysis reflect that the income earning of affected land owners is not slowly dependent on agricultural land as the household members of the farming communities are also engaged in other income earning sources. Therefore, impact on income of affected households facing loss of agricultural land for project is perceived to be limited.

Table 4.42: Professional Status of Respondents

Sr. No.	Major Income source	Respondents	Percentage
1	Businessmen/ shopkeepers	14	7
2	Agriculture	154	77
3	Drivers	2	1
4	Labour	12	6
6	Govt.Employee	4	2
7	Teacher/Student	4	2
10	Unemployment	10	5
Total		**200**	**100**

ix) Monthly Income level

229. **Table 4.43** shows the income levels of the DPs, which have been derived after their income analysis after detailed census. Most of them (46%) had incomes up to Rs 15000-20000/ month. 07% had income between Rs. 5000 to Rs.10000/ month. 25 % respondents belonged to the income group ranging between Rs.10000 to 15000/ month, 18% had income above Rs. 20000/ month and 04% give no response regarding their income level.

Table 4.43: Income Level.

Sr. No.	Income Level	Number	Percentage
1	5,000-10,000	14	7
2	10,000 – 15,000	50	25
3	15,000-20000	92	46
4	above 20000	36	18
5	No Response	8	4
Total		**200**	**100**

x) Monthly Expenses

230. **Table 4.44** shows that majority (40%) of the respondents have their monthly expenses between the range above Rs. 15000, 38% respondents have monthly expenses between the range Rs.10000 – 15000, 18% respondents have monthly expenses ranging Rs.5000 – 10000 ,whereas 04% respondents give no response regarding their expenses.. Mostly people are farmers and therefore most of the products of domestic use are produced in their own farms. Still their domestic expenses are less as compared to urban areas of Pakistan.

Table 4.44: Monthly Expenses

Sr. No.	Average Monthly Expenditure	Number	Percentage
1	5,000-10,000	36	18
2	10,000 – 15,000	76	38
3	Above 15,000	80	40
5	No Response	8	4
Total		200	100

Source: Census and Socioeconomic Survey of the Project Area by NHA Consultant

xi) House Size

231. During the Socio-economic survey respondents were also inquired about their house sizes to see the living standard of the respondents. **Table 4.45** shows that 37% of the respondents have their house area up to 5 Marla and 50% of the respondents have their house size in the range of more than 5 Marla but less than 15 Marla. 10 % respondents have big houses and have house area around 1 kanal and 03% respondents have large size houses more than 25 Marla.

Table 4.45: House Size

Sr. No	Area (Marla's)	Number	Percentage (%)
1	Up to 5	74	37%
2	5-15	100	50%
3	15 – 25	20	10%
4	More Than 25	06	03%
Total		**200**	**100**

Source: Census and Socioeconomic Survey of the Project Area by NHA Consultant

xii) Type of Construction of the Houses

232. During the Socio-economic survey respondents were also inquired about their house construction type to see the living standard of the respondents. 19% of the respondents live in Pacca houses that are constructed with superior materials and workmanship. 74% respondents have Semi pacca houses that are houses made of bricks masonry with mud mortar. Whereas, the remaining 07% of the respondents are living in Kacha houses that are constructed with unbaked mud bricks. **Table 4.46** shows the house construction type.

Table 4.46: House Construction Type

Sr. no	Construction Type	Numbers	Percentage
1	Pacca	38	19
2	Semi Pacca	148	74
3	Kacha	14	7

Sr. no	Construction Type	Numbers	Percentage
Total		200	100

Source: Census and Socioeconomic Survey of the Project Area by NHA Consultant

xiii) Borrowing Status

233. During census and socio-economic survey of the affected households, it was identified that a nominal proportion of the respondents, 06 % had borrowed money from different sources such as Agriculture Banks, relatives/friends and non-government organizations dealing in micro financing. While, major proportion of the respondents (88%) are free from any kind of debt burden and 06% respondent give no response. **Table 4.47** shows the barrowing status of the respondents.

Table 4.47: Borrowing Status.

Sr. No	Borrowing Status	No. of Respondents	Percentage (%)
1	Yes	12	6
2	No	176	88
3	No Response	12	6
Total		**200**	100

Source: Census and Socioeconomic Survey of the Project Area by NHA Consultant

xiv) Borrowing Source

234. During census of the affected households, respondents who are under debt burden were inquired about their borrowing source. The results depict that most of the respondents (66.67%) have taken loan from commercial bank, 25% have taken loan from relative or friend and only 8.33% respondents have taken loan from community based micro financing organizations like NRSP/PRSP working in the area. **Table 4.48** shows the borrowing status of the respondents.

Table 4.48: Borrowing Source.

Sr. No	Borrowing Source	No. of Respondents	Percentage (%)
1	Bank	08	66.67
2	Relative/Friend	03	25
3	Non Government Organization	01	8.33

Source: Census and Socioeconomic Survey of the Project Area by NHA Consultant

4.5.3 Gender Issues and Analysis

235. In order to ensure gender issues are sufficiently identified, steps for making LARP more gender inclusive and responsive were taken which included selection of sample size with

20% representation of women. The women were interviewed by female staff to determine their access to social amenities like education and health facilities, participation in household income generating activities and decision making, project impacts on mobility of women and to record gender concerns if any and provide appropriate mitigation plan if required. Besides, during consultation separate focus group discussions were also arranged with women at selected points in affected villages to address the overall gender issues. FGDs analyzed the existing situation of the affected communities from gender perspective, assessed the possible project impacts on women of the affected villages and recommended actions to improve gender dimensions of the LARP.

4.5.4 Access to Education and Health

236. During Socio-economic assessment 100 women (20% of population surveyed) from the project area were interviewed by the female staff by using a pre-structured performa to collect information related to socio-economic conditions of women, available education and health facilities, project related awareness, anticipated project impacts on mobility of women and their concerns if any. During survey, it was observed that the women in project affected villages mainly resides in the house and do household works. However, few women were found engaged in teaching, nursing and stitching at home. As per level of awareness on the project, most women were aware of the construction of road project. **Table 4.49** indicates the social condition of women surveyed. Out of total interviewed women 60 women (60%) were literate with different literacy levels i.e 66.7% had access to school, 20% to college level education and only 13.3% women having university level education. This reveals that they were free in getting education if they were willing and school level educational facilities were available in their surrounding areas (villages), while higher education facilities and vocational colleges were available in nearby urban centers, i.e. Khanewal ,Kabirwala and Shorkot city. On the other hand, 32% women had access to lady health visitor, 20% consult qualified government doctor in nearby hospitals and rural health centers, 28.0% consult private doctor and 20% consult quacks in case of sickness/ ailments.

Table 4.49: Social Condition of Women of the Project Area

Age	Access to Education			Access to Health Facility			
Group	School	College	University	Nurse/ LHV	Govt. Doctors	Private Doctors	Quacks
16-25	21	20	10	14	6	9	6
26-35	19	4	2	5	2	5	5
36-45	25	1	2	8	4	6	5
46-55	9	4	0	2	2	3	2
55/above	5	2	0	3	6	5	2
Total	**40**	**12**	**8**	**32**	**20**	**28**	**20**
% age	**66.7%**	**20.0%**	**13.3%**	**32%**	**20.0%**	**28.0%**	**20%**

Source: Census and Socioeconomic Survey of the Project Area by NHA Consultant

4.6 Culture and Tradition

237. The food of the inhabitants is very simple. Maize, wheat and rice are eaten in the project area. The use of Desi ghee and lassi is very popular in the rural areas. Milk is also available abundantly. The people of the area are fond of meat, especially various forms of fish and beef.

4.7 Public Concerns Regarding the Project Execution

238. During the field survey, people were asked about their views regarding the M-4 Project. People had positive thinking and good hopes about the project but fears and doubts for unforeseen issues were also in their minds. Almost, all the people showed their concerns regarding the Project. Respondents had multiple responses. The frequency of the responses of the respondents is shown in **Table 4.50.**

Table 4.50: Stakeholders Concerns

Sr. No.	Perceived Impacts	Number	Percentage
1	Increase in Dust and noise pollution	42	19
2	Loss of Income	26	12
3	Increase in job opportunities	56	25
4	Inconvenience to Commuters during Construction Stage	23	10
5	Accident rate will be decreased	27	12
6	No Impacts	09	4
7	Beneficial for the public as well as for development of area	17	8
8	Difficulty in Travelling	21	10
Total		**221**	100

*Multiple Responses

4.8 Community Health and Safety

239. The Client will inform the affected communities about the significant potential hazards in appropriate manner. The Client will be prepared to respond to accidental and emergency situations. For this purpose, a comprehensive EIA report has been prepared for the subject project and will be duly submitted to ADB Environment cell. In this EIA report, a special attention is given to public safety during project construction and its operation phases. In this report, special focus is given on rehabilitation of those health institutions which will be demolished by the execution of proposed project. But during the field visit, it was confirmed that no hospital, Basic Health Unit (BHU) or any other health institution is going to be relocated or demolished.

4.9 Physical Cultural Resources

240. During the field survey, it was confirmed that no physical or cultural resources like shrine, mosque or historical place are falling within the Right of Way (ROW). However, two mosque and one prayer place patio with small wall is being affected by the project and will be relocated.

241. Whereas a number of mosques, shrine and graveyards are located in nearby settlements which bear significant importance for the concerned localities. These cultural resources are discussed below:

i) Shrines

242. Astana Hazrat Syed Ghulam Distageer Ali Gallani is an important shrine near project area which is located in 5- Gagh Village. This shrine is visited by local people. Local people come to visit the shrine to pay homage to the saint.

ii) Mosques

243. There are about eight (8) small mosques located in the localities along project road. These mosques are locally constructed with the mutual contributions of the concerned communities. People come in the mosques to offer prayers.

iii) Graveyards

244. Graveyards are important cultural heritage of the area and are visited by the descendents of the departed people. There are about Eleven (11) graveyards located in various communities along proposed road.

iv) Historical Monuments

245. No historical or archeological site of significant importance is situated in the localities along the proposed project alignment.

4.10 Gender Issues and Analysis as per 2015

246. A total of 100 women from the project area were interviewed by female expert to analyze gender situation in the villages. Most of the women were aware of the construction of section –III of Motorway M-4.

a) Demographic & Economic Characteristics of the Respondents

i) Age

247. A gender analysis has been conducted in the project area regarding their concerns/issues, more specifically, related to implementation of the proposed project. The demographic characteristics of the sampled respondents have been shown in **Table 4.51**. It revealed that 15% of the respondents were up to 25 years of age, 35% of the respondents were between the age group of 26 – 35 years, 24% fall in age group 36 – 45 years and 26% were 45 years and above. These age brackets show that by and large

respondents were mature enough to express their opinion/concerns about the construction of M-4 Motorway.

.Table 4.51: Age Composition of the Respondents

Sr. No.	Frequency Distribution	Number of Respondents	Percentage (%)
1	15 – 25	15	15
2	26 – 35	35	35
3	36 – 45	24	24
4	45 and above	26	26
Total		**100**	100

Figure 4.6 reveals the age composition of respondents.

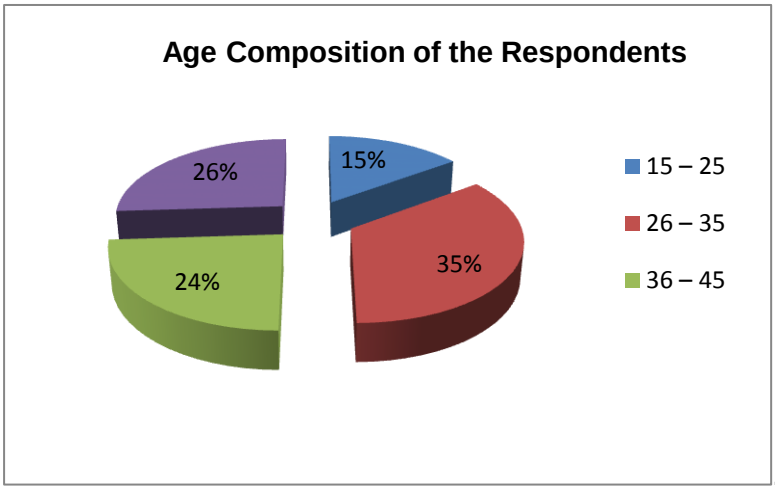


Figure 4.6: Age Composition of the Respondents

ii) Educational Level of the Respondents

248. Educational distribution of the respondents in the project area of influence is shown in **Table 4.52**. From respondents 32 % were Illiterate. Almost 16% educated up to primary level while 19% were up to middle level. About 6% of the respondents were having higher secondary education, 2% were with bachelor degree, and 4% were educated up to master level.

Table 4:52: Educational Level of the Respondents

Sr. No.	Educational Level	Number of respondents	Percentage (%)
1	Illiterate	32	32
2	Primary	16	16
3	Middle	19	19
4	Metric	21	21
5	Intermediate	06	06

Sr. No.	Educational Level	Number of respondents	Percentage (%)
6	Bachelors	02	02
7	Masters	04	04
Total		100	100

Figure 4.7 reveals the education level of respondents.

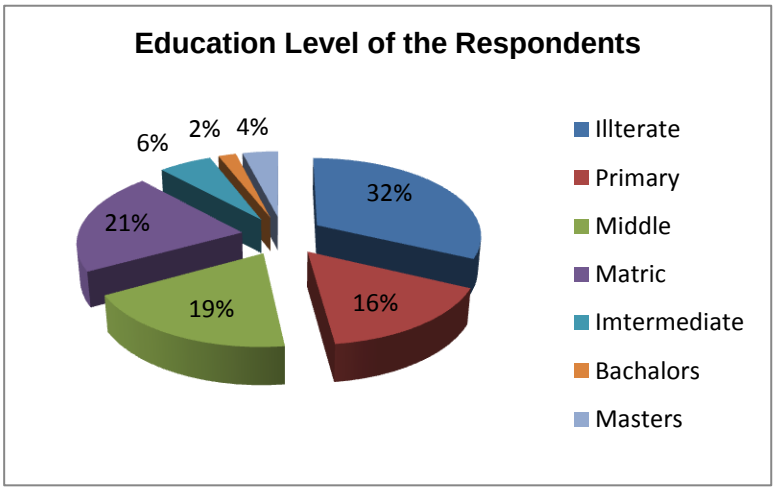


Figure 4.7: Education Level of the Respondents

iii) Marital Status

249. During the survey it was found that 76% of the respondents were married and 24% reported their status as single as given in the **Table 4.53.**

Table 4.53: Marital Status of the Respondents

Sr. No.	Marital Status	Number of Respondents	Percentage (%)
1	Married	76	76
2	Un-married	24	24
	Total	**100**	100

Figure 4.8reveals the graphical presentation of the marital status of respondents.

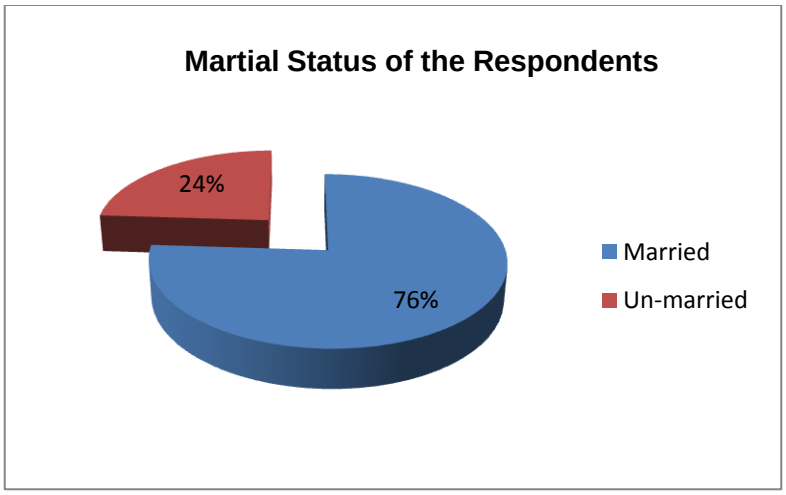


Figure 4.8: Marital Status of the Respondents

vi) Number of Children of Respondents

250. Survey results showed that 46% of the respondents were having number of children in the range of 1 to 4 years. 29% were reported having children between 5 to 8 years, 3 % having children in the age group of 9 to 12 years while 22% were reported having their children more than 12 years of age.

Table 4.54: Number of Children of Respondents

Sr. No.	Frequency	Number of Respondents	Percentage (%)
1	1-4	46	46
2	5-8	29	29
3	9-12	03	03
4	Above 12	22	22
Total		**100**	**100**

251. **Figure 4.9** reveals the number of children of respondents.

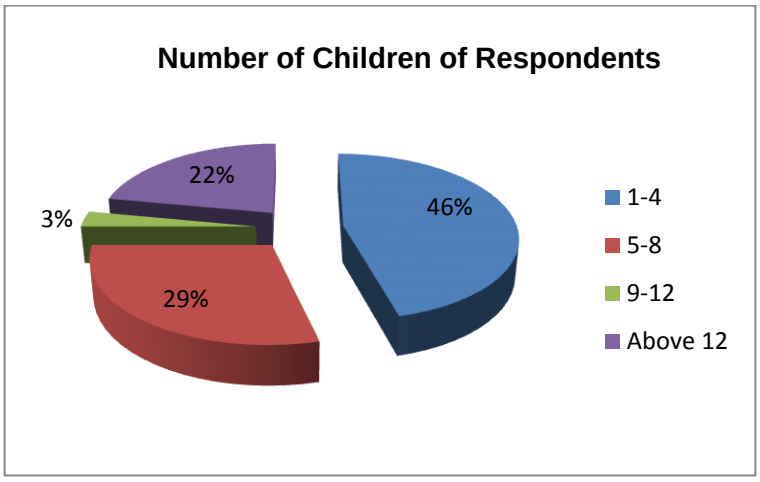


Figure 4.9: Number of Children of the Respondents.

v) Occupation of Respondents

252. During gender survey in the project area of influence, respondents were found belong to different professions such as housewives and working women. About 72% of the respondents were housewives and 28% were working women, as they were teaching in different schools and some of them doing agricultural activities in the fields as shown in **Table 4.55.**

Table 4.55: Occupations of the Respondents

Sr. No.	Profession	Number of Respondents	Percentage (%)
1	Housewife	72	72
2	Working Women	28	28
Total		**100**	100

Figure 4.10 shows the graphical presentation of occupational status of respondents.

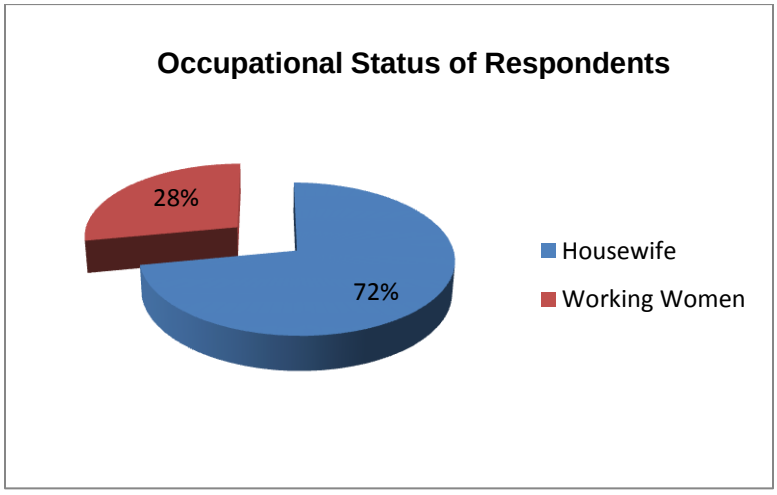


Figure 4.10: Occupational Status of the Respondents in Study Area

vi) Power to Spend Money

253. Survey results revealed that majority of the women i.e. 71% were having liberty to spend their money the way they like. Whereas, 29% respondent were not been allowed to spend their incomes/money as per their needs or choices.

Table 4.56: Power to Spend Money

Sr. No.	Frequency	Number of Respondents	Percentage (%)
1	Yes	08	29
2	No	20	71
Total		**28**	**100**

254. **Figure 4.11**reveals the graphic view of women's power to spend the money.

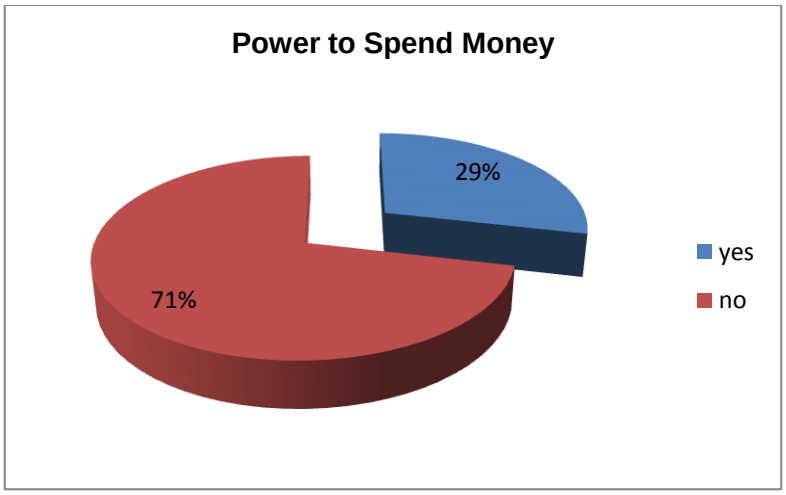


Figure: 4.11: Power to Spend Money

vii) Average Working Hours of the Respondents in Agricultural Field

255. The women in project area were mostly working part time in agricultural field as these women are housewives and usually work at their homes. During field survey it was recorded that88% of the women were working for part time. On the other hand, 12% of the respondents were those women who were working full time in agricultural fields as shown in **Table 4.57**.

Table 4.57: Average Working Hours of the Respondents

Sr. No.	Working Hours	Number of Respondents	Percentage (%)
1	Full Time	03	12
2	Part Time	22	88
Total		**25**	**100**

256. **Figure 4.12**reveals the average working hours of the respondents in project area of influence.

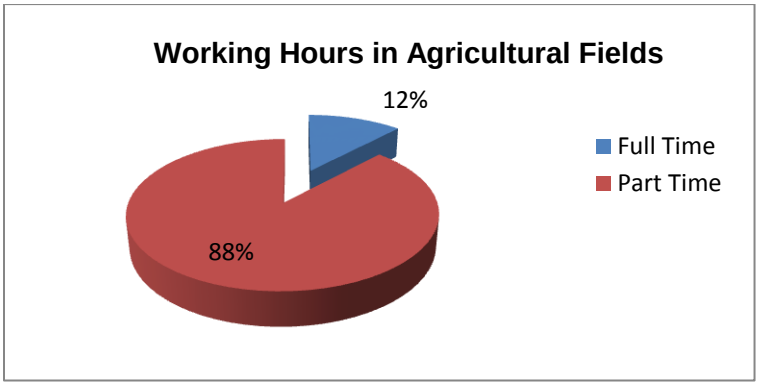


Figure 4.14: Average Working Hours of the Respondents

viii) Income Level of the Respondents

257. The income status of the respondents was evaluated by dividing the respondents into different income categories as reflected in **Table 4.58**. The analysis shows that 2% women fall in the income category of 10,000 to 20,000 rupees per month; whereas, 7% of the respondents were earning income up to 20,000 and above. While 91% did not give any response about their income status.

Table 4.58: Average Monthly Income of the Respondents

Sr. No.	Frequency Distribution	Number of Respondents	Percentage (%)
1	10,000 – 20,000	02	02
2	20,000 and above	01	01
3	No Response	97	97
	Total	**100**	**100**

258. **Figure 4.13**presents the average monthly income of respondents.

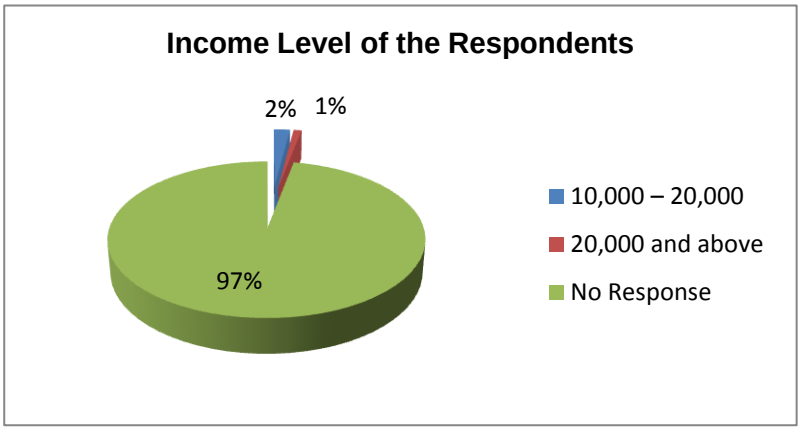


Figure: 4.13: Average Monthly Income

xi) Sources of Drinking Water

259. The sampled women were dependent on multiple sources of water for drinking purpose. Survey findings show different sources of drinking water available in project area of influence. The Hand pump is considered as the main source of water and is being used by 69% of the respondents and 28% use bore water and electric motors as a source for drinking water & 2% use public water supply ; while, 1% respondents use channel as a source of water as shown in **Table4.59**.

Table 4.59: Sources of Drinking Water

Sr. No.	Source of Water	Number of Respondents	Percentage (%)
1	Hand Pump	69	69
2	Any other (Electric Motor)	28	28
3	Public Water Supply	02	02

Sr. No.	Source of Water	Number of Respondents	Percentage (%)
4	Channel	01	01
Total		**100**	**100**

260. **Figure 4.14** reveals the graphical view of sources of drinking water in project area o influence

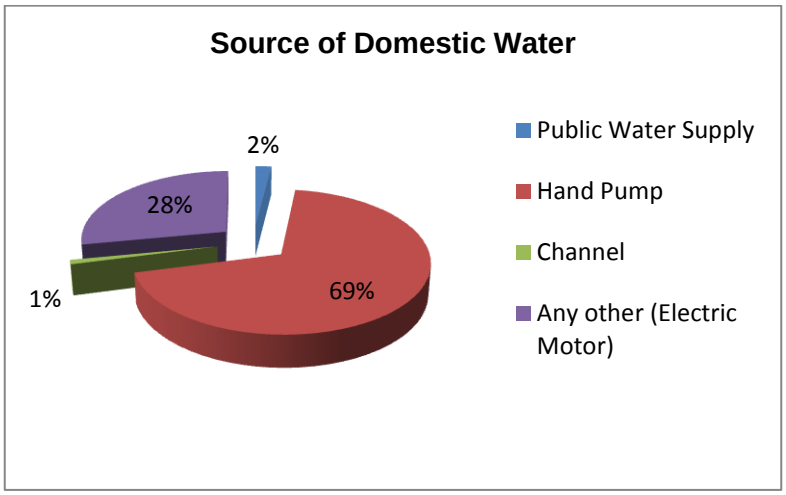


Figure: 4.14: Sources of Drinking water

x) Opinion of Respondents about Skill Learning

261. Survey findings show the opinion of women about learning of skills other than their household activities with intention to earn and participate in enhancing their family income**.** About66% of women showed positive response towards learning of different technical skills. Contrary to this34% were not in favor to do work except of household activities as described in **Table 4.60.**

Table 4.60: Interest about Skill Learning

Sr. No.	Opinion for Skill Learning	Number of Respondents	Percentage (%)
1	Yes	66	66
2	No	34	34
Total		**100**	**100**

262. **Figure 4.15** below depicts the opinion of women regarding learning of skills.

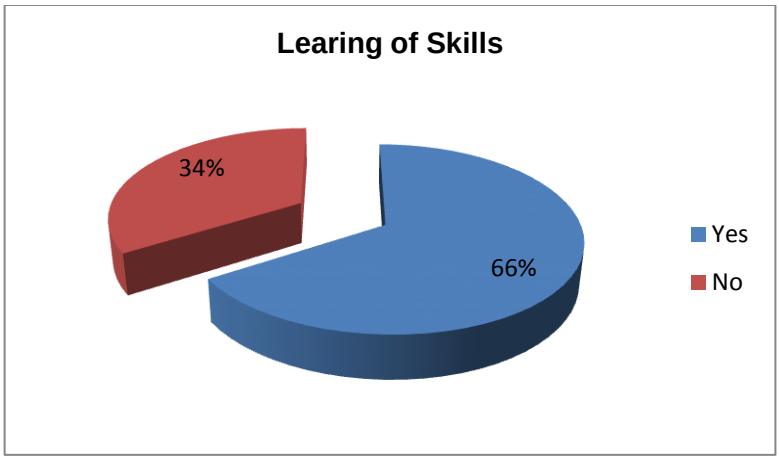


Figure: 4.15: Respondent's Opinion for Skill Learning

xi) Suggestions for Learning of Skills

263. Different type of suggested skills by the women what they want to learn in order to participate with their male member in their earnings as shown in **Table 4.61**.About half of the women 53% emphasized that the most convenient skills to be learned is stitching at village level. While 25% said that there must be teacher training institutions and 34% women suggested for beautician courses. Rest of the respondents .i.e.10% asked for the Lady Health Worker courses keeping in view the mother & child health issues in the villages.

Table 4.61: Suggestions for Learning of Skills

Sr. No.	Skills	Number of Respondents	Percentage (%)
1	Stitching	53	53
2	Teaching Training Institutions	25	25
3	Beautician Courses	12	12
4	Lady Health Worker Courses	10	10
Total		**100**	**100**

264. **Figure 4.16**depicts the suggestions for learning of skills for women of project area.

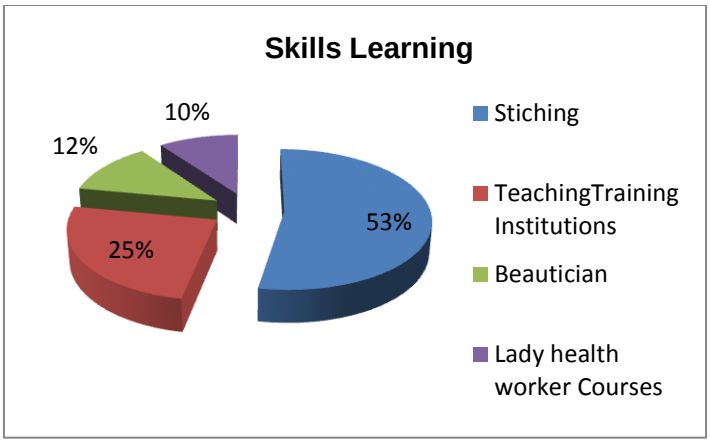


Figure: 4.16: Suggestions for Learning of Skills

xii) Women's Interest for Getting Education

265. During survey women were asked about their interest level for getting education. Majority of the women (90%) were in favor of getting education; while 10% were against due to some socio-cultural issues prevailing in project area.

Table 4.62: Women's Interest for Get Education

Sr. No.	Responses of Women	Number of Respondents	Percentage (%)
1	Yes	90	90
2	No	10	10
Total		**100**	**100**

266. **Figure 4.17**presents the women's interest for getting education.

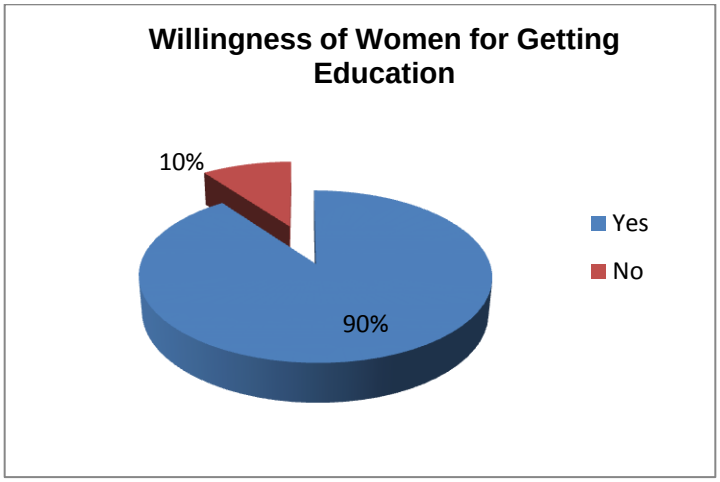


Figure: 4.17: Willingness of Women for Getting Education

xiii) Awareness regarding the Proposed Project

267. Respondents were inquired about the awareness level of the project. A significant number of respondents (92%) were aware regarding the construction of motorway M-4

and only8% were those who had no prior knowledge of the project as reflected in **Table 4.63**.

Table 4.63: Awareness about the Project

Sr. No.	Awareness About the Project	Number of Respondents	Percentage (%)
1	Yes	92	92
2	No	08	08
Total		**100**	**100**

268. **Figure 4.18** shows the graphic view of respondent's awareness about the proposed project.

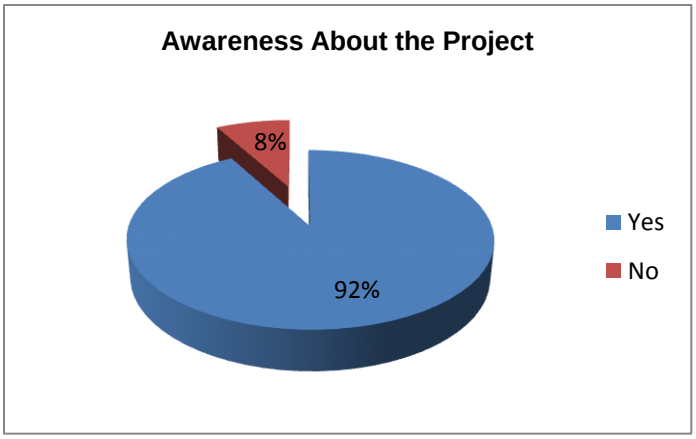


Figure: 4.18: Awareness Regarding the Proposed Project

xiv) Acceptability of the Proposed Project

269. Majority of the respondents (82%) were in favor the construction of M-4 Motorway, and 18% cases/ responses were against the construction of the proposed project keeping in view its impacts and consequences on their livings as shown in **Table 4.64**.

Table 4.64: Respondents in the Favor of the Project

Sr. No.	Frequency of Project Acceptability	Number	Percentage(%)
1	Yes	164	82
2	No	36	18
Total		200	100

270. **Figure 4.19** reveals the acceptability level of respondents regarding the proposed project.

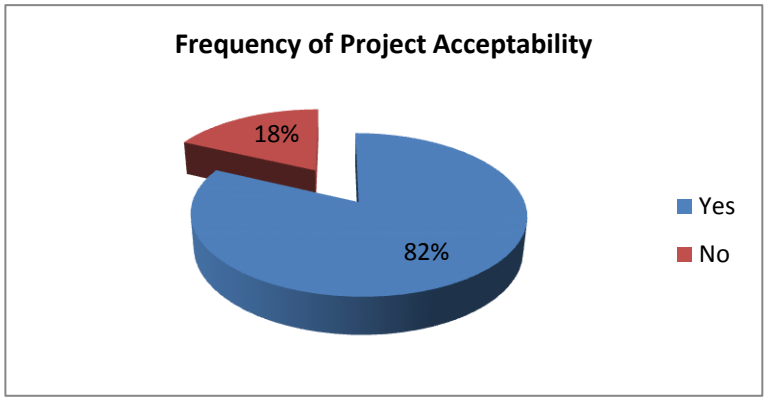


Figure 4.19: Acceptability of Respondents for Project

xv) Female Organization/Association in Project Area

271. Study results indicate that there was not a single Female Organization/Association working in the project area.

Table 4.65: Female Organization/Association in Project Area

Sr. No.	Female Association/Organization	Number of Respondents	Percentage (%)
1	Yes	0	0
2	No	100	100
Total		**100**	**100**

xvi) Pressing Needs in the Project Area

272. Survey outcomes showed that the Project area lacks the basic amenities such as Water Supply, Clean Drinking Water, Sui gas, Infrastructure, Schools and Hospitals as depicted in **Table 4.66**. It shows that the Sui Gas facility was the most desired need by 32% of the total sampled women. Whereas, 22% respondents expressed the need for hospitals, 17% responses for the development of physical infrastructure like roads network, 13%for schools in the nearest vicinity. Likewise, 12 percent respondents were deprived of clean drinking water and 03% asked for the provision of electricity in their respective villages.

Table 4.66: Pressing Need of the Area

Sr. No.	Pressing Needs	Number of Respondents	Percentage (%)
1	Sui Gas	100	32
4	Hospitals	69	22
3	Infrastructures	53	17

Sr. No.	Pressing Needs	Number of Respondents	Percentage (%)
5	Schools	42	13
6	Clean Drinking Water	38	12
2	Electricity	10	03
Total		**312**	**100**

*Multiple responses

273. **Figure 4.20** depicts the graphical representation of pressing need of the project area of influence.

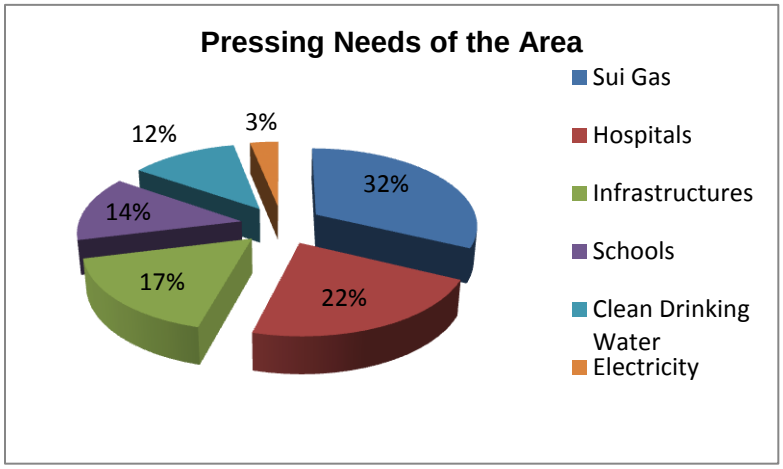


Figure: 4.20: Pressing Need of the Area

xvii) Perceived Impacts

274. Study findings depict the attention towards various perceived impacts by the respondents related to implementation of proposed project. About36% responses were that it will cause increase in dust and noise pollution during construction phase. Around 11% of the respondents showed concerns regarding loss of Income due to their land acquisition. Moreover, they were 11% concerned about the loss of Income as construction of proposed motorway will bisect their agriculture land into separate portions which is the main source of income in villages. While, 24%respondents were those who considered that project will bring job opportunities for the local people. On the other hand,14% think that it will cause difficulty in mobilization during construction phase of the project. While 11% and 9% of the respondents were of the views that this difficulty in mobilization will may cause in increase chances of accidents. Similarly, 10% considered that project will be beneficial at national level as it will boost the trade within country. Only 4% of the respondents did not give any response regarding the implementation of the projects.

Table 4.67: Perceived Impacts

Sr. No.	Perceived Impacts	Number	Percentage (%)
1	Increase in Dust and noise pollution	42	18
2	Loss of Income	26	11
3	Increase in job opportunities	56	24
4	Inconvenience to Commuters during Construction Stage	33	14
5	Accident rate will be decreased	27	11
6	Beneficial for the public as well as for development of area	24	10
7	Difficulty in Travelling	21	9
8	No Impacts	9	4
Total		**238**	**100**

* Multiple Responses

275. **Figure 4.21** reveals the perceived impacts by respondents consulted during the field survey.

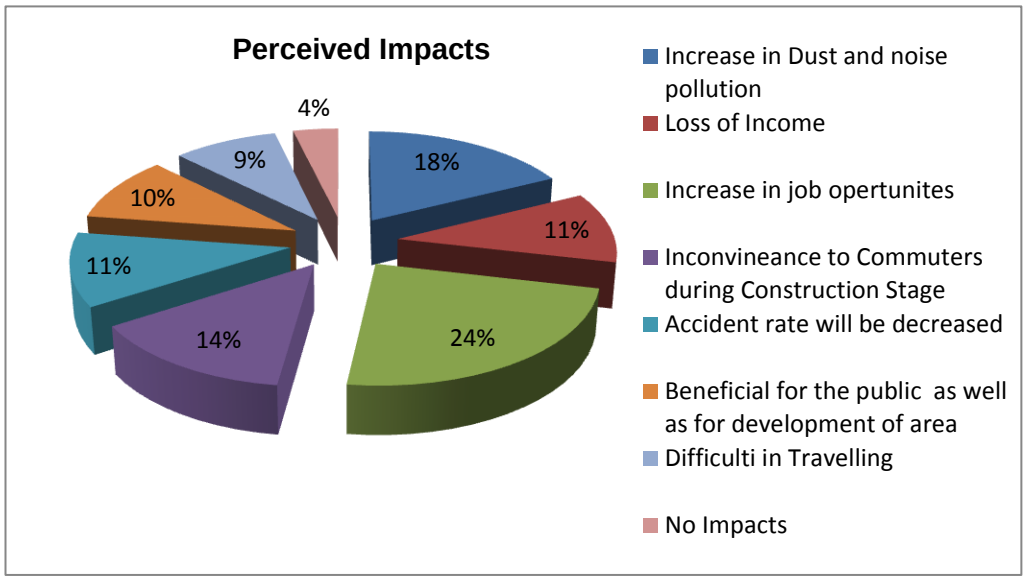


Figure 4.21: Perceived Impacts

xviii) Protective Measures Suggested by the Respondents

276. **Table 4.68** indicates that 78% respondents emphasized on provision offair compensation at current market rates in case of their loss of agricultural land or any other physical assets.Whereas,13% respondents demanded for provision of land for land and 10% responses were about to provide alternate route during the construction phase to avoid mobility issues.

Table 4.68: Protective Measures

Sr. No.	Protective Measures	Number of Respondents	Percentage (%)
1	Fair Compensation	87	78
2	Provision of Land for Land	14	13
3	Provision of Alternate Route	11	10
Total		**112**	**100**

* Multiple Responses

277. **Figure 4.22** represents the graphical representation of protective measures suggested by the respondents.

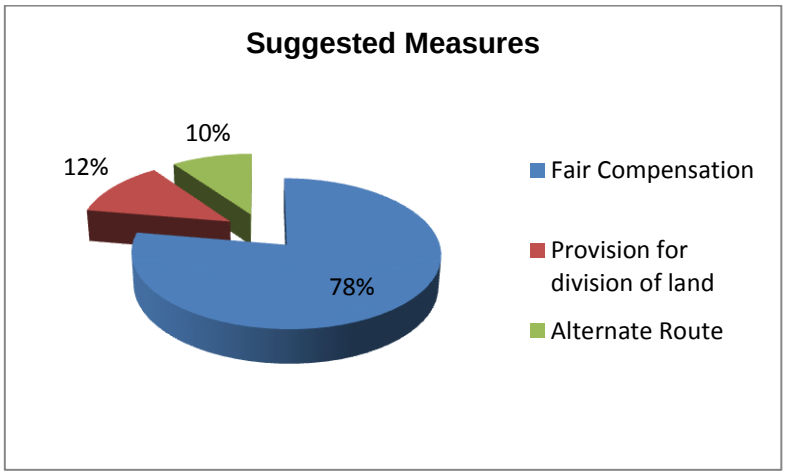


Figure 4.22: Protective Measures Suggested by the Respondents

4.4.25 Resettlement Issue

278. During the detailed field visit resettlement issues were critically observed. During the survey it was identified that designer has tried to avoid the settlements. During the detailed field visit it was found no archaeological site or graveyard, no any other structure of religious value or cultural importance is going do be demolished due to the execution of the proposed project. Only one Jamia mosque in Shorkot tehsil adjacent to a farm house needs relocation. Almost 200 house and 20 shops will need relocation for execution of the project. 80% of these houses are pacca (cement and brick masonry) and 20% of these houses are made of mud and bricks.

4.4.26 Non-Governmental Organizations (NGO's)

279. In these districts and particularly in rural areas of these districts no international NGO's is working. The only non government organization working in these rural communities is Punjab Rural Support Program. The main focus of this organization is on agriculture, health and infrastructure.

SECTION 5

PROJECT ALTERNATIVES

5.0 General

280. It is very important to evaluate different alternatives to arrive at the best possible option. Different alternatives were taken into consideration at the design stage of the proposed Project at the time of performing the EIA for the complete alignment and they are briefly described in the following paragraphs:

5.1 Alternative-1: No Project

281. According to the Traffic Projection Survey, it is estimated that in the future years, large number of people will be using the Faisalabad-Khanewal Motorway (M-4). According to the survey, total daily traffic will increase and attain rate of 7.49 per cent per year up to the year 2010 and it will be 7.08 per cent up to the year 2020. At the start of operation of the proposed Project, it is estimated that there will be approximately 13,035 vehicles using the proposed Motorway Project.

5.2 Alternative-2: Pindi Bhattian **to D.G. Khan Motorway (NHA Selected Alternative) - Motorway Length 370 kms (approximately)**

282. This Corridor was preferred by National Highway Authority. From PindiBhattian, it passes well to the north and west of Faisalabad, and then south westwards past Jhang about 15 kms to the north west of that town. It then leads straight to the City of Shorkot and crosses the River Chenab on a new bridge near the existing pontoon bridge. From this bridge, it leads south west across the Thal Desert to the River Indus approximately 25 kms downstream of the Taunsa Barrage. Having crossed the River Indus, it skirts the west and south of D.G. Khan allowing for future connections to Gawadar, Karachi etc.

5.3 Alternative 3: PindiBhattian to D.G. Khan Motorway (Punjab Government Selected Alternative) - Motorway Length 375 kms (approximately)

283. The Corridors preferred by NHA and the Government of Punjab are co-incident from PindiBhattian to Shergarh in the Thal Desert. From Shergarh, the option selected by the Government of Punjab follows the right bank of the River Chenab passing Muzaffargarh to the north-west and crossing the River Indus 15 kms south of the existing bridge. The suggested alignment then swings to west 20 kms south west of D.G. Khan.

5.4 Alternative 4: PindiBhattian to D. G. Khan Motorway (BCEOM and NESPAK Selected Alternative) – Motorway Length 405 kms (approximately)

284. This Corridor was proposed by BCEOM (French Engineering Consultants) and NESPAK (a joint venture). It was divided into the following three Sections and in each section (with the exception of Section 3) four alternatives were taken into consideration.

Section 1: Pindi Bhattian – Shorkot Cantonment

285. Within Section 1, the following four possible alternatives were considered as A, B, C and D:

Alternative A passes west of Faisalabad and then swings west towards Jhang before turning south to Shorkot Cantonment;

Alternative B follows the same route as Alternative A as far as Faisalabad and then takes a shorter direct route to Shorkot Cantonment;

Alternative C from PindiBhattian passes Faisalabad to the east and then turns sharply to the west to join Alternative B; and

Alternative D follows the same route as Alternative C to Faisalabad and then takes a shorter direct route to Shorkot Cantonment.

Section 2: Shorkot Cantonment – Muzaffargarh

285. Within Section 2, the following four possible alternatives (A, B, C, D) were considered:

Alternative 'A' strikes west from Shorkot Cantonment to cross the River Chenab downstream of the existing pontoon bridge to the west of the City of Shorkot. It then passes through the thinly populated area referred to as the Thal Desert before turning south to the west of Multan. This alternative avoids a crossing over the River Ravi.

Alternative 'B' strikes south from Shorkot Cantonment crossing the River Ravi near the existing bridge and then swinging south west to pass to the north and west of Multan near the airport.

Alternative 'C' follows the same route as Alternative B but continues south passing to the north of Khanewal and south and east of Multan.

Alternative 'D' takes a south to south easterly direction from Shorkot Cantonment crossing the River Ravi upstream of the existing bridge and continuing south of Khanewal to join Alternative C to the south-east of Multan.

Section 3: PindiBhattian – Shorkot Cantonment

286. This section crosses both the River Chenab and River Indus. The constrains imposed by these major physical features are such that it was felt that advantage had to be taken of the existing investment in, for instance, the extensive training works. No alternatives are therefore proposed. The only feasible route is along the existing corridor. All the above Sections and the corresponding alternatives were compared on the basis of these criteria i.e. length, traffic, hydrology and major bridges. The results obtained through the comparative analysis indicated Corridor C as preferred alternative in Sections 1 and 2. In Section 3, only the existing corridor was considered and was retained.

5.5 Alternative 5: Sheikhupura – Multan – D. G. Khan Motorway

287. The Sheikhupura – Multan – D.G. Khan section of Pakistan Motorway would start from Lahore – Islamabad section of Motorway in the vicinity of the city of Sheikhupura and move in the south-westerly direction, crossing Sheikhupura – PindiBhattian Road on the eastern side of Farooqabad Town. The existing Lahore – Sheikhupura – Faisalabad Road is crossed by the Project Motorway on the eastern side of the town of Manawala. Traversing through the agricultural areas, the alignment passes almost midway between the city of Faisalabad and Jaranwala Town. Passing south of Faisalabad and after crossing over the Faisalabad – Dijkot Road, the alignment takes west wardly turn to bypass the town of Gojra from north-western side. After crossing Jhang – Toba Tek Singh Road, it passes almost midway between Shorkot City and Shorkot Cantonment avoiding the sensitive defence related area. The River Ravi is proposed to be crossed between old Sidnahi and New Sidnahi barrage where river bed is well-defined, stable and straight. Passing almost midway between Khanewal and Kabirwala, the alignment crosses over National Highway (N-5) near Khanewal before moving further towards the city of Multan. While passing south of Multan, various radial roads such as Multan – Jahania, Multan – Dunyapur, Multan – Bahawalpur (N-5), and Multan Shujahabad are crossed over by this Motorway. Between Multan and D.G. Khan, the Motorway are east-west, crossing the Rivers Chenab and Indus 8-10 kms downstream of the existing bridge.

288. The total Motorway length has been calculated as 402 kms approximately and divided into four sections as described below:

From M-1 near Sheikhupura to Faisalabad – Dijkot Road, length 103 kms (approximately)

From Faisalabad – Dijkot Road to Shorkot – Shorkot Cantt, length 102 kms (approximately)

From Shorkot – Shorkot Cantt Road to Multan – Bahawalpur Road, length 112 kms (approximately)

From Multan – Bahawalpur Road to D.G. Khan – Karachi Road (N-55), length 85 kms (approximately)

5.6 Alternative 6: Faisalabad – Khanewal Motorway (M-4)

289. This option was selected by considering the factors such as low resettlement cost, less environmental damage and mitigations cost, high speed, safe, shorter distance and the linkage with existing Pindi-Bhatiyan-Faisalabad Motorway. As this Motorway Project consists of complete new alignment therefore there will be no disruption to the existing traffic system during construction. The construction of the proposed Motorway will lessen the burden of the existing Faisalabad-Khanewal road and will also decrease travel time for non-stop travellers from Faisalabad to Kanewal and other cities close to interchanges. It will also minimise resettlement of structures and other utilities. Provision of new Interchanges at various road crossings will facilitate the traffic joining Motorway and leaving it.

5.7 Project Alternatives and Impacts on Environment, Social and Economic Conditions

290. All the above mentioned alternatives were considered with respect to their impacts on environment, social and economic conditions. Table 5.1 presents summary of these alternatives and their respective impacts.

Table 5.1: Comparative Analysis of Different Project Alternatives

Project Alternatives	Impacts		
	Environmental	**Social**	**Economic**
Alternative 1: No Project	Increased air and noise pollution due to traffic jams on the existing Faisalabad – Khanewal Road – Higher emissions of CO, NO_x, SO_x, PM_{10}, Volatile Organic Compounds (VOC), and Photochemical Oxidants will affect the environment in the following ways: ▪ Damage to plants by choking the leaf pores and restricting photosynthesis; ▪ Impairment of atmospheric visibility affecting transportation safety; ▪ Deterioration of aesthetic quality of atmosphere, land and water; ▪ Soiling of materials, physical properties and infrastructure; ▪ Chlorosis and Plasmolysis in plants; ▪ Damage to materials and property, by acid rains, resulting from oxidation of	▪ Longer travelling times ▪ Traffic accidents ▪ Health impacts due to air and noise pollution caused by increased traffic load on the existing Faisalabad – Khanewal Road	The increased traffic load on the existing Faisalabad – Khanewal Road in future will not only cause traffic jams but also deteriorate its condition thus affecting trade activities in different parts of the country. This will be a major economic impact. Other associated impacts include increased fuel cost and wear and tear of vehicles.

Project Alternatives	Impacts		
	Environmental	**Social**	**Economic**
	sulphur oxides to sulphuric acid, after reacting with water vapours; ▪ Formation of photochemical oxidants; ▪ Damage to materials and property, by acid rains, resulting from oxidation of oxides of nitrogen to nitric acid, after reacting with water vapours; ▪ Retardation of growth in plants; ▪ Leaf discoloration and cell collapse in plant; and ▪ Damage to rubber, textiles, paints and other materials.		
Alternative 2: PindiBhattian – D.G. Khan Motorway (National Highway Authority Alternative) – 370 kms	▪ It will pass through the unproductive Thal Desert for a distance of 75 kms. ▪ Positive impacts on air and noise during the operation phase	▪ Little land acquisition and compensation. ▪ Considerable distance from N5, being at the closest a distance of 45 kms away from Multan. ▪ It will not provide easy or short length access to Multan, Muzaffargarh and Khanewal.	▪ It will open-up new areas for Industrial Development subject to the provision of necessary infrastructure support. ▪ This route would include two of the most expensive and time-consuming bridge river crossings over the Indus and Chenab, which could jeopardize the implementation schedule.

Project Alternatives	Impacts		
	Environmental	**Social**	**Economic**
			▪ Less attractive to intercity traffic. ▪ Having crossed the River Indus, it skirts the west and south of D.G. Khan allowing for future connections to Karachi, Gawadar etc.
Alternative 3: PindiBhattian – D.G. Khan Motorway (Punjab Government Alternative) – 375 kms	▪ It will pass through the Thal Desert area for a distance of 75 kms immediately west of the Chenab River. ▪ Positive impacts on air and noise during the operation phase	▪ It is well away from N5. ▪ No easy or short access to Khanewal.	▪ It will open up new areas for possible development. ▪ This alignment will pass closer to both Multan and Muzaffargarh at 20 kms and 10 kms respectively. ▪ It will demand a new link road to Multan and for this purpose requiring a new bridge over the Chenab River ▪ It will demand three expensive bridges over crossings. ▪ Less attractive for the development of inter-city traffic. ▪ Technical risks on these river crossings could jeopardize the overall implementation schedule.
Alternative 4: PindiBhattian - D.G. Khan Motorway	Positive impacts on air and noise during the operation phase	▪ The proposed will pass closer to the major population centres	▪ It will promote the most economical bridge over

Project Alternatives	Impacts		
	Environmental	**Social**	**Economic**
(BCEOM-NESPAK alternative) – 405 kms		throughout the province of Punjab and ease their links with the capital Islamabad. ▪ This Motorway Corridor will serve the maximum number of potential Motorway users. ▪ It will provide a by-pass route to the towns of Faisalabad and Multan. ▪ The likely impact on acquisition and compensation for agricultural lands is more than for Alternatives 2 and 3.	crossings in terms of both capital expenditure and time of construction period. ▪ This Motorway Corridor will best serve the present inter-city traffic and will allow for the development of services once constructed. ▪ By locating the proposed M1 (referred to as Lahore – Islamabad Motorway in 1992) and M3 (referred to as PindiBhattian – D.G. Khan Motorway in 1992) Motorway interchange at 15 kms short of PindiBhattian and passing south of Faisalabad, it will make this corridor more attractive for Lahore to Faisalabad traffic. ▪ It will not be the shortest route from Islamabad to Karachi.
Alternative 5: Sheikhupura – Multan-D.G. Khan Motorway (BCEOM-NESPAK alternative) – 402 kms	▪ It will traverse through the flat agricultural areas where numerous villages are located. The proposed alignment will help in maintaining sufficient desired distance from the villages all along the alignment and thus results in minimum	▪ The Motorway alignment has been fixed keeping in view the extent of the existing urban areas and possible future extensions in foreseeable future. ▪ After crossing Jhang – Toba Tek Singh Road, it will pass almost	▪ Combination of the already planned interchange on Sheikhupura – Gujranwala road with the new interchange required for this Project will result in a very complicated and expensive arrangement.

Project Alternatives	Impacts		
	Environmental	**Social**	**Economic**
	disturbance to the village life. ▪ The alignment will be aesthetically pleasing and will blend well with topography. ▪ Positive impacts on air and noise during the operation phase	midway between Shorkot city and Shorkot cantonment avoiding the sensitive defense related area. ▪ The city of Sheikhupura itself is on the southern side not very far from M1 (referred to as Lahore – Islamabad Motorway in 1992) alignment, which makes it difficult to create another take off point for the project motorway because otherwise built up area shall have to be acquired. ▪ The motorway end point has been selected on Indus Highway (N-55) about 8 kms south of D.G. Khan well clear of existing urban area and to allow for future expansion of the city.	
Alternative 6: Faisalabad – Khanewal Motorway (M-4) – 184 kms	▪ Positive impacts on air and noise during the operation phase ▪ Less environmental damage. ▪ Less mitigation cost	▪ It will reduce traffic congestion and travel time by providing safe and good quality route for movement of people and goods. ▪ It will minimise resettlement of structures and other utilities.	▪ The Motorway will enhance economic development by providing high speed safe trade corridor for the movement of goods and passengers to and from other areas of the Province. ▪ Less fuel consumption ▪ Less wear and tear ▪ Due to shorter route

Project Alternatives	Impacts		
	Environmental	**Social**	**Economic**
			comparatively less resettlement of structures ▪ Comparatively low resettlement cost.

5.8 Selection of the Preferred Alternative

300. The alternatives (2-5) were studied in the year 1992 for the Motorway (M-3) from Pindi-Bhattian to D. G. Khan (later named as Sheikhupura – Multan - D.G. Khan Motorway). Frequent changes have been made ever since. M-1 (formerly used for Lahore – Islamabad Motorway) was replaced with M-2. M-1 is now meant for Islamabad – Peshawar Motorway, which is now operational. M-3, being approved by NHA, was supposed to start from Sheikhupura and end all the way up to D. G. Khan. But later on, the former M-3 (PindiBhattian to D.G. Khan Motorway) was confined to PindiBhattian – Faisalabad Motorway with modifications in the design especially in the Section between PindiBhattian to Faisalabad. M-4 (the preferred alternative) is a part of the formerly known M-3 Project (PindiBhattian to D.G. Khan), and it will start from Faisalabad and end at Khanewal while traversing along a number of cities such as Gojra, Toba Tek Singh, Shorkot Cantt and Kabirwala. Minor modifications have been made especially near Faisalabad and rest of the route follows the same route as approved by NHA under the M-3 Project (Sheikhupura – Multan – D. G. Khan). As already discussed, most of the alternatives are merging at Gojra. Through the construction of M-4, the route from Faisalabad to Gojra will be the shortest. The major reason for changes in the design was to reduce cost by shortening the length and minimizing resettlement as environmental impacts envisaged were nearly the same for all options.

SECTION 6

ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

6.0 General

301. This section identifies the overall impacts of construction/operation works on the physical, biological and socio-economic environment of the Project Area. This assessment also includes the impact of traffic volume due to improved road conditions. In addition, it also narrates the measures that will mitigate the Project's adverse environmental effects.

Following is a description of the perceived environmental impacts (positive/negative) of the proposed Project with their proposed mitigation measures.

6.1 Project Corridor

302. The Project corridor is delineated according to two criteria: right of way (RoW); which the NHA is legally entitled to, and Corridor of Impact (CoI), i.e. the width of the corridor that will be impacted, directly or indirectly, by the proposed Project during the construction and operational phases.

a) Project Right of Way (RoW)

303. The proposed Project corridor will have a well defined RoW that will be 100 meters (328 ft) for the entire length of the Motorway except interchanges where RoW will be 300 meters (984 ft). Major construction works will generally remain confined within the RoW. All the infrastructure and commercial activities within the existing or proposed RoW need to be relocated as they will have direct impact of the Project.

b) Corridor of Impact (CoI)

304. The corridor of the proposed Impact (CoI) was delineated as the extent, which has direct or indirect impact of Project. Direct impacts of the Project are relocation of houses, utilities and air and noise pollution impact on workers during construction. All direct impacts are constrained within the RoW. Indirect impacts, caused by noise, dust emissions, camp sites and borrow sites could be beyond the RoW. The direct CoI of the surface water bodies will be confined within the RoW of the proposed Project and will be temporary only for the construction period. Cumulative impacts have been studies/modelled separately and are annexed in Annexure V.

6.2 Pre-Construction/Design Phase

305. Following is the brief description of impacts envisaged during the Pre-construction/ Design Phase:

6.2.1 Topography

306. The topography in the Project Area will change to some extent because of construction of the proposed Project related structures such as embankments, culverts etc. Visual changes to the topography would be permanent and minor negative in nature. However, the aesthetic elements (such as plantation) will be incorporated in the design to overcome the impacts.

6.2.2 Soil Erosion and Contamination

307. Soil erosion will take place around road cuttings and embankments, which will be mitigated by incorporating the following measures in the design:

- The provision for vegetation with a fast growing crop and a native seed mix immediately after fill placement to prevent scour and to encourage stabilization will be made in the design. Use of stone pitching or riprap will also be provided in the design at appropriate places especially around flyovers, bridges, culverts;
- Provision for rip-rap in discharge zones from drainage structures will be made in the design to reduce erosion;
- Down drains/chutes will be lined with rip-rap/masonry or concrete to prevent erosion;
- Side slopes will be adjusted to a gradient necessary to reduce erosion potential or, if steeper, stabilized, covered with riprap or other material to prevent soil erosion; and
- The proposed Project Site, through which the alignment is proposed, will be investigated for the presence of naturally occurring contaminants such as asbestos, arsenic; likelihood of erodibility of soil; contours, terrain stability, slope gradient; physical and chemical properties of soil such as soil depth, particle size distribution, permeability, dispensability, pH, salinity; and likelihood of seismic activity. If any contaminated soils are found, they shall be removed and deposited in a sealed pit in an area agreed with the concerned authority. The seismic factor shall also be considered at the design stage.

6.2.3 Land Acquisition and Resettlement

308. The major issue in the proposed Project at this stage will be land acquisition and resettlement. This will result in landlessness, homelessness, joblessness, marginalization, loss of access to common property resources, food insecurity, morbidity and mortality, and social disarticulation due to land acquisition and severance (blocking access across it due to be being fenced on both sides). Though, effort has been made to avoid relocation of houses while selecting the alignment of the proposed Motorway. Even then the land acquisition and resettlement will take place for those affected by loss of agricultural land (most of the owners with small landholdings) and associated infrastructures (farm houses, tube wells, poultry farms etc.).

309. The proposed Motorway will be constructed on a new alignment for which about 4794 acres of land will be acquired. The current land acquisition process and procedures are

not adequate enough to ensure fair and justifiable compensation to the affectees. Serious negative impacts may result if proper mitigation measures are not adopted.

310. The most significant impact of the Project is the taking of about 4794 acres of agricultural land out of production. The loss in production will be met with by increasing the yield from fields in the agricultural sector. Orchards lost to the Project will also have to be raised by the private owners of land. However the owners of land whose land is to be acquired and the neighbouring farmers will be helped to gain access to modern technology to increase production from their land. Similarly the deficiency in livestock feed/fodder will have to be met from the adjoining areas.

311. This impact would be permanent and major negative in nature and the mitigation measures will involve careful alignment and route selection by the designer to minimise the impact. Also adequate budget will be provided in the Project cost for the compensation to the affected people as per Land Acquisition Act, 1894 and ADB's Resettlement policy 2009 for the lost assets and restoration of their livelihoods.

312. Entire Motorway Project will be fenced except at the interchanges; therefore, it will not cause substantial increase in the price of land. It is expected that land values will increase near interchanges. This Impact would be a minor positive in nature.

313. During the field visits to the Project Area, resettlement issues were critically observed. During the route survey care was taken to avoid the settlements. About 200 mud/ brick structures will be demolished. During field visits, it was found that no archaeological site or graveyard, nor any other structure of religious value or cultural significance is going to be demolished due to the execution of the proposed Project. Only one Jamia Mosque at Shorkot Tehsil adjacent to a farm house needs to be relocated.

314. The mitigation measures for this have been included in the land acquisition plan (LARP) for the project. :

6.2.4 Flora

315. It has been estimated that a total of 18,000 trees will be felled from the agricultural fields in the entire Project Area. This loss will be compensated by planting strips on both sides of the motorway which, on an average, are estimated to be about 25 meters wide.

316. Compensatory Planting shall be done in rows (avenues). Eight avenues with a row to row distance of 3 meters shall be planted for a length of 50 km near the habitations and four avenues with row to row distance of 6 meters in the rest of the 134 km long strip thus covering the whole length of the Motorway section. A total of 623,984 (311,992 in each strip on both sides of the road) saplings shall be planted. Planting shall go hand in hand with the construction of the road structure. Planting of this nature and extent shall be a huge task and will have to be outsourced. The executing agency is advised to plan in advance for the procurement of planting stock in consultation with the Provincial Forest Department. Permission from the Forest Department will also have to be sought for cutting trees from the roadside or along the water courses if these fall within the ROW. Planting will be done as soon as the construction of the road is completed.

Maintenance is the key to the establishment of the plantation. Regular monitoring of plantation will be carried out by the executing agency. Any failures will be immediately beaten up. 25% is the usual percentage provided for beating up of failures.

317. After the Project Area is fenced, the natural vegetation shall establish itself. The indigenous trees most suited to the tract like Shisham, Kikar, Bakain, Dharek, Siris (*Albizzia procera*), Farash, Sukh chain, Jaman, Bohar, Peepal (Ficus reliogosa), Gullahr (*Ficus glomerata*), Sohanjana *(Moringa oleifera*), Karir and Wan (*Salvadora oleoides*) are helpful in providing shade, ground cover, aquifer recharge, and habitat (including shelter and food) for the wildlife. The compact plantations shall be effective live screens against night glare, dust, noise and pollutant emissions. These vegetated strips shall develop into a complete ecosystem. Flowering and fruiting shrubs will be planted along the road to beautify the landscape. Planting will however be done keeping in view the principles of landscape designing.

- A total of 623,984 (311,992 in each strip on both sides of the road) sapling trees will be planted
- Raised Median will be planted with grasses and shrubs which may not attain height more than two meters. This planting could provide an effective protection against night glare besides beautifying the area;
- The compact plantation will be done on both sides;
- Regular monitoring of plantation will be carried out by the Forest Department and any failures will be immediately beaten upto 25%;
- The indigenous trees most suited to the tract like Shisham, Kikar, Bakain, Dharek, Siris (*Albizzia procera*), Farash, Sukh chain, Jaman, Bohar, Peepal (Ficus reliogosa), Gullahr (*Ficus glomerata*), Sohanjana *(Moringa oleifera*), Karir and Wan (*Salvadora oleoides*) will be planted;
- If a tree of rare species is growing within the ROW and is required to be removed, it will not be felled but uprooted and transplanted in close consultation with the Forest Department;
- All old and mature trees falling in the 25 meter wide proposed planting strips will be saved. Effort will be made to save as many trees as possible even if they are young or poll stage. Proper irrigation and maintenance of plants will be ensured;
- An awareness campaign targeted on the neighborhood farmers will be carried to popularize the planting of trees; and
- Organic farming will be encouraged to minimize the use of chemical fertilizers and pesticides.

318. In section-II of M-4 it has been estimated that a total of 52610 trees will be felled from the agricultural fields in the Project Area, on both sides of the motorway trees will be planted in rows with a distance of 4m in a 62 km long section. A total of 93000 (46500 number of plants will be raised on one side of RoW) Planting will be done as soon as the construction of the road is completed. 25% is the usual percentage provided for beating up of failures. The indigenous species will be planted

6.2.5 Change in Hydrologic Regime

319. As the proposed Motorway does not pass through any flood prone areas therefore, no change in hydrological regime will occur. The Motorway will cross the Ravi River and Sadhnai Canal, while this crossing will be carried out by bridges therefore no change in water flow pattern will be caused. For the crossing of canals and drains small bridges will be constructed. For the crossing of water courses, culverts and other possible arrangement will be done. The direct CoI of the surface water bodies will be confined within the RoW of the Project, and it will be minor and temporary in nature.

320. Possible impacts are temporary and minor negative, however following mitigation measures will be incorporated:

- Proper design of bridges on Ravi River and Sadhnai canal to accommodate design flows;
- Small bridges will be constructed on canals and drains coming in the RoW;
- Provision of box culverts to control flood damages and provision of safety of embankments; and
- Provision of sufficient sizes of drains to take design flows.

6.2.6 Water logging and Salinity

321. Almost 3-5% of the land along the Proposed Project corridor Section was seen affected by water logging and salinity. The waterlogged areas are more than 1 km far from the proposed Motorway therefore it is obvious that it will not affect the proposed Project. However to keep effective drainage system, pipe and box culverts at suitable location will be provided in the design.

6.2.7 Restricted Access Problems

322. As the Proposed Motorway will be fenced therefore the communities along the alignment will face crossing problems. This is a major negative impact due to the proposed Project. To mitigate this impact, underpasses and flyovers will be provided in the design at the shorter distances and at places wherever there are existing crossing paths.

6.2.8 Public Utilities

323. Due to the proposed Project, public utilities will be affected creating disruption of public services and inconvenience to the local residents. This impact is temporary and may be considered as moderately negative in nature. Mitigation measures will include:

- Provision in the design and budget for the relocation of the existing utility infrastructures wherever required; and

- All public utilities (e.g. water pipes, power/ telephone lines likely to be affected by the proposed Motorway will be relocated well ahead of time before the actual commencement of the construction work.

6.2.9 Noise Problems

324. Fast movement of vehicles on the Proposed Motorway will create excessive noise for the communities along the alignment which will be a cause of disturbance for them. This will be a moderate negative impact. To mitigate this impact noise barriers will be constructed wherever there will be populated area within 500 meters along the route by thick plantation or constructing sound barriers wherever possible. Provision of thick plantation of about 25 kms for each side will be provided.

6.3 Construction Phase

325 Following is the brief description of impacts envisaged during the Construction Phase:

6.3.1 Topography

326. As a result of construction, topography of the Project Area will be changed. One of the important activities during construction will be the cutting and dismantling of existing infrastructure and borrow areas that will have impact on the topography of the Project Area.

327. This impact is temporary and minor negative in nature. Mitigation measure for this impact is proper landscaping. All the affected areas will be restored to their original levels.

6.3.2 Borrow/ Open Pits

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

329. Borrow/ Open pits may also become potential sources of mosquito breeding and may prove hazardous to human beings, livestock and wildlife. This will also degrade hygienic condition of the Project Area.

330. This impact is permanent and moderate negative in nature. Mitigation measures will include:

- Necessary permits will be obtained for any borrow pits from the competent authorities;
- In borrow pits, the depth of the pits will be regulated so that the sides of the excavation will have a slope not steeper than 1: 4;

- Soil erosion along the borrow pit will be regularly checked to prevent/ mitigate impacts on adjacent lands;
- In case borrow pits are filled with water, measures have to be taken to prevent the creation of mosquito-breeding sites; and
- Borrow pits will be used for construction waste, but during the excavation, top 20 cm soil cover will be preserved for vegetation after the filling of the pits. This is the best way to restore the flora of that area.

6.3.3 Air Quality

331. Air quality may be affected from the following sources:

- Construction machinery;
- Hydrocarbons from asphalt plants and vehicular traffic;
- Dust emissions due to movement of construction machinery on earthen service roads.

332. Impacts of air emissions may be carried over long distances depending upon the wind speed, direction, temperature of the surrounding air and atmospheric stability. Emissions from crushers and quarry sites will cause health impacts, i.e. coughing, flue, difficulty in inhaling, irritation in eyes and reduction in visibility. This impact is temporary and major negative in nature.

333. Mitigation measures will include:

- Dust control by equipping asphalt hot mix and batching plants with fabric filters or wet scrubbers to reduce the level of dust emissions;
- Asphalt hot mix and batching plants will be located 1 Km away from the residential areas, schools and hospitals;
- Surface treating or overlaying diversion tracks with shingle, and sprinkling water across diversion tracks;
- Ensuring that haul trucks carrying aggregate fill materials are kept covered with canvass sheet to help contain construction material being transported between sites;
- Enforcing the NEQS applicable to gaseous emissions generated by construction vehicles, equipment and machinery;
- Dust mask will be provided to the workers. Proper dust collection system will be ensured at crushers and continuous sprinkling of water; and
- Air Quality Monitoring will be carried out as per schedule given in Environmental Monitoring Plan

6.3.4 Construction Waste Disposal (Wastewater, Oil, Solid Waste etc.)

334. Due to construction activities waste will be generated at construction and contractors camp site. The construction waste will include wastewater, oil spillage from machinery and solid waste etc. This will result in unhygienic conditions, health risk to work force and general public at the camp site.

335. Following are the types and sources of construction waste:

- Oil, grease etc. from construction machinery;
- Solid waste from waste construction material and food;
- Wastewater from washing and sprinkling; and
- Sanitary waste from staff toilets.

336. This impact is temporary and moderate negative in nature. Mitigation measures will include:

- Wastewater effluent from contractor's workshop and equipment washing yards would be passed through gravel/ sand beds to remove oil/ grease contaminants before discharging it into natural streams;
- Waste will be disposed at designated sites and no waste will be disposed in the productive agricultural field;
- The hazardous waste will be transported to nearby incineration facility;
- Solid Waste generated during construction will be safely disposed in approved and demarcated waste disposal sites and the contractor will not dispose waste into productive agricultural lands and will also provide a proper waste management plan;
- Sanitary wastes generating from staff and labour camps must be disposed of in environment friendly manner, i.e. provision of septic tank etc. for toilet wastes; and
- Aggregate waste material of existing road will be reused in up-gradation of road.

6.3.5 Siting of Construction Camps and Other Facilities

337. The precise locations for construction camps and other facilities such as workshops, equipment washing yards, borrow pits, quarries, crushing plants, asphalt plants, batching plants, construction material storage areas, haul routes and disposal sites for construction waste will be finally decided by NHA in consultation with Contractors. However, the siting of these facilities may cause a number of issues such as loss of plantation and vegetation, permanent physical and visual impact on the area, siltation and pollution risks if construction materials are extracted from the River Chenab bed. The impacts of these facilities would be temporary and moderate negative in nature, which will be mitigated by adopting the following measures:

- The construction camps and workshops shall not be located in sensitive areas and shall not be within 500 meters distance from the existing settlements;
- Efforts will be made to minimize vegetation loss while making site arrangements for construction camps and other facilities;
- Cutting of trees shall be prohibited by contractor(s) and workers near camp sites failing which three new trees will be planted by the Contractor(s) for each tree cut;
- The crushing plants shall not be located in environmentally sensitive areas or existing settlements;
- The sites for borrow pits shall be selected on the basis of type of soil strata, depth of water table, ground topography, prevalent vegetation state etc. and shall not be located within 100 meters from RoW of the proposed Project. They shall be prohibited where they might interfere with the existing or designed drainage pattern. The River locations shall be prohibited where there is greater likelihood of damaging the River bank or carrying fine material downstream. The Contractor(s) shall also ensure that borrow pits are left in a tidy state with stable side slopes and proper drainage in order to avoid creation of stagnant water bodies, which are favorable places for mosquito breeding. The depth of construction materials such as gravel removed from the River bank shall be kept one tenth of the total width of the River and this activity shall not interrupt the River flow or undermine the River banks;
- Asphalt hot mix and batching plants shall not be located within 1000 meters of the existing settlements and shall be located sufficiently away from agricultural activities, industrial establishments and sensitive areas including, but not limited to, educational and health facilities;
- Only licensed quarry operations will be used for material sources. If licensed quarries are not available then the contractors may be made responsible for setting up their dedicated crusher plants at approved quarry sites;
- The construction material storage areas shall not be located in sensitive areas and shall be sheltered or sited within hoardings;
- The Contractor(s) shall use the selected routes for transport of construction materials. Any damage caused to these routes by overloading or heavy vehicles shall be borne by the Contractor(s);
- Landowners shall be compensated according to the terms of lease agreements negotiated with them for constructing camps and other facilities; and
- The sites for camps and associated facilities shall be reinstated by the Contractor(s) after decommissioning of the proposed Project.

6.3.6 Soil Erosion and Contamination

338. The proposed Project is planned to be constructed on already fertile soil, which will be lost if not stripped, stored and reused properly. Soil erosion generally takes place where ground cover is removed and inadequately re-established. Due to construction of the proposed Project, soil erosion and contamination may take place around borrow pits, road cuttings, embankments, construction camps, workshop areas, equipment washing yards, asphalt plants, batching plants, fuel and chemical storage areas, etc. Soil erosion

and contamination may affect the road stability, increased flood risk (by more rapid and higher levels of runoff), silting up of water bodies, landscape value and in worst cases may reduce the economic productivity of land and biodiversity in the Project Area. The impacts of soil erosion and contamination would be temporary and moderate negative. The following mitigation measures are proposed to alleviate or avoid these impacts:

- Non-productive, barren lands in broken terrain, nullahs and publicly recognized waste lands shall be used for borrowing materials;
- The excavation of earth fill shall be limited to an approximate depth of 50 to 100 cm;

339. In case the use of agricultural land is unavoidable, the top 30 cm of the plough layer shall be stripped off and stockpiled. Where deep ditching is to be carried out, the top 1 meter layer of the ditching area shall be stripped and stockpiled for redressing the land after the required borrow material has been removed;

- Drainage interception ditches shall be built around the borrow pits to prevent surface run off causing erosion during the rainy season;
- The denuded ground cover shall be re-vegetated as soon as possible following fill placement to facilitate regeneration of a stabilizing ground cover;
- The road embankments and road cuttings shall be vegetated with a fast growing crop and a native seed mix immediately after fill placement to prevent scour and to encourage stabilization. Use of stone pitching or riprap shall be made at appropriate places especially around overpasses, bridges, culverts;
- Discharge zones from drainage structures shall be furnished with rip-rap to reduce erosion;
- Down drains/chutes shall be lined with rip-rap/masonry or concrete to prevent erosion;
- Side slopes shall be adjusted to a gradient necessary to reduce erosion potential or, if steeper, stabilized, covered with riprap or other material to prevent soil erosion;
- Construction shall be restricted to dry season to avoid soil erosion;
- Soil erosion checking measures such as the formation of sediment basins etc, shall be taken;
- Soil contamination by bitumen, fuel and chemical storages shall be minimized by siting them on an impervious base within an embanked area and secured by fencing. The base and walls of the embankment shall be impermeable and of sufficient capacity to contain 110 per cent of the total volume of stored fuels and chemicals; and
- The disposal of waste asphalt shall be made in approved locations such as borrow pits or natural depressions and shall not be within the RoW. Unless located in areas with impervious soils, encapsulation with pre-laid impervious liners including walls and capping is required with the objective to prevent water percolating through the waste materials and leaching toxic chemicals into the surrounding soils. On completion of disposal at the site, the area shall be capped

with a compacted thickness of at least 0.5 meters of impermeable soil covered with at least 200 mm of top soil and shall be finally landscaped.

6.3.7 Noise

340. Noise is one of the most pervasive environmental problems in the urban areas especially on the road side. Noise pollution will be due to increase in mobility and construction activity. However, this impact will be temporary but moderate negative in nature. All mitigation measures mentioned below will be taken in order to minimize the impacts of noise in the Project Area. These measures include, but are not limited to the following:

- Selection of latest equipment and plant with reduced noise level ensured by suitable in-built damping techniques and appropriate muffling devices;
- Confining excessively noisy work to normal working hours in the day;
- Providing the construction workers with suitable hearing protection like ear cap, ear muffs etc.;
- Avoiding heavy machinery like percussion hammers and pneumatic drills, especially during night time;
- Locating the rock crushing, concrete mixing and material shipment yards away from residential areas, particularly schools, hospitals and nursing homes; and
- Noise quality monitoring will be carried out as per schedule given in Environmental Monitoring Plan.

Table 6.1: Maximum Limits of Noise Levels

Noise Level dB (A)	Situation
194	Lung damage
180	Ear drum rupture
150	Absolute limit with ears protected
150	Maximum of instantaneous noise
135	Absolute maximum with ears unprotected
100	Prolonged noise causing permanent damage
90	Factory work for an 8-hour day, 5 days a week
*85	Ear protection should be worn
80	Noise on building or construction sites
70	Normal road traffic near residential areas

Source: *"Environmental Degradation"* by Engr. Col. Mumtaz Hussain

* Above 85 dB (A) ear protection devices should be worn.

Table 6.2: General Noise Levels of Machinery and Equipment

S. No.	Equipment	Noise-Level in dB (A)
1	Earth Moving Machinery	75-85
2	Material Handling Equipment	75
3	Stationary Equipment	75
4	Tools, Hammers and Drivers	80-95

Source: The General Services Administration, Construction Noise Specification, USEPA 1972

Table 6.3: Construction Equipment Noise Levels

S. No.	Equipment	Observation Point to the Source (meters)	Noise dB(A)
1	Wheeled loading	5	90
2	Grader	5	90
3	Vibration pavement roller	5	86
4	2-wheel vibration pavement roller	5	81
5	3-wheel pavement roller	5	81
6	Tire pavement roller	5	76
7	Bulldozer	5	86
8	Wheeled pneumatic dredger	5	84
9	Sprayer	5	87
10	Power generator	5	98
11	Impact drill	5	87
12	Impact pile driver	5	112
13	Truck	5	92
14	Concrete mixer	5	91
15	Concrete pump	5	85
16	Mobile lift	5	96
17	Pneumatic hammer and rock crusher	5	98
18	Breaker	5	84
19	Pneumatic spanner	5	95

Source: Guangzhou City Center Inner Ring Road Project, Environmental Assessment Report (1997)

6.3.8 Surface and Groundwater

341. Surface water might get contaminated due to the disposal of construction waste generated due to the Project activity; this contamination will not only endanger the aquatic life but will also result in jeopardizing the health of natives that use this water for meeting domestic requirement. The impact on these water bodies will be only for the period of construction and will vanish as the construction work is over. In addition to that, construction waste, if left unattended will result in forming leachate which will percolate through the soil strata and will reach underground water table and hence, will end up contaminating it.

342. This impact is temporary and minor negative in nature. Following are the mitigation measures:

- The surface and groundwater reserves will be adequately protected from any source of contamination such as the construction and oily waste that will degrade its potable quality;
- The proponent will ensure that the construction work is confined within the RoW and water bodies are prevented from pollution during construction;
- The solid waste will be disposed of in designated landfill sites to sustain the water quality for domestic requirements;
- Regular water quality monitoring according to determined sampling schedule;
- The contractor will ensure that construction debris do not find their way into the rivers, drainage or irrigation canals which may get clogged;
- Work on irrigation canal areas will be kept to a minimum, protective walls be constructed;
- To maintain the surface water flow/drainage, proper mitigation measures will be taken along the road, like drainage structures in urban areas;
- Prohibit washing of machinery and vehicles in surface waters, provide sealed washing basins and collect wastewater in sedimentation/retention pond;
- Construction work close to the streams or other water bodies will be avoided, especially during monsoon period; and
- Wastes will be collected, stored and taken to approved disposal site.

6.3.9 Flora and Fauna

343. It has been estimated that a total of 18000 trees will have to be felled from the agricultural fields in the Project Area. This loss will be more than compensated by planting strips on both sides of the motorway which, on an average, is estimated to be about 25 meters wide. After the project area is fenced, the natural vegetation shall establish itself. The indigenous trees most suited to the tract like Shisham, Kikar, Bakain, Dharek, Siris (*Albizzia procera*), Farash, Sukh chain, Jaman, Bohar, Peepal (*Ficus reliogosa*), Gullahr (*Ficus glomerata*), Sohanjana *(Moringa oleifera*), Karir and Wan (*Salvadora oleoides*) could be planted. These trees shall be helpful in providing shade, ground cover, aquifer recharge, and habitat (including shelter and food) for the wildlife. Following mitigations will be adopted: It has been estimated that a total of 27,302 trees

will be affected including both fruit and non-fruit trees from the agricultural fields in the Section - II of M-4 and 91,611 trees will be affected in Section – III. All affectees will be compensated. The details can be found in LARP of Section - II and Section – III (M-4).

- The compact plantations will be effective live screens against night glare, dust, noise and pollutant emissions. These vegetated strips shall develop into a complete ecosystem. Flowering and fruiting shrubs will be planted along the road to beautify the landscape. Planting will however be done keeping in view the principles of landscape designing;
- A raised median will be planted with grasses (turfing) and shrubs which may not attain height more than two meters. This planting could provide an effective protection against night glare besides beautifying the area;
- All old and mature trees falling in the 25 meter wide proposed planting strips will be saved. Effort will be made to save as many trees as possible even if they are young or poll stage. Proper irrigation and maintenance of plants will be ensured;
- An awareness campaign targeted on the neighbourhood farmers shall be run to popularize the planting of trees; and
- Organic farming will be encouraged to minimize the use of chemical fertilizers and pesticides.

344. Black and Grey Partridges are the only huntable species that might occur in the Project Area. Their hunting is allowed as per legislation during the hunting season to a fixed bag limit in open areas on Sundays and holidays. Any hunting outside of this is liable to be checked by the Wildlife Department staff. However such hunting shall hardly impact the wildlife populations in the area.

345. No rare or endangered aquatic faunal or floral species occur in the area. The Provincial Fisheries Department auctions fishing rights in the rivers and canals. The water reservoirs like Sidhnai are stocked with carp fingerlings. The canals are not stocked but the fish stock from the rivers escapes to canals. Fishing is not allowed without a permit and any illegal catch is liable to be punished. Reports about illegal fishing in these areas are almost non-existent. Occasional cases may be reported which may not have any significant impact on the biodiversity of the wetlands.

346. The Project will pose minor negative impact on the fauna present in the area. There is no presence of any game reserve or wild life sanctuary along the proposed alignment, therefore no negative impact will happen. However following mitigation measures will be taken:

- Illegal animal and fish hunting will not be allowed and punishment will be enforced in case of violation;
- Wildlife Department will check and confirm that no hunting is made;
- New and good condition machinery with minimum noise will be used in construction;
- Noisy work will not be carried out in night time so that there will be no disturbance to local birds and animals;

- Contractor will ensure that the no hunting, trapping of animal will be carried out during construction; and
- Borrow pits will be fenced so that no animal will fell into these.

6.3.10 Social and Cultural Problems

347. Due to construction of the proposed Project, exit/entry problems for the residents/ movement of the people to the mosque/shrines may be disturbed. However, the major issue in the proposed Project is land acquisition, which will take place in the project affected areas. This will result in loss of agricultural land, infrastructure (farm houses, tube wells, poultry farms), livelihood, loss of fertile plough layer at camp sites and associated facilities (workshops, asphalt plants etc.).

348. National Environmental Policy of the Government of Pakistan emphasizes on the achievement of environmental sustainability and poverty reduction to enhance the economic growth. Increased economic activity in the Project Area by involvement of local people in the Project related activity. Local labour will be hired, which will provide them an opportunity to develop their skills and capacities. After serving in this Project, the local will utilize their skills in future endeavours.

349. As a result of Motorway Project, prices of lands near interchanges and service areas will increase that will be a positive thing for the local people. After the construction of interchanges and service areas, local people will get a chance to open shops and hotels in its vicinity. This will provide them earning opportunities, which will enhance economic profile of the area. This is a minor positive impact.

350. Change in local lifestyle and culture may occur when the local and migrant workers will come in contact during the construction works. This impact is permanent and minor positive. Those impacts will be mitigated by adding appropriate clauses in the construction contract to avoid any law and order situation.

351. Regarding the resettlement issue It is required that these settlements will be relocated and handled in such a way that those affectees might not be turned into poor or vulnerable groups. These issues are discussed in detail in Resettlement Action Plan.

352. People will face minor exit/entry problems during the construction activities. Only one mosque will fall in the RoW and that is Jamia Masjid (main mosque) situated in Tehsil Shorkot. The impact of construction on entry/exit problem is of minor nature as there is no major shrine located in the immediate vicinity of RoW.

353. This impact is temporary and minor negative in nature. Mitigation measures will include:

Timely completion of the construction work and provision of alternative routes during the construction;

- Providing alternative ways in order for the local people to perform their routine tasks;
- Timely and adequate compensation package to the Project Affected Persons (PAPs);
- Adding appropriate clauses in the construction contracts to avoid any law and order situation;
- Timely and full public consultation and announcement of mobilizing equipment;
- Establishment of formal links with affected communities;
- Plan for social grievance redress mechanisms;
- Seek assistance from and cooperation with local NGOs;
- Familiarize outside labourers on local etiquettes;
- Local labour shall be employed with an agreed ratio (>75%) for construction works;
- An agreed minimum unskilled labour employment for women with equal remuneration as men agreed at an early stage; and
- The drinking water requirement shall be met preferably by resorting to other sources rather than using the community resources.

6.3.11 Traffic Management

354. Due to construction activities traffic management may be a problem in the Project area. This may result in traffic jams and cause inconvenience to the people passing through the road crossings at proposed interchanges due to movement of vehicles carrying construction materials.

355. This impact is temporary and minor negative in nature and will be mitigated by providing proper alternative traffic management plan during construction of the proposed Motorway. Interchanges will be constructed in a way that traffic flow is not disturbed; alternative routes will be clearly defined. Proper traffic management with marking will be done on the road crossings near proposed interchanges.

6.3.12 Utilities

356. Various utilities such as electrical poles, transmission lines, telephone lines and wells are situated within the RoW of the proposed Motorway. These utilities will be relocated before the start of construction activities. These utilities if not handled properly will cause difficulties to the peoples of Project Area. To handle this problem following mitigation measures will be taken:

- Strengthening of utilities, wherever required; and
- Close coordination with the concerned departments to curtail inconvenience to the residents of the Project area

6.4 Operational Phase

6.4.1 Noise

357. Due to increase in traffic volume, noise is expected to increase. As presently project area is free from noise pollution therefore this impact is permanent and major negative in nature. To cope with this issue, adequate noise barriers such as indigenous tree species will be planted along the fence to reduce the noise pollution. Further improvement will be made with the help of National Highway and Motorway Police (NH&MP) by enforcing the laws and getting the vehicles tested, regularly after a specific time period, by some reputable vehicle testing laboratory and obtaining a clearance certificate. Noise monitoring will be carried out as per Environmental Monitoring Plan.

6.4.2 Deterioration of vehicles

358. The proposed Motorway, due to smooth road surface will result in less wear and tear of vehicles; it will also result in less fuel consumption. This impact is permanent and major positive in nature.

6.4.3 Soil Erosion and Contamination

359. During the operational phase, soil erosion may take place at different road structures (bridges, embankments, culverts etc.), which may increase the flood risk by rapid flash of storm-water runoff and also undermine these structures. Soil contamination can take place on border areas by road runoff containing heavy metals (e.g. lead). If these areas are used for growing vegetables for human consumption, it can have adverse impacts on human health. The research has shown that the increase in heavy metals is generally limited to a narrow border along the edge of the road and concentrations rapidly fall away with distance from the hard shoulder. The following mitigation measures are proposed to reduce the impacts on soil:

- In case soil erosion takes place, proper remedial measures will be undertaken to stop future impacts of loss of soils and the associated impacts caused by soil erosion; and
- Vegetation for human use will be banned within the proposed RoW.

6.4.4 Road Safety

360. The increased vehicular movement and speed may result in road safety issues like traffic accidents. The accidents may also be due to tiredness. The impacts on road safety would be permanent and moderate negative. They will be mitigated by enforcing speed limits and imposing penalties on the traffic violators. Rest areas will also be provided for those in need for rest during travel. Traffic signs will be provided to facilitate road users about speed limits, rest areas, eating establishments etc. Warning messages such as "*speed thrills but kills*" or "*better late than never*" etc. will also be displayed at appropriate locations to aware drivers about likely accidents due to overspeeding. All the lanes, median, sharp bends will be reflectorized to facilitate travellers in the night time. Proper lighting arrangement on the proposed Motorway will be done at required places.

6.4.5 Landscaping

361. The settlements in the immediate vicinity of the proposed Motorway will be directly affected due to this Project, which would be minor negative impact and will be mitigated by tree plantation along the proposed Corridor. It would also serve as physical barrier between the road and the existing settlements as well as future developments.

6.4.6 Land Use

362. The proposed Project may induce land use changes in the form of development of commercial establishments (restaurants, petrol and gas filling stations), educational institutes etc. The changes in land use may affect the land value, which will vary depending upon the location. The impacts on land use would be permanent and both moderate negativeespecially for those whose land values have not increased and medium beneficialfor businessmen and those having escalated land values (especially near interchanges). However, all the facilities with the exception of restaurants and petrol/gas filling stations likely to pop up in the future will be prohibited within the RoW. The permission will be sought from the concerned authority for the development of any establishment along the proposed Project corridor.

6.4.7 Air Quality

363. The existing status of the project area is that there are agricultural fields due to this no or minor air pollution in the Project Area. Therefore this impact is permanent but minor negative.

364. Mitigation measures will include:

- Setting up of system to monitor air quality along the Project Area in accordance with acceptable International standards;
- Monitoring emissions of vehicles as per NEQS;
- Trees will be planted along the fence of the proposed Motorway, these will work noise barrier. For suitable plantation Forest Department will be consulted.

6.4.8 Time Saving

365. Due to increase in speed and undisturbed flow of traffic, travelling time will be saved to reach destination. Trade will improve due to better transport opportunities. This impact is permanent and major positive in nature.

6.4.9 Socio-economic Conditions

366. The operation of the proposed Motorway would lead to opening up markets to rural economic activities by reducing the production and transportation cost thereby stimulating agricultural production. The proposed Project will promote better business opportunities such as new petrol pumps and hotels. This impact is permanent and major positive in nature.

367. This would be a high beneficial impact but at the same time, it would be major negative for those who cannot access the Motorway except from interchanges. To overcome this problem, interchanges at the existing important routes will be provided in the design.

6.4.10 Water Quality

a) Surface Water

368. The surface water bodies may get flooded and polluted due to uncontrolled release of contaminated storm-water/road runoff from road surfaces. The pollutants associated with the road-runoff include: (a) hydrocarbons such as fuel and polycyclic aromatic hydrocarbons from wear and tear of the road surface, tyres, lubricants leaking from vehicles and from unburnt fuels; (b) heavy metals including cadmium, copper, zinc, iron derived from unburnt fuels, corrosive products from vehicles, wear and tear of tyres and road surfacing. Some heavy metals are largely soluble (copper for example) and insoluble (zinc for example); and (c) suspended solids including insoluble heavy metals as colloidal materials. The worst contamination generally takes place during the first flush of runoff from roads after a spell of dry weather. The level of pollution is directly related to the traffic volume.

369. The pollution risk from accidental spillage may increase moderately. In the long run, the increased traffic volume of traffic and faster traffic speeds would increase the risk of accidental spillage, which could have medium adverse impact on surface water quality. The natural drainage of road runoff across embankments or discharge of runoff into water bodies from large area of carriageway may have medium adverse impacts on ponding and the flood risk to downstream locations. The following mitigation measures are proposed to attenuate surface water quality related impacts:

- In order to discharge rapid removal of storm-water/road runoff, cross slopes and longitudinal drainage will be provided in the design. Well-designed cross drainage structures limit ponding across embankments;

- Retention basins with reedbeds provided in the design will improve the quality of polluted storm-water/road runoff;

- Cleaning of drainage structures will be carried out in case they are blocked by debris etc.; and

- The surface water quality monitoring will also be carried out at defined intervals and for environmental quality monitoring parameters suggested in the Environmental Monitoring Plan. If these parameters are above the prescribed limits, suitable control measures will be taken.

b) Groundwater

370. Groundwater may get polluted due to contaminated road runoff on earthen shoulders and embankments planted with grasses. However, the areas in the immediate vicinity of the proposed Motorway will be avoided for vegetation due to the risk of contamination. Groundwater quality monitoring will be carried out as per schedule suggested in the Environmental Monitoring Plan.

SECTION 7

ECONOMIC ASSESSMENT

7.0 General

371. This section includes the overall economic benefits in relation to environmental costs resulting due to implementation of the proposed project.

7.1 Economic Benefits

372. The economic benefits resulting due to the implementation of the proposed Motorway Project will include:

i) Decreasing the vehicle operating cost and travel time costs due to better/ improved road facility, reduced traffic congestion, uninterrupted and smooth traffic flow;

ii) Improvement in the trade opportunities in country;

iii) Decrease in travelling costs and vehicles maintenance costs

iv) Uplift in the overall economy of the Punjab Province and

v) Improvement in the commercial activity in the Project Area, resulting in economic uplift of the people of the Project Area.

7.2 Environmental Costs

373. The total environmental cost has been worked out to be Rs. 2,265,414,404 (Rs. 2,265 million). This includes Rs. 2,177,994,404 (Rs. 2,177 million) resettlement cost and Rs. 96,420,000/- (Rs.96.42 million) environmental monitoring, environmental training and tree plantation cost. This cost has been added to the total Project cost and the Economic Internal Rate of Return (EIRR) was 36% which was well above 12% the assumed opportunity cost of Capital in Pakistan, thus rendering this project economically viable for implementation (Feasibility Report June 2005 Economic Analysis).

374. Annual Operation and Maintenance (O&M) cost and overlaying costs have been worked out as Rs. 58.874 million and 2980.014 million respectively. Both expressed in economic terms are as Rs. 52.987 million and 2682.013 million respectively.

375. Economic Internal Rate of Return (EIRR) has been thus worked out as 13.2%, which is well above 12% the assumed opportunity cost of capital in Pakistan, thus rendering this Project economically viable for implementation.

SECTION 8

ENVIRONMENTAL MANAGEMENT PLAN

8.0 General

376. This section provides an approach for managing and monitoring environment related issues and describes the institutional framework for environmental management and resource allocations to be carried out by the National Highway Authority (NHA) for mitigating negative impacts of the proposed Faisalabad-Khanewal Motorway (M-4) Project.

8.1 Objectives of Environmental Management Plan (EMP)

377. The EMP will help the NHA, address the upcoming adverse environmental impacts of the proposed Motorway Project, enhance the Project's overall benefits and introduce standards of good environmental practices. The primary objectives of the EMP are to:

1. Define the responsibilities of the Project proponents in accordance with the three Project phases (design, construction and operation);
2. Facilitate the implementation of the mitigation measures by providing the technical details of each Project impact, and proposing an implementation schedule of the proposed mitigation measures;
3. Define a monitoring mechanism and identify monitoring parameters to ensure that all proposed mitigation measures are completely and effectively implemented;
4. Identify training requirements at various levels and provide a plan for the implementation of training sessions;
5. Identify the resources required to implement the EMP and outline corresponding financing arrangements; and
6. Providing a cost estimate for all proposed EMP actions.

8.2 Key Environmental and Social Components

378. The key environmental and social issues associated with this Project are as follows:

1. Resettling commercial structures owned by squatters presently operating within the proposed construction limit of the project corridor;
2. Appropriately locating temporary construction camps, asphalt plants, and waste disposal sites, and the environmental impact of operating these facilities;
3. Regulating the procurement of borrow material and topsoil erosion during construction;
4. Avoiding the obstruction of Motorway drainage system during construction and operation;

5. Enhancing and maintaining avenue tree plantation along the entire length of the project corridor;
6. Minimizing the impact on cultural sites or structures and community-owned assets during construction and operation; and
7. Ensuring pedestrian and traffic safety during construction and operation.

8.3 Role of Functionaries for Implementation of EMP

8.3.1 General

379. This sub section describes the methodology required for the implementation of EMP in conjunction with the NHA, Design Consultants, EIA Team, Supervision Consultants and Contractors. The executing agency of the Project will be National Highway Authority (NHA). General Manager (NHA/ADB) will be the overall Incharge of the Project. The GM (NHA/ADB) will delegate the supervisory responsibilities of the Project to the Project Director who will have professional staff supported by a team of consultants including Environmental Monitoring Specialists/Consultants.

380. Environmental Protection Agency (EPA) Punjab will act as the overall regulatory body. The specific roles of key functionaries are described hereafter.

381. The Organizational setup of the management plan is shown in Figure. 8.1.

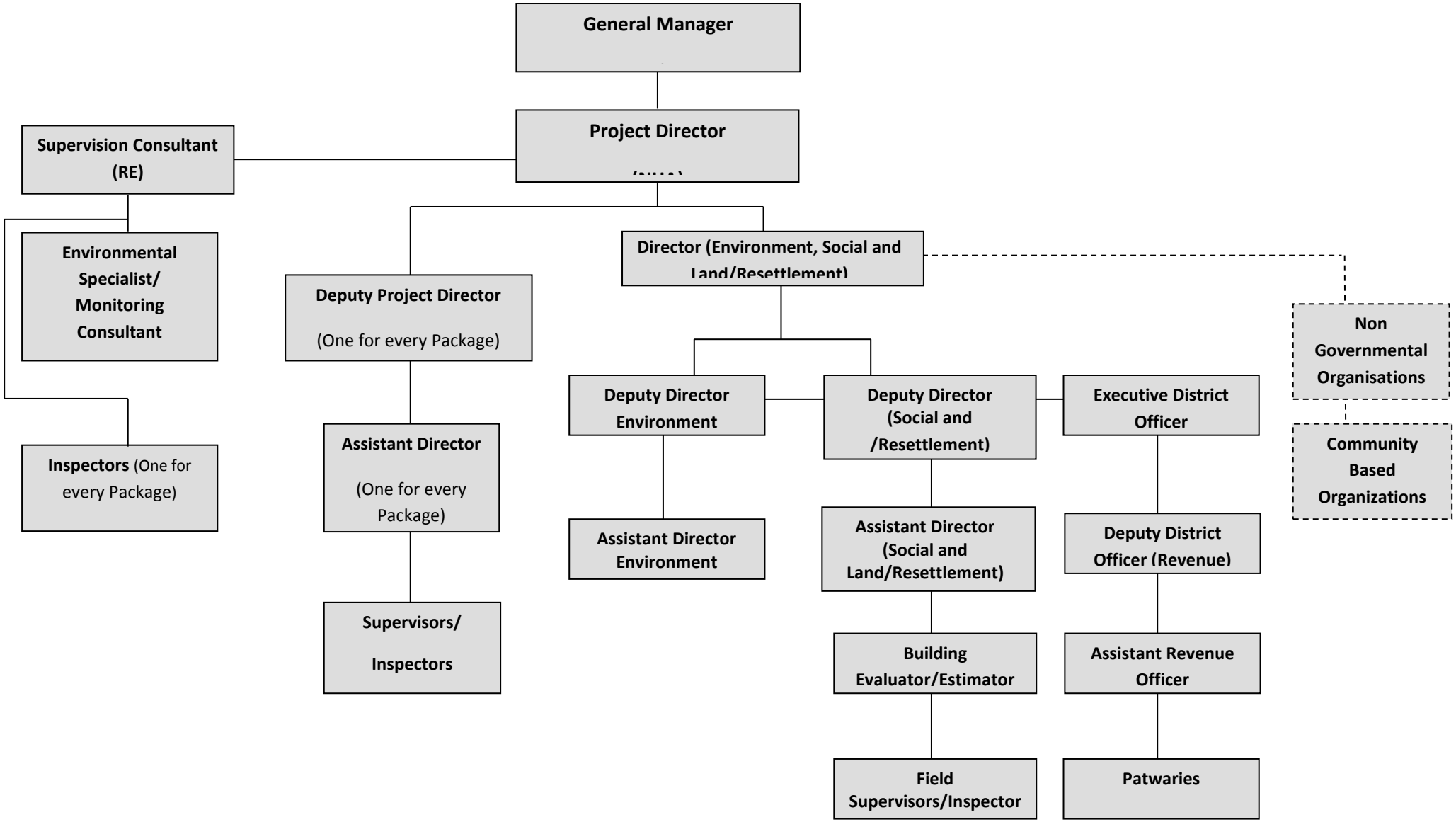


Figure. 8.1: Organization Chart for Construction, Environmental Management and Resettlement Action Plan

8.3.2 National Highway Authority (NHA)

a) Project Director

382. The Project Director (NHA) will be responsible for the successful implementation of the Project. He will be assisted by the Supervision Consultants. The Project is divided into four Packages. Project Director will have four Deputy Directors; one for every Package.

b) Director (Environment, Social and Land/Resettlement)

383. The Director (Environment) will be the overall incharge for handling NHA's obligations with respect to the EMP. Preparation of bi-annual environmental monitoring report, or any corrective action plans required to be submitted by ADB will be the responsibility of Director Environment. The Director (Environment) will depute one Deputy Director (Environment) for the Project, who will be responsible for ensuring that the provisions of the EMP and Site Specific Environmental Management Plan (SSEMP) are implemented. In addition, the Deputy Director (Environment) will also coordinate with the EPA Punjab, provincial Agriculture, Forest and Wildlife departments, NGOs/ CBOs and other public/ private sector organizations.

384. Deputy Director (Environment) will be assisted by Assistant Director (Environment) for the execution of Environmental Management Plan (EMP) for each Package of the Project. Deputy Director (Social and Land/Resettlement) will be responsible for the land acquisition and resettlement related issues.

385. Executive District Officer (E.D.O Revenue) will be assisted by D.D.O (Revenue), Assistant Revenue Officer and Patwaries in assessing the award price for land acquisition to the affectees.

8.3.3 EIA Consultants

386. EIA consultants will prepare a comprehensive EIA and EMP of the Project in compliance with Pak EPA and ADB Guidelines.

8.3.4 Design Consultants

387. The design consultants will ensure that all the mitigation measures designated for the design phase are incorporated in the design and included in the contract documents.

8.3.5 Supervision Consultants

388. Supervision Consultants appointed by the GM (NHA/ADB) will be headed by a "Project Manager", who will be an Engineer. He along with his team will supervise the Project contractors to ensure quality of work and fulfilment of contractual obligations. The Supervision Consultants (SC) will provide one Environmental Specialist/ Monitoring Consultant (MC) who will:

1. Ensure that all the environmental and social parameters/provisions comply with the applicable standards;

2. Ensure that day-to-day construction activities are carried out in an environmentally sound and sustainable manner;
3. Organise periodic environmental training programmes and workshops for the Contractors' staff and NHA site staff in consultation with the NHA; and
4. Develop "good practices" construction guidelines to assist the Contractors and NHA staff in implementing the EMP;
5. Assist NHA as required in developing the bi-annual environmental monitoring reports;
6. Assist NHA in reviewing the SSEMP developed by the contractor.

8.3.6 Construction Contractor

389. EMP will be made a part of the contract agreement and the contractor will ensure that all Project activities are in compliance with the EMP and NEQS.

8.4 Specific Implementation Responsibilities

390. This section describes the implementation and supervision responsibilities for the different phases of the Project.

8.4.1 Design Phase/ Pre-Construction Phase

391. The Director (Environment, Social and Land/Resettlement), NHA and his staff with the assistance of EIA consultant are responsible for ensuring that the Project design and specifications adequately reflect the EMP and the Resettlement Policy Framework (RPF). He will ensure the Project's compliance with environmental regulations and donor requirements; and ensure stakeholder participation in the Project design.

392. The responsibilities of Director (Environment) may be briefly described as follows:

1. To coordinate with regulatory agencies including EPAs, EIA consultant, local NGOs, that could assist the NHA in independent reviews of environmental and social compliance;
2. To supervise environmental and social assessment reports, and provide substantial inputs and guidance to the EIA consultant;
3. To get the approval of EIA from the EPA Punjab;
4. To ensure that the design consultant has incorporated all the mitigation measures proposed for the design phase in the design and included in the contract documents;
5. Submit the bi-annual environmental monitoring report to ADB.

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393. Specifically, before the start of the Project, the NHA's Deputy Director (Social and Land/Resettlement) will ensure that the following activities are carried out in a transparent manner and according to the acceptable standards:

1. Identifying and verifying Project affected persons (PAPs) on the basis of specified documents;
2. Identifying which public facilities and utilities need to be relocated;
3. Identifying alternative resettlement sites for PAPs outside the RoW;
4. Carrying out a consultation and dissemination campaign with regard to compensation procedures, entitlement packages, and proposed alternative resettlement sites;
5. Preparing individual entitlement files;
6. Preparing and approving compensation budgets;
7. Ensuring that an adequate notice period is given to PAPs before shifting;
8. Providing shifting assistance to displaced squatters and to assist squatter-owners to salvage their facilities as per ADB Guidelines; and
9. Submit bi-annual environmental monitoring reports to ADB; and
10. Approve the SSEMP prepared by the contractor prior to the commencement of civil works.

8.4.2 Construction Phase

394. The NHA will appoint Supervision Consultants, who along with the Deputy Director (Environment) will oversee the working of contractor in accordance with the EMP.

- The Supervision Consultant will liaise with the Project staff to monitor environmental compliance during the construction;
- He will supervise the construction and provide technical support to help ensure compliance with the EMP;
- The Supervision Consultants will assess the environmental impact of Motorway construction;
- He will monitor the progress of work and adherence of the contractor to the EMP and Resettlement Action Plan; and
- He will direct the Contractor to work in such a manner that all Project activities are in compliance with the EMP and NEQS.

8.4.3 Operation Phase

395. The Deputy Director (Environment) and his staff will be responsible for the following:

1. Coordinating with the operational staff working under the Regional General Manager to monitor environmental compliance during Motorway operation;
2. Advising on, and monitoring tree plantations along the Motorway;
3. Reporting on the progress of environmental compliance to the federal and EPA Punjab;
4. Assessing the long-term environmental impacts of Motorway operation;

5. Sustaining a working partnership among the NHA, Punjab EPA, Agriculture, Forest and Wildlife departments of Punjab, NGOs and other related public private sector organizations; and
6. Reporting to Director (Environment) about progress of the work.

8.5 Environmental Management Plan Updated for Section III

396. The Environmental Management Plan based on the mitigation measures (indicated in Section 5 of this Report)is presented in Table 8.1 below.

Table 8.1 (a): Environmental Management Plan – Section II (Faisalabad - Gojra)

Project Stage	Parameters	Details of Location	*Standards/ Guidelines	No. of Samples	Frequency	Responsibility	Duration	Cost (Rs.)
Pre-Construction Stage								
	|Ambient Air Quality (CO, NO_x, SO_x, PM_{10})	7.5 metres from the edge of pavement downwind at seven selected locations	USEPA Standards	7	Once @ Rs.50,000/ location	NHA	Continuous for 24 hours or one full working day	350,000/-
	Groundwater Quality (Total Coliforms, Fecal E. Coli, Total Colonial Count, Fecal Entercocci, pH, TDS, Total Hardness, Nitrate, Chloride, Sodium) Surface Water Quality (pH, DO, TSS, Alkalinity, BOD_5, COD, Turbidity)	Community groundwater sources near the edge of the RoW at 7 selected locations along the proposed Motorway	▪ WHO Drinking Water Quality Guidelines (2004) ▪ NEQS (2000)	7 for groundwater and 4 for surface water	Once @ Rs. 10,000 /-per sample	NHA		110,000/-
	Noise Levels on dB(A) Scale	Seven locations: 15 meters from the edge of the pavement, at sensitive locations like basic health unit, school, madrassa and residential/ commercial area.	WHO Noise Guidelines	7	Once @ Rs. 1,500/- per point	NHA	24 hours @ 15 seconds interval over 15 min every hour, then averaged	10,500/-
							TOTAL	**470,500/- (US$ 7,841.667)**

Project Stage	Parameters	Details of Location	*Standards/ Guidelines	No. of Samples	Frequency	Responsibility	Duration	Cost (Rs.)
Construction Stage								
	Air Quality (PM_{10}, Hydrocarbons) All relevant stack emissions (CO, NO_x, SO_x, Smoke)	40 metres from hot mix plants	USEPA, WHO, NAAQS	4 (1 in each section)	Bi-annually @ Rs. 70,000/- for four years	Contractor	Continuous for 24 hours or one full working day	2,24,000/-
	PM_{10}	In active construction area	USEPA, WHO, NAAQS	4 (1 in each section)	Monthly @ Rs. 10,000 for four years	Contractor	Continuous for 24 hours or over one full working day	1,920,000
	Water Quality Groundwater Quality (Total Coliforms, Fecal E. Coli, Total Colonial Count, Fecal Enterococci, pH, TDS, Total Hardness, Nitrate, Chloride, Sodium) Wastewater Quality (pH, DO, TSS, Alkalinity, BOD_5, COD, Turbidity)	Four locations - near edge of the RoW and community groundwater source All project-related wastewater discharge locations including camp sites, asphalt plants and workshops (four locations)	WHO Drinking Water Quality Guidelines (2004) NEQS (2000)	4 for groundwater and 4 for wastewater (1 for groundwater and 1 for surface water in each section)	Bi-annually @ Rs. 10,000	Contractor		640,000/-
	Noise Levels on dB (A) Scale	At equipment yard and construction site and during pile driving 7 meters from noise source	WHO Noise Guidelines	4 (1 in each section)	Monthly @ Rs. 1,500 per point for four years	Contractor	24 hours @ 15 seconds	288,000/-

Project Stage	Parameters	Details of Location	*Standards/ Guidelines	No. of Samples	Frequency	Responsibility	Duration	Cost (Rs.)
		Not less than one location 15 meters from the edge of pavement and at locations of all potentially affected sensitive receptors		7			interval over 15 min every hour, then averaged	504,000/-
							TOTAL	**5,592,000/-** **US $ 93,200/-**
Operation Stage								
	Ambient Air Quality (CO, NO_x, SO_x, PM_{10})	7.5 metres from the edge of pavement downwind at seven selected locations	USEPA Standards	7	Once @ Rs.50,000/ location	NHA	Continuous for 24 hours	350,000/-
	Groundwater Quality (Total Coliforms, Fecal E. Coli, Total Colonial Count, Fecal Entercocci, pH, TDS, Total Hardness, Nitrate, Chloride, Sodium) Surface Water Quality (pH, DO, TSS, Alkalinity, BOD_5, COD, Turbidity)	Community groundwater sources near the edge of the RoW at 7 selected locations along the proposed Motorway	▪ WHO Drinking Water Quality Guidelines (2004) ▪ NEQS (2000)	7 for groundwater and 4 for Wastewater	Once @ Rs. 10,000 per sample	NHA		110,000/-
	Noise Levels on dB(A) Scale	Seven locations: 15 meters from the edge of the pavement, at	WHO Noise Guidelines	7	Once @ Rs.1,500/- point	NHA	24 hours @ 15 seconds interval over	10,500

Project Stage	Parameters	Details of Location	*Standards/ Guidelines	No. of Samples	Frequency	Responsibility	Duration	Cost (Rs.)
		sensitive location like basic health unit, school, madrassa and residential/ commercial area.					15 min every hour, then averaged	
							TOTAL	**470,500/- US $ 7,841.667/-**
							Total Monitoring Cost	**6,533,000/- US $ 108,883.3 /-**

Table 8.1 (b): Environmental Management Plan – Section II (Gojra- Shorkot)

Project Stage	Parameters	Details of Location	*Standards/ Guidelines	No. of Samples	Frequency	Responsibility	Duration	Cost (Rs.)
Pre-Construction Stage								
	|Ambient Air Quality (CO, NO_x, SO_x, PM_{10})	7.5 metres from the edge of pavement downwind at four selected locations	PAK NEQS	4	Once @ Rs.50,000/ location	NHA	Once in 24 hours	200,000/-
	Surface water and Ground water Quality (Total Coliforms, Fecal E. Coli, Total Colonial Count, Fecal Entercocci, pH, TDS, Total Hardness,	Community ground water and surface water sources near the edge of the RoW at 4 selected locations along the proposed section-II	▪ WHO Drinking Water Quality Guidelines (2004) ▪ NEQS	2 for groundwater and 2 for surface water	Once @ Rs. 15,000 /-per sample	NHA		60,000/-

Project Stage	Parameters	Details of Location	*Standards/ Guidelines	No. of Samples	Frequency	Responsibility	Duration	Cost (Rs.)
	Nitrate, Chloride, Sodium) Surface Water Quality (pH, DO, TSS, Alkalinity, BOD_5, COD, Turbidity)	of M-4						
	Noise Levels on dB(A) Scale	Four locations: In Chak No. 305/JB at RD 59+200, Chak No. 396 JB at RD 86+700 near GGES, at RD 119+500 at Rakh Kotla and at RD 120+200 in Mouza 7 Ghag area locations shown on map no Riaz.	PAK NEQS	4	Once @ Rs. 1,500/- per point	NHA	Once in 24 hours	6,000/-
							TOTAL	**266,000/- (US$ 2660)**
Construction Stage								
	Air Quality (PM_{10}, Hydrocarbons) All relevant stack emissions (CO, NO_x, SO_x,	40 metres from hot mix plants	Pak-NEQS	4	Bi-annually @ Rs. 50,000/- for two years	Contractor	Continuous for 24 hours or one full working day	800,000/-

Project Stage	Parameters	Details of Location	*Standards/ Guidelines	No. of Samples	Frequency	Responsibility	Duration	Cost (Rs.)
	Smoke)							
	PM_{10}	In active construction area	Pak-NEQS	4	Monthly @ Rs. 10,000 for two years	Contractor	Continuous for 24 hours or over one full working day	960,000/-
	Water Quality Groundwater Quality (Total Coliforms, Fecal E. Coli, Total Colonial Count, Fecal Enterococci, pH, TDS, Total Hardness, Nitrate, Chloride, Sodium) Wastewater Quality (pH, DO, TSS, Alkalinity, BOD_5, COD, Turbidity)	Four locations - near edge of the RoW and community groundwater source All project-related wastewater discharge locations including camp sites, asphalt plants and workshops (four locations)	WHO Drinking Water Quality Guidelines (2004) NEQS	2 for groundwater and 4 for wastewater 2 for surface water	Bi-annually @ Rs. 15,000	Contractor		480,000/-
	Noise Levels on dB (A) Scale	At equipment yard and construction site and during pile driving 7 meters from noise source	PAK NEQS	4	Monthly @ Rs. 1,500 per point for two years	Contractor	24 hours @ 15 seconds interval over 15 min every hour, then	6,000/-
		Not less than one location 15 meters from the edge of		4				6,000/-

Project Stage	Parameters	Details of Location	*Standards/ Guidelines	No. of Samples	Frequency	Responsibility	Duration	Cost (Rs.)
		pavement and at locations of all potentially affected sensitive receptors					averaged	
							TOTAL	**2,252,000/- US $ 22,520/-**
Operation Stage								
	Ambient Air Quality (CO, NO_x, SO_x, PM_{10})	7.5 metres from the edge of pavement downwind at four selected locations	PAK-NEQS	4	Once @ Rs.50,000/ location	NHA	Once in 24 hours	200,000/-
	Groundwater Quality (Total Coliforms, Fecal E. Coli, Total Colonial Count, Fecal Entercocci, pH, TDS, Total Hardness, Nitrate, Chloride, Sodium) Surface Water Quality (pH, DO, TSS, Alkalinity, BOD_5, COD, Turbidity)	Community ground water and surface water sources near RoW at four selected locations along the proposed section-II of M-4 Motorway	▪ WHO Drinking Water Quality Guidelines ▪ NEQS	2 for groundwater and 2 for surface water	Once @ Rs. 15,000 per sample	NHA		60,000/-
	Noise Levels on dB(A) Scale	Four locations: In Chak No. 305/JB at	PAK NEQS	4	Once @ Rs.1,500/- point	NHA	Once in 24 hours	6000

Project Stage	Parameters	Details of Location	*Standards/ Guidelines	No. of Samples	Frequency	Responsibility	Duration	Cost (Rs.)
		RD 59+200, Chak No. 396 JB at RD 86+700 near GGES, at RD 119+500 at Rakh Kotla and at RD 120+200 in Mouza 7 Ghag area locations shown on map no Riaz						
							TOTAL	**266,000/-** **US $ 2660/-**
							Total Monitoring Cost	**5,178,000/-** **US $ 51,780 /-**

Table 8.1 (c): Environmental Management Plan – Section III (Shorkot- Khanewal)

Sr. No	*Environmental Activity*	*Impacts*	*Mitigation*	*Responsibility*	*Cost Estimate* *PKR*	*Basis*
A: Design/ Pre-Construction Phase						
1	Topography	▪ Visual changes to the topography due to construction of the proposed Project.	▪ The aesthetic elements (such as plantation) should be incorporated in the design to overcome the potential impacts.	DC, NHA	No additional cost / Included in project's cost	

Sr. No	Environmental Activity	Impacts	Mitigation	Responsibility	Cost Estimate PKR	Basis
2	Soil Erosion and Contamination	▪ The excavation of earth may result in change of edaphic characteristics, loss of fertile top soil. ▪ The fertile plough layer will be wasted.	▪ The provision for vegetation with a fast growing vetiver grass that can flourish in dry conditions, immediately after fill placement to encourage stabilization ▪ Side slopes shall be adjusted to a gradient necessary to reduce erosion potential.	DC, NHA	No additional cost / Included in project's cost	
3	Land Acquisition and Resettlement	▪ It will result in causing disturbance to the residents of the project area.	▪ Careful alignment and route selection by the designer to minimize the impacts by avoiding the residences. ▪ The affected people will be compensated as per provisions of LARP. ▪ Proper access should be provided to the farmers to cultivate the divided land at a minimum travel distance.	DC, NHA	As per approved LARP document	
4	Flora and Fauna	▪ The project will affect and alter habitat conditions, which in turn manipulate the abundance and	▪ Incorporate technical design measures to minimize removal of these trees, if possible such as change in the alignment.	DC, NHA	85,280,000	Total cost for raising 1,30,000 plants including

Sr. No	Environmental Activity	Impacts	Mitigation	Responsibility	Cost Estimate PKR	Basis
		distribution of plant and animal species. ▪ It will result in habitat damage and fragmentation, exotic species incursion, pollution, over hunting and genetic obstacles.	▪ Provision of compensation in the Project Budget for the loss of trees to the affected people.			maintenance for 5 years along the boundary station in 2 rows
5	Change in Hydrologic Regime	▪ Poor drainage can cause cut or fill failures, road surface erosion, and weakened sub-grade followed by a mass failure. ▪ Improper drainage can modify surface water flow by concentrating flows at certain points and, in many cases, increasing the speed of flow.	▪ For the crossing of canals and drains small bridges will be constructed. ▪ For the crossing of water courses, culverts and other possible arrangement will be done.	DC, NHA	No additional cost / Included in project's cost	
6	Restricted Access Problems	▪ The communities along the alignment will face entry/exit problems and bifurcation of	▪ Underpasses and flyovers shall be provided in the design at the shorter distances and at places wherever there are existing	DC, NHA	No additional cost / Included in project's cost	

Sr. No	Environmental Activity	Impacts	Mitigation	Responsibility	Cost Estimate PKR	Basis
		settlements. ▪ Hindrance in movement of residents, agricultural machinery and transportation of agricultural products.	crossing paths.			
7	Public Utilities	▪ Public utilities will be affected creating disruption of public services and inconvenience to the local residents.	▪ Provision in the design and budget for the relocation of the existing utility infrastructures wherever required. ▪ Scheduling of relocation/ rehabilitation of all public utilities likely to be affected by the proposed project well ahead of the commencement of construction work.	DC, NHA	No additional cost / Included in project's cost	
8	Air and Noise Quality	▪ Vehicles will create excessive noise which will be a cause of disturbance for communities.	▪ Noise barriers shall be constructed wherever there will be populated area in close proximity to the alignment. ▪ There should be special provision in the budget for the maintenance/rehabilitation of the village roads in order to bring them in their original	DC	400,000	Complete air and noise monitoring at ten (10) points

Sr. No	Environmental Activity	Impacts	Mitigation	Responsibility	Cost Estimate PKR	Basis
			condition.			
9	Transportation of Construction Material	▪ It will cause unnecessary degradation of roads and areas surrounding along haul routes resulting in generation of dust, noise, traffic congestion and safety issues.	▪ Preparation of a checklist and guidelines for handling of all construction materials and the designation of roads not suited for hauling materials by NHA. ▪ Preparation traffic management plan for the movement of the heavy construction vehicles.	DC, NHA	No additional cost / Included in project's cost	
10	Construction Camps	▪ Mismanagement of construction camp activities can lead to impacts including: noise, health and safety, traffic, solid waste and water pollution.	▪ Formulation of a training program for the workers residing in construction camps. ▪ Formulation of a comprehensive safety and security plan for the camps.	NHA	300,000	Hiring of a trainer and refreshment cost
11	Seismic Hazard	▪ The infrastructure may be affected in case of earthquake tremors.	▪ The structures of the proposed alignment (Section-III) should be designed and constructed to withstand moderate earthquakes. ▪ For seismic hazard analysis, updated structural, geotechnical and seismic	DC, NHA	No additional cost / Included in project's cost	

Sr. No	Environmental Activity	Impacts	Mitigation	Responsibility	Cost Estimate PKR	Basis
			evaluations should be consulted.			
12	Emergency Management	▪ Natural disasters (floods, fires or earthquakes) or man-made (accidental spillages) disasters are major concerns that may cause fatal accidents.	▪ An emergency response plan should be formulated by NHA which should emphasize line of action for rescue, medical emergencies, natural disasters and fire fighting operations.	DC, NHA	No additional cost / Included in project's cost	
B: Construction Phase						
1	Topography	▪ Visual intrusion will be caused due to large piles of embankment materials.	▪ All the affected areas shall be restored to their original levels. ▪ Material stockpiles should be removed as soon as work is completed.	EE of CC, EE of SC and DD Environment of EALS	No additional cost / Included in project's cost	
2	Borrow/ Open Pits	▪ It may result in land disputes, soil erosion, loss of potential cropland, loss of vegetation, landscape degradation, and damage to road	▪ Necessary permits should be obtained for any borrow pits from the competent authorities. ▪ In case borrow pits are filled with water, measures have to be taken to prevent the creation of mosquito-breeding	EE of CC, EE of SC and DD Environment of EALS	No additional cost / Included in project's cost	

Sr. No	Environmental Activity	Impacts	Mitigation	Responsibility	Cost Estimate PKR	Basis
		embankments.	sites.			
3	Air Quality	▪ Fugitive dust emissions will occur from wind erosion of open aggregate storage piles. ▪ Emissions from crushers and quarry sites will cause health impacts, i.e. coughing, flue, difficulty in inhaling, irritation in eyes and reduction in visibility.	▪ All vehicles, machinery, equipment and generators used during construction activities should be kept in good working condition and be properly tuned and maintained in order to minimize the exhaust emissions. ▪ Air emission monitoring program for NO_2, SO_2, CO and PM_{10} should be undertaken quarterly by the construction contractor. ▪ All excavation work should be sprinkled with water to control dust.	EE of CC, EE of SC and DD Environment of EALS	3,000,000	Quarterly monitoring for two (02) years @ 37500 for ten (10) points
4	Solid Waste (Construction, Municipal and Hazardous Waste)	▪ The generated will result in unhygienic conditions, health risk to work force and general public at the camp site.	▪ Solid Waste generated during construction should be safely disposed of at approved and demarcated waste disposal sites. ▪ Proper labeling of waste containers, including the identification and quantity of the contents, hazard contact	EE of CC, EE of SC and DD Environment of EALS	480,000	Rs.20, 000 per month (two trips per month) for a period of 24 months, which includes the cost of collection, transportation

Sr. No	Environmental Activity	Impacts	Mitigation	Responsibility	Cost Estimate PKR	Basis
			information etc. ▪ The sewage system for camps should be properly designed (pit latrines or, as required, septic tanks) to receive all sanitary wastewaters.			and disposal to the designated site.
5	Siting and Setting up Construction Camps and Related Facilities	▪ Setting up of these facilities may cause a number of issues such as loss of plantation and vegetation, permanent physical and visual impact on the area.	▪ The construction camps and workshops shall not be located in sensitive areas and shall not be within 500 meters distance from the existing settlements. ▪ The sites for camps and associated facilities shall be reinstated by the Contractor(s) after decommissioning of the proposed Project. ▪ In order to minimize social disturbances as a result of construction workers, the project shall seek to avoid sitting camps where their presence might contribute to any conflicts between villages. ▪ Medical screening of the workers to will be arranged in the construction camps.	EE of CC, EE of SC and DD Environment of EALS	360,000	Rs 15,000 per month for supply of drinking water and latrines for a period of 24 months

Sr. No	Environmental Activity	Impacts	Mitigation	Responsibility	Cost Estimate PKR	Basis
					12,00,000	Rs. 1200 for medical screening of 100 employees are estimated
6	Soil Erosion and Contamination	▪ Soil erosion and contamination may affect the road stability, silting up of water bodies, landscape value and in worst cases may reduce the economic productivity of land and biodiversity in the Project Area.	▪ Non-productive, barren lands in broken terrain, nullahs and publicly recognized waste lands shall be used for borrowing materials. ▪ Side slopes shall be adjusted to a gradient necessary to reduce erosion potential. ▪ Soil contamination by bitumen, fuel and chemical storages shall be minimized by siting them on an impervious base within an embanked area and secured by fencing.	EE of CC, EE of SC and DD Environment of EALS	500,000	Rs. 500,000 for plastic

Sr. No	Environmental Activity	Impacts	Mitigation	Responsibility	Cost Estimate PKR	Basis
						sheets and hay bales sheets
7	Noise	▪ Psychological effects of distraction of attention, irritation and short temperedness in the exposed persons due to persistently higher noise levels. ▪ Noise produced from moving construction vehicles and blowing of pressure horns, at times, could be intolerable particularly during quiet hours of night.	▪ Confining excessively noisy work to normal working hours in the day as far as possible. ▪ Providing the construction workers with suitable hearing protection like ear cap, ear muffs etc. ▪ Avoiding heavy machinery like percussion hammers and pneumatic drills, especially during night time. ▪ Noise monitoring	EE of CC, EE of SC and DD Environment of EALS	1,200,000	Quarterly monitoring for two (02) years @ 15000 for ten (10) points

Sr. No	Environmental Activity	Impacts	Mitigation	Responsibility	Cost Estimate PKR	Basis
8	Surface and Groundwater	▪ The surface water at workers camp and project site areas may get polluted due to fecal, organic and other contamination. ▪ The potential exists for drinking water sources to be contaminated by the seepage of wastes from workers camps through the soil profile into the ground water aquifer.	▪ The surface and groundwater reserves should be adequately protected from any source of contamination such as the construction and oily waste that will degrade its potable quality. ▪ Workforce camps should be located at a safe distance from water resources. ▪ All effluents should not be disposed of directly into natural waters, but via settling basins to allow suspended sediment to settle out. ▪ Surface and groundwater monitoring	EE of CC, EE of SC and DD Environment of EALS	1,200,000	Biannual monitoring for two (02) years @ 30,000 at ten (10) points for groundwater

Sr. No	Environmental Activity	Impacts	Mitigation	Responsibility	Cost Estimate PKR	Basis
					360,000	Biannual monitoring for two (02) years @ 30,000 at three (03) points for surface water
9	Flora and Fauna	▪ The contractor's workers may damage the vegetation including trees. ▪ Dust laden polluted air will form a dust film on the leaves, thus blocking sunshine and stomata, thereby hindering photosynthesis process. ▪ The Project will pose minor negative impact	▪ Land holders should be paid reasonable compensation for the loss of their standing trees, in accordance with the prevailing market rates. ▪ Staff and labour should be strictly directed not to damage any vegetation such as trees or bushes. ▪ Construction vehicles, equipments and machinery will remain confined within their designated areas of movement.	EE of CC, EE of SC and DD Environment of EALS	1,600,000	Expenditure per 1000 meter (1 Km) length or 500 plants @ Rs. 500/- for two years

Sr. No	Environmental Activity	Impacts	Mitigation	Responsibility	Cost Estimate PKR	Basis
		on the fauna present in the area.	▪ Illegal animal and fish hunting should not be allowed and punishment will be enforced in case of violation.			
10	Social and Cultural Problems	▪ Due to construction of the proposed Project, exit/entry problems for the residents/ movement of the people to the mosque/shrines may be disturbed. ▪ The major issue in the proposed Project is land acquisition. ▪ There are chances of arising of issues related to cultural differences/conflict between the Contractor's workforce and the local inhabitants.	▪ Timely completion of the construction work and provision of alternative routes during the construction. ▪ Providing alternative ways in order for the local people to perform their routine tasks. ▪ Plan for social grievance redress mechanisms.	EE of CC, EE of SC and DD Environment of EALS	No additional cost / Included in project's cost	
11	Traffic Management	▪ This may result in traffic jams and cause inconvenience to the people passing	▪ Proper traffic management plan will be needed to avoid traffic jams/public inconvenience.	EE of CC, EE of SC and DD Environment of	250,000	For mandatory sign boards

Sr. No	Environmental Activity	Impacts	Mitigation	Responsibility	Cost Estimate PKR	Basis
		through the project area due to movement of heavy machinery/vehicles carrying construction materials	▪ Coordinated planning of traffic diversions by the traffic police and the Transport Department in accordance with the construction program with advance warnings to the affected residents and road users.	EALS	250,000	@ Rs. 4600 For warning signs @ Rs. 4300
12	Utilities	▪ There may be some disruption to the already existing utilities like electricity poles, underground telephone lines, power transmission lines, water courses, small village roads, etc. in the project area during the construction phase.	▪ Relocation of existing utilities before construction to avoid any inconvenience to the residents of the project area or provide them with an alternate arrangement during the construction period. ▪ Close coordination with the concerned departments to curtail inconvenience to the residents of the Project area.	EE of CC, EE of SC and DD Environment of EALS	No additional cost / Included in project's cost	
13	Health and Safety	▪ Poor safety oversight and management of the worksites by the construction contractor can lead to accidents and unsafe working conditions.	▪ Obligatory insurance against accidents for labourers/workers. ▪ Providing basic medical training to specified work staff and basic medical service and supplies to workers. ▪ All labour must be medically	EE of CC, EE of SC and DD Environment of EALS	500,000 (lump sum) 40,000	Environmental and safety training cost Provision of ear plugs @ Rs. 80 for 500

Sr. No	Environmental Activity	Impacts	Mitigation	Responsibility	Cost Estimate PKR	Basis
		▪ The laborers with different transmittable diseases may cause spread out of those diseases in the local residents.	checked so that if they interface with the local communities, undesirable transmittable disease does not spread.		200,000 1,000,000 75,000 100,000	quantity Provision of safety helmets @ Rs. 800 for 250 quantity Provision of safety shoes @ 2000 for 500 quantity Provision of protective goggles @ Rs. 150 for 500 quantity Provision of gloves @ Rs. 200 for 500 quantity Dust masks

Sr. No	Environmental Activity	Impacts	Mitigation	Responsibility	Cost Estimate PKR	Basis
					40,000	@ Rs. 80 for 500 quantity
14	Resource Conservation	▪ The use of water and other non renewable resources might affect the community water consumption.	▪ Source of water should be carefully selected. Water use should not disturb the existing community water supplies. ▪ Unnecessary equipment washings should be avoided	EE of CC, EE of SC and DD Environment of EALS	No additional cost / Included in project's cost	
C: Operational Phase						
1	Noise	▪ Due to increase in traffic volume, noise is expected to increase.	▪ Adequate noise barriers such as indigenous tree species will be planted along the fence to reduce the noise pollution. ▪ Noise monitoring will be carried out as per Environmental Monitoring Plan.	EE & NHA	600,000	Biannually for two (02) years @ Rs.15,000 at ten (10) points
2	Soil Erosion and Contamination	▪ It may increase the flood risk by rapid flash of storm-water runoff and also undermine the structures.	▪ In case soil erosion takes place, proper remedial measures should be undertaken to stop future impacts of loss of soils and the associated impacts caused by soil erosion; and ▪ Vegetation for human use	EE & NHA	No additional cost / Included in O&M cost	

Sr. No	Environmental Activity	Impacts	Mitigation	Responsibility	Cost Estimate PKR	Basis
			should be banned within the proposed RoW.			
3	Road Safety	▪ The increased vehicular movement and speed may result in traffic accidents.	▪ Enforcement of speed limits and imposing penalties on the traffic violators. ▪ Rest areas will also be provided for those in need for rest during travel. ▪ Traffic signs will be provided to facilitate road users about speed limits, rest areas, eating establishments etc.	EE, Traffic Police & NHA	No additional cost / Included in O&M cost	
4	Air Quality	▪ The air quality will be deteriorated due to exhaust of vehicles.	▪ Setting up of system to monitor air quality along the Project Area in accordance with acceptable International standards. ▪ Monitoring emissions of vehicles as per NEQS. ▪ Trees will be planted along the fence of the proposed Motorway, these will work noise barrier. For suitable plantation Forest Department will be consulted.	EE & NHA	3,000,000	Quarterly monitoring for two (02) years @ Rs. 37,500 at ten (10) points

Sr. No	Environmental Activity	Impacts	Mitigation	Responsibility	Cost Estimate PKR	Basis
5	Water Quality	▪ The surface water bodies may get polluted due to uncontrolled release of contaminated storm-water/road runoff from road surfaces. ▪ The pollution risk from accidental spillage may increase moderately. ▪ In the long run, the increased traffic volume of traffic and faster traffic speeds would increase.	▪ In order to discharge rapid removal of storm-water/road runoff, cross slopes and longitudinal drainage may be provided in the design. ▪ Retention basins with reed beds provided in the design will improve the quality of polluted storm-water/road runoff. ▪ The surface and ground water quality monitoring shall also be carried out at defined intervals for environmental quality monitoring parameters suggested in the Environmental Monitoring Plan.	EE & NHA	1,200,000 360,000	Biannual monitoring of ground water quality @ Rs. 30,000 for ten (10) points Biannual monitoring of surface water quality @ Rs. 30,000 for three (03) points

Note: DC (Design Consultant), CC (Construction Contractor), SC (Supervision Consultant), NHA (National Highway Authority), NHMP (National Highway & Motorway Police)

Environmental Engineer of the contractor will prepare a Site Specific Environmental Management Plan (SSEMP) and submit to the client for approval. The plan will be approved at least ten (10) days before the contractor is given access to the site.

8.6 Environmental Monitoring

397. This section provides a monitoring plan that identifies the roles and responsibilities of project staff involved in environmental and social monitoring and lists the parameters that will be used in the monitoring process.

8.6.1 Objectives

398. The main objectives of the pre-construction, construction and operation phase monitoring plans will be to:

- Monitor the actual impact of the works on physical, biological and socio-economic receptors within the project corridor for indicating the adequacy of the EIA;
- Recommend mitigation measures for any unexpected impact or where the impact level exceeds that anticipated in the EIA;
- Ensure compliance with legal and community obligations including safety on construction sites;
- Monitor the rehabilitation of borrow areas and the restoration of construction campsites as described in the EMP; and
- Ensure the safe disposal of excess construction materials.

399. The main objectives of monitoring during the operation phase will be to:

- Appraise the adequacy of the EIA with respect to the Project's predicted long-term impacts on the corridor's physical, biological and socio-economic environment;
- Evaluate the effectiveness of the mitigation measures proposed in the EMP and recommend improvements, if and when necessary;
- Compile periodic accident data to support analyses that will help minimise future risks; and
- Monitor the survival rate of avenue plantations.

8.6.2 Monitoring Roles, Responsibilities and Schedules

400. The Project staff engaged in social and environmental monitoring is listed below, followed by descriptions of the monitoring responsibilities specific to each post:

- DD (Environment)
- Supervision Consultants

401. Overall monitoring plan is shown in Table 8.3.

a) Deputy Director (Environment)

402. The Deputy Director (Environment) will have overall responsibility for Environmental Monitoring and Evaluation (M&E). This includes the following:

1. Ensuring the availability of human and material resources required for environmental monitoring;
2. Generating periodic monitoring reports and disseminating these among the management and appropriate staff members;
3. Ensuring that the required environmental training is provided to the staff concerned; and
4. Contracting out external monitoring to independent firms and ensuring that periodic environmental audits are carried out.

403. The DD (Environment) and his team will also be responsible for:

1. Carrying out visits to the construction sites to review the environmental performance of the contractors; and
2. The status of the Project's consultation strategy.

b) Supervision Consultant

404. Supervision Consultant will involve the Environmental Expert/ Monitoring Consultant and Resident Engineer. The Resident Engineer will overlook the performance of contractor to make sure that the contractor is carrying out the work in accordance with EMP. The Monitoring Consultant (MC) on the other hand will carry out the environmental monitoring and report to DD (Environment) for adequacy of the monitoring program as specified in EMP. The MC will also induct a Technical Training Consultant to educate the Contractor's and NHA's staff.

8.6.3 Monitoring Parameters

a) Environmental Monitoring Parameters

405. The following environmental parameters will be monitored at locations identified during the construction phase (e.g. location of asphalt plants, construction camps. etc.).

- Ambient Air Quality (NO_x, SO_x, CO, PM_{10}, Hydrocarbons, Smoke)
- Water Quality

  Groundwater Quality (Total Coliforms, Fecal E. Coli, Total Colonial Count, Fecal Enterococci, pH, TDS, Total Hardness, Nitrate, Chloride, Sodium)

  Wastewater Quality (pH, DO, TSS, Alkalinity, BOD_5, COD, Turbidity)
- Noise Levels

b) Social Monitoring Parameters

406. Social monitoring will be carried out based on the following indicators:

- Number of PAPs to be resettled/ relocated/ provided livelihood assistance where required;

- Availability and adequacy of alternative resettlement sites for PAPs (by number and type);
- Inventory and valuation of PAPs' affected assets;
- Pre- and post-resettlement incomes of PAPs;
- Notice period given to PAPs before shifting them from their original locations within the RoW;
- Number of vulnerable PAPs compensated under the EMP;
- Verification of shifting assistance provided to displaced squatters and to squatter-owners allowed to salvage their facilities;
- Number and nature of consultations carried out, as well as targeted stakeholders;
- PAPs' perspectives on compensation procedures, entitlement packages, and proposed alternative resettlement sites;
- Record of any problems due to restricted access to the Motorway during construction and whether ramps/ diversions have been provided where required;
- Number of grievances recorded and redressed;
- Number of public facilities and utilities to be relocated;
- Number of mosques/ shrines/ graves to be relocated (if any) and corresponding contribution of affected communities and NHA; and
- Verification of relocation of mosques/ shrines/ graves.

8.6.4 Reporting Structure and Outcomes

407. Progress reporting will be the overall responsibility of the Project Director who will provide inputs to the Supervision Consultants for submission to GM (NHA/ADB). The Supervision Consultants will be responsible for submitting a monthly environmental/ social report for the Project to GM (NHA/ADB). In addition, the DD (Environment) will prepare a quarterly report encompassing environmental concerns, and following review by the Director (Environment, Social and Land/Resettlement) he will submit the report to the EPA Punjab.

Table 8.3 (a) Environmental Monitoring Plan (2015)

Components	Parameters	No. of Samples (No. of Samples x Frequency x Year)	Frequency	Responsibility	Duration	Cost (Rs.)
Construction Phase (02 years)						
Air Quality	CO, NO_2, SO_2, PM_{10}	10x4x2 = 80	Quarterly	EE of CC and SC	24 hours	**3,**000,000/-
Ground Water Quality	Total Coliforms, Fecal E. Coli, Total Colonial Count, Fecal Enterococci, pH, TDS, Total Hardness, Nitrate, Chloride, Sodium, Arsenic	10x2x2 =40	Bi-annually	EE of CC and SC	-	1,200,000/-
Surface Water Quality	pH, Dissolved Oxygen, TSS, TDS, Alkalinity, BOD_5, COD, Turbidity	3x2x2 = 12	Bi-annually	EE of CC and SC	-	360,000/-
Noise Level	-	10x4x2 = 80	Quarterly	EE of CC and SC	24 hours	1,200,000/-
TOTAL						**5,760,000/-**
Operation Phase (2 years)						
Air Quality	CO, NO_2, SO_x, PM_{10}	10x4x2 = 80	Quarterly	NHA	24 hours	3,000,000/-
Ground Water	Total Coliforms, Fecal E.	10x1x2 = 20	Annually	NHA	-	600,000/-

Quality	Coli, Total Colonial Count, Fecal Enterococci, pH, TDS, Total Hardness, Nitrate, Chloride, Sodium					
Surface Water Quality	pH, Dissolved Oxygen, TSS, Alkalinity, BOD_5, COD, Turbidity	3x1x2 = 6	Annually	NHA	-	180,000/-
Noise Level	-	10x2x2 = 4	Bi-annually	NHA	24 hours	600,000/-
TOTAL						**4,380,000/-**
GRAND TORAL						**10,140,000/-**

KEY

EC - Environmental Committee, NHA – National Highways Authority

EE - Environmental Engineer, CC – Construction Contractor

SC – Supervision Consultant

8.7 Plantation Plan (2014)

408. To minimise the negative impacts arising due to increased vehicular activity on the road, excessive trees will be planted along the entire Project.

409. Table 8.4 gives the mitigation cost for Planting and Maintenance. Two strips of 25m width have been planned to be reserved for planting on both sides of the motorway (Faisalabad – Khanewal section = 184 km long). Planting shall be done in rows (avenues). Eight avenues (row to row distance = 3m) shall be planted for a length of 50 km near the habitations and four avenues (row to row distance = 6m) in the rest of the 134 km long strip.

Number of plants in eight avenue/ rows of 50 km = (50,000m/3m x 8)

= 133,328

Number of plants in four avenue/ rows of 134 km = (134,000m/3m x4)

= 178,664

Number of plants in one strip (133,328 +178,664) = 311,992

Number of plants in one strip (311,992 x2) = 623,984

Number of Avenue miles (500 plants in on avenue mile) to be planted = 1,250

Beating up of failures

(25% of the plants planted) Avenue miles = 312

Table 8.4: Mitigation Cost on Planting and Maintenance

#	Year	Planting cost (Rs. Per Av. Mile)	Avenue Miles	Amount	
				Pak Rs.	US $
1	1	25,000 ($ 416.6)	1,250	31,250,000	520,833.3
2	1	(for beating up failures) 25,000 ($ 416.6)	312	7,800,000	130,000
3	2	10,000 ($166.6)	1,250	12,500,000	208,333.3
4	3	7,500 ($ 125)	1,250	9,375,000	156,250
5	4	4,000 ($ 66.7)	1,250	5,000,000	83,333.3
6	5	3,000 ($ 60)	1,250	3,750,000	62,500
		TOTAL		**69,675,000**	**1,161,250**

291. Table 8.5 gives the mitigation cost for grass turfing and planting with shrubs and climbers. Raised Median shall be planted with grasses (turfing) and shrubs which may not attain height more than two meters. A large variety of shrubs and stout climbers is available and choice can be made out of these. Kener (Nerium oleander) and Bouganvillea are two examples. This planting could provide an effective protection against night glare besides beautifying the area.

The width of the median = 7 m

Length of the motorway section = 184 km

Area of the median = 130 ha

Table 8.5: Cost on Grass Turfing and Planting with Shrubs and Climbers

#	Year	Planting cost (Rs. Per Hectare)	Area (Ha)	Amount	
				Pak Rs	US $
1	1	75,000 ($ 1250)	130	9,750,000	162500
2	1	75,000 ($ 1250), beating up failures, turfing (25%)	32.5	2,475,000	41250
3	2	30,000 ($ 500)	130	3,900,000	65000
4	3	30,000 ($ 500)	130	3,900,000	65000
5	4	30,000 ($ 500)	130	3,900,000	65000
6	5	30,000 ($ 500)	130	3,900,000	65000
7		**Total**		**27,825,000**	**463,750**

8.8 Environmental Technical Assistance and Training Plan (2014)

410. An environmental and social training and Technical Assistance (TA) program will be carried out to build the NHA's capacity to effectively implement this EMP, as well as to facilitate the improved environmental management of future Motorway Projects by increasing the environmental and social awareness of NHA staff in general. The NHA with the collaboration of Monitoring Consultants (MC) will arrange the environmental training sessions for their staff. The objective of these sessions will be to help establish appropriate systems, and to train senior NHA staff responsible for managing environment, operations, and planning, who can then impart training at a broader level within and outside the NHA (i.e., the training of trainers). The Consultants will organize training courses for NHA staff, in specialized areas such as air and noise pollution monitoring; develop environment operation manuals in consultation with the NHA's Environmental wing. The details of this training program are presented in Table 8.6

Table 8.6: Personnel Training Programme/ TA Services

Provided by	Contents	Trainees/ Events	Duration
Monitoring consultants/ organizations specializing in environmental management and monitoring	Short seminars and courses on: Environmental laws and regulations daily monitoring and supervision	Three seminars for NHA Project staff	2 days
Monitoring consultants/ organizations specializing in social management and monitoring	Short seminars and courses on: Social awareness	Three seminars for Project staff dealing in Social/lands matters	2 days
Monitoring consultants/ organizations specializing in Occupational, health and safety issues	Short lectures relating to Occupational Safety and Health	Two seminars for contractor's staff	2 days

8.9 Environmental Monitoring, Mitigation and Training Costs

411. For an effective implementation of environmental mitigation measures, it is very important to provide sufficient funds for the implementation of environmental mitigation measures, monitoring, training and land acquisition and resettlement (including damages). National Highways Authority (NHA) is committed to implement all mitigation measures given in this report and will provide required funds in this regard. The summary of total environmental costs is given in Table 8.7, which amounts out to be Rs. 3,969.199 million (US $ 66.187).

Table 8.7 Summary of Environmental Costs

#	Description	Cost (Millions)	
		Pak Rs.	US $
1.	Environmental Mitigation Cost	97.50	1.625
2.	Environmental Monitoring Cost	6.53	0.109
3.	Environmental Training Cost	0.2	0.033
4.	Land Acquisition and Resettlement Cost	3,864.969	64.42
	TOTAL	**3,969.199**	**66.187**

Plantation Plan (2015)

The cost of raising one Kilometer (1000 meter) length of plantation, with 500 plants, has been estimated as Rs. 3,28,000/- including price of plants, earthwork, procurement of manures, continued supply of water to young plants throughout the year and its maintenance five (5) years.

Break-up of Expenditure per 1000 meter length or 500 plants (1 Kilometer) @ Rs. 500/- per diem is given in Table 8.9 below:

Table 3: Estimated Cost of Plantation for First Year

Sr. No.	Particulars of Work	Quantity	Rate (Rupees)	Amount (Rs.)
1.	Layout	1..km	2 MD/Av.km	1000.00
2.	Digging of Pits 2.5 ft. each 2.5x500 =1500 cft.	1500 cft.	10 MD/Av.km	5000.00
3.	Cost of Plants including	500 No.	Rs.20/- plant	10,000.00
4.	Cost of planting of plants	500 No.	Rs. 10/- plant	5,000.00
5.	Carriage of plants from private nursery to site including loading/unloading	500 No.	Rs. 2/- plant	1000.00
6.	Cost of Manure and Bhall (silt) including carriage	500 plants		5,000.00
7.	H/watering 50 times 500x50 with water bowser, one driver and one coolie	25,000 no.	5 MD/per 1000	62,500
8.	Weeding twice 500x2	1000 no.	5 MD	2,500.00
9.	Reopening of Pits twice (500x2)/cft/pit	1000 cft.	5 MD	2,500.00
10.	Unforeseen			500.00
Total				**95,000.00**

Table 4: Estimated Cost of Restocking and Maintenance for 2nd Year

Sr. No.	Particulars of Work	Quantity	Rate (Rupees)	Amount (Rs.)
1.	Cost of Plants 20% Restocking	100 No.	Rs.20/- plant	2000.00
2.	Cost of planting	100 No.	Rs. 10/- plant	1000.00
3.	Carriage of plants	100 No.	Rs. 2/- plant	200.00
4.	H/watering 50 times with water bowser, one driver and one coolie	25,000 no.	5 MD/per %	62500
5.	Reopening of Pits twice (500x2)	1000 cft.	5 MD	2,500.00
6.	Weeding twice 500x2	1000 no.	5 MD	2,500.00
7.	Unforeseen			300.00
Total				**71,000.00**

Table 5: Estimated Cost of Restocking and Maintenance for 3rd Year

Sr. No.	Item	Quantity	Rate (Rupees)	Amount (Rs.)
1.	Cost of Plants 10% Restocking 100 No.	100 No.	Rs.20/- plant	2000.00
2.	Cost of planting	100 No.	Rs. 10/- plant	1000.00
3.	Carriage of plants	100 No.	Rs. 2/- plant	200.00
4.	H/watering 40 times	20,000 no.	5 MD/1000	50,000
5.	Reopening of Pits twice (500x2)	1000	5 MD	2,500.00
6.	Unforeseen			300.00
Total				**56,000.00**

Table 6: Estimated Cost of Maintenance for 4th Year

Sr. No.	Particulars of Work	Quantity	Rate (Rupees)	Amount (Rs.)
1.	H/watering 40 times	20,000 no.	5 MD/1000	50.000
2.	Pruning and cleaning of plants	500 no.	5 MD	2,500.00
3.	Unforeseen			500.00
Total				**53,000.00**

Table 7: Estimated Cost of Maintenance for 5th Year

Sr. No.	Item	Quantity	Rate	Amount (Rs.)
1.	H/watering 40 times	20,000 no.	5 MD/1000	50,000
2.	Pruning and cleaning of plants	500 no.	5 MD	2,500.00
3.	Unforeseen			500.00
Total				**53,000.00**

Table 8: Total Plantation Cost (From Table 3 to 7)

Sr. No.	Item	Cost (Rs.)
1.	Total cost for raising 500 plants (1 Km of plantation) and Maintenance for 5 years (1 to 5)	328,000.00
2.	Total cost for raising 1,30,000 plants including maintenance for 5 years along the boundary of converter station in 2 rows and along inner roads, open spaces, within compounds of the buildings	85,280,000 or 85.28 million

Cost of raising one plant with four years maintenance: Rs. 656.00/-

8.11 Environmental Technical Assistance and Training Plan (2015)

412. An environmental and social training and Technical Assistance (TA) program will be carried out to build the NHA's capacity to effectively implement this EMP, as well as to facilitate the improved environmental management of future Motorway Projects by increasing the environmental and social awareness of NHA staff in general. The NHA with the collaboration of Monitoring Consultants (MC) will arrange the environmental training sessions for their staff.

413. The objective of these sessions will be to help/establish appropriate systems, and to train senior NHA staff responsible for managing environment, operations, and planning, who can then impart training at a broader level within and outside the NHA (i.e., the training of trainers). The Consultants will organize training courses for NHA staff, in specialized areas such as air and noise pollution monitoring; develop environment operation manuals in consultation with the NHA's Environment section. The details of this training program are presented in Table 8.10

Table 8.10 Personnel Training Programme/ TA Services

Provided by	Contents	Trainees/ Events	Duration
Monitoring consultants/ organizations specializing in environmental management and monitoring	Short seminars and courses on: Environmental laws and regulations daily monitoring and supervision	Three seminars for NHA Project staff	2 days
Monitoring3 consultants/ organizations specializing in social management and monitoring	Short seminars and courses on: Social awareness	Three seminars for Project staff dealing in Social/lands matters	2 days
Monitoring consultants/ organizations specializing in Occupational, health and safety issues	Short lectures relating to Occupational Safety and Health	Two seminars for contractor's staff	2 days

a) Cost of Environmental Technical Training

414. The cost provision of Rs. 700,000 (US$ 7000) is estimated on lump sum basis for providing technical training to the staff.

8.12 Environmental Monitoring, Mitigation and Training Cost (Section III)

415.The cost required to effectively implement the mitigation measures is important for the sustainability of the Project both in the construction and operation stages of the Project.

416. These costs are summarized as below:

Environmental Monitoring Cost	=	10,140,000/-
Environmental Training Cost	=	1,000,000/- (lump sum)
Tree Plantation Cost	=	85,280,000/-
Total	=	96,420,000/-
Say	=	**96.42 Million Rupees**

All the environmental cost would be the part of project cost.

SECTION 9

PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

9.0 General

417. This section deals with the information disclosure to the public and consultation sessions held with the different stakeholder groups that are likely to be affected by the implementation of the proposed Project. The consultation process was carried out as per the guidelines of ADB and EPA.

418. This consultation process had the following objectives:

1. Share information with stakeholders on proposed improvement works and expected impacts on the physical, biological and socio-economic environment of the Project corridor;
2. Understand stakeholders' concerns regarding various aspects of the Project, including the existing condition of the Motorway, upgrading requirements, and the likely impact of construction related activities and operation of the improved Motorway;
3. Provide an opportunity to the public to influence Project design in a positive manner;
4. Obtain local and traditional knowledge, before decision making;
5. Increase public confidence about the proponent, reviewers and decision makers;
6. Reduce conflict through the early identification of controversial issues, and work through them to find acceptable solutions;
7. Create a sense of ownership of the proposal in the mind of the stakeholders; and
8. Develop the proposal which is truly sustainable.

9.1 Identification of main Stakeholder

419. During the field survey, significant efforts were made to identify the possible categories of stakeholders and their stakes. During the field survey different stakeholders identified were the villagers, local residents, government officials, shop owners, public representative, NGO's and general public. All those stakeholders had different types of stakes according to their professions.

9.2 Scoping Sessions

420. A series of scoping sessions and focus group discussions were also carried out with local communities and local government representatives. The meetings were held at various locations.

421. Generally, people were found to be aware of the need of the Motorway, and indicated their support for the present NHA Project. Local communities demanded that they will be part of a continuous consultation process with other

stakeholders at different stages of the Project including the design, construction, and operational periods. The scoping sessions were carried out according to the schedule indicated in Table 9.1.

Table 9.1: Schedule of Scoping Sessions

S. No.	Date	District /Tehsil	Time	Village	No. of Participants	Topic
1	19th January 2007 20th January 2007	Faisalabad Tehsil (District Faisalabad)	10:00 am	Kamal Pur ShahbazPur Chanan Key Gardana Dandawal	6 12 8 11	Project introduction & Suggestions of Stakeholders Compensation package for affected persons Land acquisition related matters Under passes and Fly overs designs
2	21th January 2007 22th January 2007	Gojra Tehsil (District T.T.Singh)	05:00 pm	Chak No 334 J.B. Chak No 337 J.B. Chak No 343 J.B. Chak No 353 J.B. Chak No 438 J.B.	9 12 7 12 7	Project introduction & Discussion on Compensation Package with the Affectees Resettlement issues were discussed Compensation in cash and in time Special care for vulnerable groups
3	23th January 2007 24th January 2007	Tehsil Toba Tek Singh (District T.T.Singh)	10:30 am 10:30 am	Chak No 317 J.B. Chak No 384 J.B. Chak No 383 J.B. Chak No 397 J.B. Chak No 400 J.B.	10 7 8 6 5	Project introduction & Suggestions regarding Road Safety Resettlement issues were discussed Compensation package with the Affectees

S. No.	Date	District /Tehsil	Time	Village	No. of Participants	Topic
						Compensation in cash and in time
4	23th January 2007 24th January 2007	Tehsil Shorkot (District Jhang)	1:30 pm 16:30 pm	Chak No 487 J.B. Chak No 489 J.B. Chak No 404 J.B. Chak No 406 J.B. Chak No 505 J.B.	11 9 8 9 6	Project introduction & Discussion on Compensation Package with the Affectees Compensation in cash and in time Resettlement issues were discussed Under passes and Fly overs designs
5	25th January 2007 26th January 2007	Tehsil Kabirwala (District Khanewal)	10:30 am 15:30 pm	Mouza Jalal Pur Mouza Allah Hoo Mouza Nahaley Wala Mouza Ali Pur MouzaKotBhader Mouza Sham Kot	9 6 4 6 5 5 4	Project introduction & Discussion on Compensation Package with the Affectees Resettlement issues were discussed Compensation Package with the Affectees Compensation in cash and in time Resettlement issues were discussed Under passes and Fly overs designs
6	27th January 2007	Tehsil Khanewal (District	13:30 pm	Mouza 8 Vanohe Mouza 15 Vanohe	6 4	Project introduction & Discussion on Compensation Package with the

S. No.	Date	District /Tehsil	Time	Village	No. of Participants	Topic
		Khanewal)		Mouza Dunaya wala Mouza 9 Vanohe	6 4	Affectees Resettlement issues were discussed Compensation in cash and in time

Stakeholders' Concerns

422. The most commonly raised concerns raised during the meetings are listed herewith:

(a) Motorway Design

- Provide underpasses at shorter distances;
- Provide interchanges at appropriate places so that residents of the Project Area can avail the Motorway travel;
- Overhead bridges at existing Link road crossings;
- Improve general standards of construction;
- Abate dust emissions by providing paved road shoulders;
- Construct median in the centre of road for the safety of moving traffic.
- Provide drain outlets to help drain away run-off from the Motorway, particularly in areas where road level is higher than that of surrounding settlements; and
- Plant trees along the Motorway that could reduce air and noise pollution.

(b) Motorway Construction

- Avoid dumping construction material along the Motorway;
- Adopt measures to minimise dust, smoke, and noise pollution, and to control spillages from construction machinery;
- Implement a proper solid waste management plan;
- Induct local labour into the construction workforce as far as possible to avoid social conflict between the migrant labour and local communities; and
- Provide proper diversion for the traffic during construction to avoid traffic congestion, related hazards, and dust emissions.

(c) Motorway Operation

- Erect cautionary and informatory signs;
- Control use of loud horns near schools, traffic disorders and violations of traffic regulations;
- Specify speed limits where required;
- Ensure that cross-drainage pipes and culverts are regularly cleaned; and
- Regularly remove accumulated piles of rubbish from the RoW.

9.3 Proposed Measures for incorporating the Stakeholders' Concerns

(a) Motorway Design

423. The contractors and design consultants will include the following environmental and safety provisions in the project design under the Project:

- Under passes, bridges and interchanges will be located at appropriate and possibly shorter distance;
- A tree plantation programme to compensate for the anticipated loss of vegetation during the construction activities, and to help abate pollution caused by emissions, dust, and noise during Motorway operation; and
- Drainage system will be provided to control surface runoff.

(b) Motorway Construction

424. The following measures will be carried out in order to protect surrounding communities from the expected impact of construction:

- Project facilities will be located at a minimum distance of 500 metres from existing settlements and built-up areas. In order to avoid restricting the mobility of local people, construction vehicles will remain confined within their designated areas of movement.
- Sensitivity towards local customs and traditions will be encouraged to minimise social friction. Good relations with local communities will be promoted by encouraging contractors to provide opportunities for skilled and unskilled employment to locals, as well as on job training in construction for young people.
- NHA is bound to comply with the prevailing national/provincial regulations concerning pollution and waste disposal.
- Solid waste generated during construction and at camp sites will be properly treated and safely disposed off only in demarcated waste disposal sites approved by the supervision consultant; and
- All necessary measures will be taken to ensure the safety of traffic during construction, including barricades (including signs, pavement markings, flags, and lights) erected as required by the NHA/NH&MP

(National Highway and Motorway Police). All such barricades will be set up as per local regulations.

(c) Motorway Operation

- Cautionary and informatory signs will be erected;
- Use of loud horns near schools, traffic disorders and violations of traffic regulations will be monitored and controlled by NH&MP;
- Speed limits will be specified and NH&MP will control it; and
- Cross-drainage pipes and culverts cleaning will be ensured on regular basis.

9.4 Village Meetings

425. Village meetings have many uses in participatory development, including information sharing and group consultation, consensus building, prioritising and sequencing of interventions and collaborative monitoring and evaluations. Concerns raised during village meetings have been discussed in Table 9.2.

9.5 Future Information Disclosure Plan

426. After suggesting the possible solutions of the stakeholders' concerns, the solutions (final EIA report) will be disclosed once again before the stake holders and general public. EIA report will be accessible to interested parties on request and the version of final report will be available in the nearest library and its summary will be available in stakeholders' mother tongue.

Table 9.2: Village Meetings and the Concerns

S. No	Village Name/ Venue	Total House hold	Population	Date	No of Participant	Main Concerns	Expectations
1	Chak No. 5 Kamalpur	1000	8000	19.01.07	12	Judicious compensation at market price will be given to affected persons. Agriculture land will be divided in to two portions. Title less affected persons will not given compensation	Economics opportunities for the people of area. Employment opportunity for the people of area. Transport Facility will be improved.
2	Village Shahbazpur	500	4000	19.01.07	9	Under passes will be given. Land will be acquired at market price. Land price will be given before land acquisition.	Transport Facility will be improved.
3	Chak No.337 J.B.	400	3500	21.01.07	10	Agriculture land will be divided in to two portions. Tenants will be compensated for their crops. Under pass will be constructed. Interchange will be given here.	Better transport facilities. Chance of labour work during construction. Less time consumption during Journey
4	Chak No.317 J.B.	300	3000	23.01.07	10	Judicious compensation at market price will be given to affected persons. Accidents Chances will be increase. .	Better transport facilities. Chance of labour work during construction. Less time consumption during Journey
5	ChakNo.487J.B.	50	750	23.01.07	11	Accidents Chances will be increase.	Unemployment will be

S. No	Village Name/ Venue	Total House hold	Population	Date	No of Participant	Main Concerns	Expectations
						Judicious compensation at market price will be given to affected persons. Fly over will be constructed. Agriculture land will be divided in to two portions.	decrease. Patients would easily go to big cities
6	Chak No.406J.B.	300	6000	24.01.07	9	Accidents Chances will be increase. Land will be acquired at current market price. Fly over will be constructed. Agriculture land will be divided in to two portions.	We will enjoy better trans port facilities. Business facilities will be generated. Better transport facilities will be available.
7	MouzaJalalpur	250	1800	25.01.07	9	Service road will be provided. Sign board will be provided along the settlement. Proper arrangements will be done to avoid construction hazards.	We will enjoy better trans port facilities. Business opportunities will be generated. Better transport facilities will be available.
8	Mouza Allah hoo	200	2100	26.01.07	6	Agriculture land will be divided in to two portions. Cash compensation will be given through one window operation.	People will be able to reach big cities easily. Village people will never migrated to big cities
9	Village MouzaVanohe	100	1000	27.01.07	6	Agriculture land will be divided in to two portions. Houses and shops will not be	People will be able to reach big cities easily. This road will link the people of different cities. Economy of the area will

S. No	Village Name/ Venue	Total House hold	Population	Date	No of Participant	Main Concerns	Expectations
						dislocated Compensation will be given before demolition. Business will be disturbed Village will be ruin.	be boasted village at people will never migrated to big cities
10	Mouza 9 ChakVanohe	150	1800	27.01.07	21	Fair and proper compensation will be given. Compensation will be given well in time. Agriculture land will be divided in to two portions.	Different kind of conveyances will be available. Different kind of industries will be installed. We will enjoy better trans port facilities. Business facilities will be generated. Better transport facilities will be available.

The Public Meetings were also held in the affected villages for sharing social and environmental issues and their mitigation measures. The details of these meetings are attached as Annexure-IV.

9.6 Proponent Commitments

427. The LAA and its implementation Rules require that following impacts assessment / valuation effort, land and crops are compensation in cash at market rate to titled landowners and registered land tenants /users respectively. The LAA mandates that land valuation is to be based on the latest 5-3 years average reinstated land sale rates, through, in several recent cases the median rate over the past 1 year, or even the current rates, have been applied. Due to vide spread and under –valuation by the revenue department current market rates are now frequently applied with an added 15% compulsory Acquisition surcharge as provided in LAA.

428. Based on the LAA, only legal owners and tenants' registered with the Land Revenue department or processing formal agreements are eligible for compensation or livelihood support. The right of the title less are however addressed under the 1986. Jinnah Abadees for non proprietors in Rural Areas Act which recognise to squatters the right to receive rehabilitation in from of a replacement plot. It is to be noted that this right has been sometime extended in practice to include some from of rehabilitation in cash or in the forms of different from land. Projects such as Chotiari Dam, Ghazi Brotha Hydropower and National Highways Improvement, have awarded compensation and assistance to unregistered tenants and other forms of AP (sharecropper/squatters).

429. As noted above, exceptions to the rule are intrinsic to the fact that the law is elastic and are broadly interpreted at provincial level depending on operational requirements, local needs, and socio-economic circumstances. Recourse is often taken to ad hock arrangements, and understandings for resettlement in difficult situations. The above is also influenced by the fact that an amendment of the LAA has been considered necessary by the Ministry of Environment. Accordingly, a National Resettlement Policy (NRP) and a Resettlement Ordinance have been drafted to broaden LAA provisions and current practices so as to widen the scope of eligibility and tightening up loopholes (i.e. regarding definitions of malpractices, cut-off dates, political influence on routing, etc.). But both these documents are still awaiting government's approval for implementation.

9.7 ADB's Involuntary Resettlement Policy

430. The ADB Policy on Involuntary Resettlement is based on the following principles which will be adopted at time of land acquisition problem:

- Involuntary resettlement will be avoided or at least minimized.
- Compensation will be given to ensure the maintenance of the APs' pre-project living standards.
- APs will be fully informed and consulted on LAR compensation options.
- APs' socio-cultural institutions will be supported/ used as much as possible.
- Compensation will be carried out with equal consideration of women and men.
- Lack of formal legal land title will not be a hindrance to rehabilitation.

- Particular attention will be paid to households headed by women and other vulnerable groups, such as IPs and ethnic minorities, and appropriate assistance will be provided to help them improve their status.
- LAR will be conceived and executed as a part of the project, and the full costs of compensation will be included in project costs and benefits.
- Compensation/rehabilitation assistance will be paid prior to ground levelling, demolition, and in any case, before an impact occurs.

SECTION 10

PUBLIC CONSULTATION AND INFORMATION DISCLOSURE (SECTION-II, 2014) AND (SECTION III, 2015) M-4

A. Public Consultation and Information Disclosure in the Year 2014 for Section-II M-4

431. This section deals with the information disclosure to the public and consultation sessions held with the different stakeholder groups that are likely to be affected by the implementation/construction of section-II of M-4 Project. The consultation process was carried out as per the guidelines of ADB and EPA.

432. This consultation process had the following objectives:

9. Share information with stakeholders on proposed improvement works and expected impacts on the physical, biological and socio-economic environment of the Project corridor;
10. Understand stakeholders' concerns regarding various aspects of the Project, including the existing condition of the Motorway, upgrading requirements, and the likely impact of construction related activities and operation of the improved Motorway;
11. Provide an opportunity to the public to influence Project design in a positive manner;
12. Obtain local and traditional knowledge, before decision making;
13. Increase public confidence about the proponent, reviewers and decision makers;
14. Reduce conflict through the early identification of controversial issues, and work through them to find acceptable solutions;
15. Create a sense of ownership of the proposal in the mind of the stakeholders; and
16. Develop the proposal which is truly sustainable.

10.1 Identification of Main Stakeholder

433. During the field survey, significant efforts were made to identify the possible categories of stakeholders and their stakes. During the field survey different stakeholders identified were the villagers, local residents, government officials, shop owners, public representative, NGO's and general public. All those stakeholders had different types of stakes according to their interests and professions.

434. General public, elected representatives, local councillors and informal community leaders including members of non-government organizations (NGOs) were asked to state their current perceptions of priorities for improvements to the urban environmental infrastructure in their areas and about the likely impacts of the Project during construction and operation phases. women groups were also contacted. The main objectives of the public

information campaign and public consultation were as follows:

- To share the information about the proposed project, its components and activities with affected people;
- To obtain cooperation and participation of the general public in Project planning and implementation processes;
- To establish accessible and effective grievance redress procedures; and
- Create a sense of ownership among the stake holders regarding the Project.

10.2 Approach for Public Consultation

435. The approach adopted towards public participation was to disseminate information, solicited inputs and getting consensus on issues and propose mitigation measures. This approach was put into practice through consultation in public meetings, meetings with influential people of the districts, workshops and roadside consultations with pedestrians, vehicle drivers, roadside vendors etc were held. The first consultation process was held in 2006-2007 during the preparation of environmental assessment report. Subsequently, further consultations were held in June 2014 and October 2014 during the updation of the Environmental Impact Assessment Report for section-II of M-4. A fresh public consultation was conducted on 24-25 June 2014 and 13-15 October 2014 by the team of Environment Cell and the Land Staff (NHA). The main focus of the consultation was to get a view/idea of the public about the construction of proposed section-II of M-4 and their grievances if any. As the construction of the first section i.e. Faisalabad-Gojra section-I of M-4 is near the completion stage therefore public was well aware of the benefit of the construction which they will obtain during the construction and at the operational stage of the second section of the project. Village meetings were conducted both with the male and female residents of the communities, and public was aware for the provision of jobs during the construction period. On the whole residents appreciate the proposed project and were happy for the development of the area.

10.3 Meetings with Stakeholders

436. During the first round of consultations meetings were held with the local communities NGO's Government officials and all possible stakeholders in 2007. During discussions with residents and site visits, it has been revealed that local people were generally aware of the Project and were in favor of its construction

437. In the second round of consultation for the updation of EIA report for Section-II Director Environment and Monitoring from Environmental Protection Agency (EPA) Punjab was contacted for validation of NOC which was earlier issued in 2007. In June and October 2014 Public Consultations were also arranged with community members of different villages along the road alignment, the Project is generally accepted and people want this Project to be taken up. The consultation sessions were carried out according to the schedule indicated in **Table 10.1.**

Table 10.1 Schedule of Scoping Sessions (2014)

S. No.	Date	District /Tehsil	Time	Village	No. of Participants	Name of Participants	Topic
1	24 June 2014	Tehsil & District Toba Taksingh	10:00 am	Chak 383 JB	11	M. Akram S/O Shah Muhammad M. Adeel S/O Abdul Rasheed M. Ajmal Hussain S/O M. Hussain QamarAjaz S/O Khushi Muhammad M. Naeem Babar S/O liaquat Ali GhulamRasoul S/O M. Ismail Muraba FalakSher S/O M. Shafi Imran Ali S/O AshiqAuraim t Adil Husain S/O M. Hassan Abdul Ghafar S/O Ismail JavaidAhmar S/O Abdul HameedManzoor Hussain S/O Ismail	Compensation package for affected persons Land acquisition related matters Under passes and culverts Designs Formation of a village level committee Briefing about the Environmental Issues arise during the construction activities
2	24 June 2014	Tehsil & District Toba Taksingh	10:45 am	RD 80+100	3	Kareem Bibi W/O KhadimHasan SughraIqbal- Anwer Ali Kinza Fatima D/O Farman Ali	Discussion on Compensation Package with the Affectees Resettlement issues were discussed Jobs to the local residents Briefing about the Environmental Issues arise during the

S. No.	Date	District /Tehsil	Time	Village	No. of Participants	Name of Participants	Topic
							construction activities
3	24 June 2014	District T.T.Singh)	11:30 am	Chak 397 JB RD 84+700	4	Mohammad Adil S/o M.Anyat Ummar Hayat S/O M.Adil Samenabibi W/O Ummar Hayat Rasheed S/O M.Adil	Suggestions regarding Road Safety Resettlement issues were discussed Compensation package with the Affectees Briefing about the Environmental Issues arise during the construction activities
4	25th June 2014	Tehsil Shorkot (District Jhang)	12:15 pm	RD 86+637	13	Mahmood S/O Ramzan Abdulstar S/O Abdul Latif Umair Hayat S/O Ahmed Bux Nazeer Ahmed S/O Wariam Haq Nawaz S/O Deen Mohammad Mohammad Asif S/O Mohammad Zulfiqar Mohammad Muzafar S/O Alladita Shaukat S/O Mohammad RamzanAlamgheer S/O Saad Ali Mohammad Asghar S/O Nazeer Ahmad NazarBibi W/O Muhammad Bux SakinaBibi W/O Tahir Abbas JantaBibi W/O Mohammad Nawaz ShahnazBibi W/O ZafarIqbal	Discussion on Compensation Package with the Affectees Under passes and culverts designs Briefing about the Environmental Issues arise during the construction activities
5	25th June	Tehsil	2:00	RD	3		Land

S. No.	Date	District /Tehsil	Time	Village	No. of Participants	Name of Participants	Topic
	2014	Shorkot (District Jhang)	pm	87+100		GhazalaBibi W/O Mazhar MoundaBibi W/O Sultan Suneera W/O Saleem	Compensation issues were discussed Under passes and culverts designs Briefing about the Environmental Issues arise during the construction activities
6	25 June 2014	Tehsil Shorkot District Jhung	13:30 pm	Mouza Sat Ghag RD 120 End Point of Section-II M-4	11	Mohammad Sadiq S/O Badhur Khan Mohammad Yasheen S/O GhulamBaqir GhulamMurtaza S/O Abdul Kareem Abdul Rasheed S/O Jafar Hussain Amir Nadeem S/O Mohammad Ayub Mohammad Ramzan S/O Mohammad Nadir Ejaz Hussain S/O Tariq Hussain Sajjad Hussain S/O Talib Hussain Umar Daraz S/O Talib Hussain Sarfaraz S/O Talib Hussain Sadabahar S/O TalibHussain	Discussion on Compensation Package with the Affectees Under passes and culverts designs Briefing about the Environmental Issues arise during the construction activities
7	14 October 2014		11:00 am	Chak 487	25	Maqsood Ahmed S/o Haji NabiBhaksh, M. Nawaz S/o Haji NabiBhaksh, Abdul Rasheed S/o Kamal Din, Mukhtar Ali S/o Barkat Ali, M. Ashraf S/o Talib Din, Asghar Ali S/o Mukhtair Ali,	Compensation package for affected persons Land acquisition

S. No.	Date	District /Tehsil	Time	Village	No. of Participants	Name of Participants	Topic
						Asghar Ali S/o NabiBaksh, Abdul Sattar S/o Kamal Din, Sardar S/o Kamal Din, Ghulam Bari S/o Barkat Ali, Faqeer Muhammad S/o MoulaBhaksh (other names of participants are attached in Annexure-IV for reference	related matters Under passes and culverts Designs Formation of a village level committee Briefing about the Environmental Issues arise during the construction activities
8	14October 2014			Chak 396 JB	17	Mazhar Abbas S/o M. Nawaz, M Ameen S/o GhulamNaveed, Rub Nawaz S/o Bhadur Khan, M. Sadiq S/o Chiragh Din, Nazir Ahmed S/o M. Daraya, M. Iqbal S/o Lal Khan, Raja Ali Shan S/o Malik Dad, M. Riaz S/o Rahim Dad, Raja Liaquat Ali S/o Aslam Khan, Haq Nawaz S/o Murad, M. Tariq S/o Tariq Aslam, M. Imran S/o Taj Muhammad, Faqeer Muhammad Nambar Dar, M. Riaz S/o Khan,	Compensation package for affected persons Land acquisition related matters Under passes and culverts Designs Formation of a village level committee Briefing about the Environmental Issues arise during the construction activities

S. No.	Date	District /Tehsil	Time	Village	No. of Participants	Name of Participants	Topic
9	15 October 2014			Chak 310	27	Farzand Ali S/o M. Sadiq, Akbar Ali S/o Maqbool Ahmed, M. Akram S/o Allah Ditta, Ali Raza S/o M. Hanif, SaifUllah S/o AnayatUllah, ZafarIqbal S/o M. Iqbal, MateenUllah S/o Anayatullah, M. Ijaz S/o M. Sarwar, Arshed Ali S/o Rehmat Ali, Munir Ahmed S/o Ghulam Ali, Nazir Ahmed S/o M. Din (other names of participants are attached in Annexure-IV for reference	Land Compensation issues were discussed Under passes and culverts designs Briefing about the Environmental Issues arise during the construction activities
10	16 October 2014			Chak 383 JB	23	ShahidaParveen W/o Farman Ali, Nasreen W/o Dilbar Hussain, ShameemWoMuhammdRamzan, Dilbar Hussain S/o M. Tufail, Farooq-e-Azam S/o M. Irshad, Shahzad Ahmed S/o Munawar Hussain, M. ShahidShaheen S/o M. Yaqoob, (other names of participants are attached in Annexure-IV for reference	Land Compensation issues were discussed Under passes and culverts designs Briefing about the Environmental Issues arise during the construction activities
11	15 October 2014			Chak 396	16		Discussion on Compensation Package with the Affectees Under passes and culverts

S. No.	Date	District /Tehsil	Time	Village	No. of Participants	Name of Participants	Topic
							designs Briefing about the Environmental Issues arise during the construction activities Formation of a village level committee
12	15 October 2014			Chak 7 Gagh	24	M. Ikram Shah S/o MianShab, AmanUllah S/o M. Ramzan, Zia Ullah S/o M. Sharif, Sarfraz S/o MianFazil, Jumma Din S/o M. Khan, Allah Ditta S/o KhudaBaksh, M. Ramzan S/o M. Fazil, Adil S/o Bhadur Khan (other names of participants are attached in Annexure-IV for reference	Compensation package for affected persons Land acquisition related matters Under passes and culverts Designs Formation of a village level committee Briefing about the Environmental Issues arise during the construction activities

The details of these meetings (scanned copies of attendance sheets and the pictorial profile) are attached as Annexure-IV.

10.4 Stake Holders Concern

438. The most common concerns noticed during the fresh public meeting are listed as under:

Motorway Design

- The design of road should be least disturbing the local agriculture and economic activity.
- Sufficient cross drainage structures should be provided to avoid flooding of the area.
- The Motorway alignment should minimum effect the local settings and to avoid the severance of the area while passing through the populated area.
- The respectful local customs should be taken in account in a design and should be maintained during construction.

Motorway Construction

- Avoid undue delays in construction to limit the inconvenience to the public cause by the road construction.
- Adopt measures to minimize dust, smoke and noise pollution during construction.
- Avoid dumping of the construction materials during the construction and to carry out proper site clearance after completion of the construction activities.
- Provision of properly formed and maintained diversions during construction.
- Inclusion of local labour and workforce up to the maximum possible extent in project construction activities.

Motorway Operations

- Erection of informatory regulatory and cautionary signs to eliminate operational hazards
- Control over speeding and the use of loud pressure horns near populated area.
- Specify speed limits where required.
- Proper maintenance of cross drainage structure to avoid flooding of road and adjacent area.

439. These concerns will be addressed through the proper implementation of the EMP. The list of consulted persons during consultations held in June and October 2014 and the pictorial profile of public consultation are attached as

Annexure-IV. Public consultation was held in accordance with the guidelines of ADB and Pakistan Environmental Protection Act 1997. On different locations at different Chaks public meetings were organized and the team travelled along the project alignment and gathered all data about the sensitive receptors as well.

10.5 Future Information Disclosure Plan

440. After suggesting the possible solutions of the stakeholders' concerns, the solutions (final EIA report) will be accessible to interested parties on request

and the version of final report will be available in the project offices and its summary will be available to stakeholders in national language.

B. Public Consultation and Information Disclosure in the Year 2015 for Section-III M-4 (Shorkot – Khanewal)

General

441. This section deals with the Public Involvement (PI), information disclosure to the public and consultation sessions held with the different stakeholder groups that are likely to be affected by the implementation of the proposed Project. The consultation process was carried out as per the guidelines of ADB and EPA.

442. This consultation process had the following objectives:

- Share information with stakeholders about the Project and expected impacts on the physical, biological and socio-economic environment of the Project corridor;
- Understand stakeholders' concerns regarding various aspects of the Project, including the existing condition of the Motorway, upgrading requirements, and the likely impact of construction related activities and operation of the improved Motorway;
- Provide an opportunity to the public to influence Project design in a positive manner;
- Obtain local and traditional knowledge, before decision making;
- Increase public confidence about the proponent, reviewers and decision makers;
- Reduce conflict through the early identification of controversial issues, and work through them to find acceptable solutions;
- Create a sense of ownership of the proposal in the mind of the stakeholders; and
- Develop the proposal which is truly sustainable.

10.6 Public Involvement (PI) in the Project

a. Identification of Stakeholder

443. During the field survey, significant efforts were made to identify the possible categories of stakeholders and their stakes. Different stakeholders identified were the project affected people, villagers, local residents, government officials, shop owners, Vendors, pedestrians, students, drivers, non-motorized vehicle users, public representative, NGO's and general public. All those stakeholders had different types of stakes according to their professions.

b. Consultation and Participation Process

444. For ascertaining the perceptions of different stakeholders about the project (during/ after construction) meetings were held with them in the project area of influence. These meetings were held in an open atmosphere, in which participants expressed their views freely. Informal group discussions were also held as an additional tool for the assessment of the perceptions of the stakeholders about the project and potential impacts both positive and adverse likely to occur due to its implementation. Particular attention was given to take the views of minority groups or less powerful elements of community such as squatters, renters, women, and the poor in less formal settings.

c. Methods Adopted For PI

445. The following methods were used for public consultation with project stakeholders in order to ascertain their stakes regarding project implementation.

- Focused Group Discussion
- Village meetings
- Formal Group Meetings
- Informal Group Meetings
- Social and rural rapid appraisal techniques

10.7 Stakeholders Apprehensions

446. During the survey, identified stakeholders were interviewed and their concerns were noted to assess their perception of the existing status of the Project and their insight. A social survey performa (attached as Annex XI) was used a tool for this. **Table 10.2** describes different categories of the stakeholders and their apprehensions.

Table 10.2: Different Stakeholders and their Stakes in the Project Area

Sr. No	Stakeholders	Stakes (apprehensions)
1	Residents	Split communities, change in community interaction, cutting of traditional line of interaction, longer routes for the local movements affecting pedestrian and non-motorized vehicles , Dust and noise pollution, privacy / safety issues. Cutting the link between villagers and farmland, disruption to existing farming pattern and connection between fields, loss of agriculture productivity and increased travel cost
2	Shop owners	Business loss due to cutting of link between communities, Noise, air Pollution, access problem for customers, reduction in number of customers. Change in vehicle flow on secondary routes shifting the business.
3	Office workers	Dust, noise & vibrations, access to office, disruption in routine work
4	Taxi/Rickshaw Drivers	Increase time and distance of short local trips, Dust & noise, disruption to passengers, change in travel patterns
5	Government Offices	Appropriate detour, road traffic management, use of heavy machinery in day timings to avoid disturbance for the residents of nearing vicinity
6	Pedestrian, bicyclers, and user of non-motorized	Reduce convenience for local mode of transportation. Increased distance, Provision of appropriate passages for pedestrian to cross Motorway.

Sr. No	Stakeholders	Stakes (apprehensions)
	vehicles	

10.8 Details of Scoping Sessions / Village Meetings

447. A series of scoping sessions and focus group discussions were also carried out with local communities and local government representatives. The meetings were held at various locations. The schedule of scoping sessions held at different locations is shown in **Table 10.3**.

Table 10.3: Schedule of village meetings

Sr. No.	Date	District /Tehsil	Time	Village	No. of Participants
1	July 28,2015	(Tehsil Kabeerwala (District Khanewal)	10:00 am	15-V	9
			11:30 am	Jahanpur	17
			02:00 Pm	Hussanpur	23
2	July 29,2015	(Tehsil Kabeerwala (District Khanewal)	09:00 am	10-D	8
			11:00 am	8-D	6
			03:00 Pm	1-KM	15
3	July 30,2015	(Tehsil Kabeerwala (District Khanewal)	10:30 am	SahadatKandla .	7
			02:30 pm	JhalaPahore	25
4	Juiy 31,2015	(Tehsil Kabeerwala (District Khanewal)	10:00 am	Noorpur	14
			02;00 pm	Alipur	15

Sr. No.	Date	District /Tehsil	Time	Village	No. of Participants
5	August 1,2015	(Tehsil Kabeerwala (District Khanewala)	01:30 pm	Nihalawala	11
			04:30 pm	AllahaHoo	12
			06:00 pm	7-V	20
6	August 3, 2015	Tehsil Kabirwala (District Khanewal)	10:30 am	Kalkanwala	26
			10:00 am	8-V	34
7	August 4, 2015	Tehsil Kabirwala (District Khanewal)	02:00 pm	9-V	11
			03:30 pm	13-V	25
8	August 5, 2015	Tehsil Khanewal (District Khanewal)	09:30 am	Khanewal Khona	11
			11:30 am	Shamkot	16
			03:00 pm	Jamesabad	8
9	December 07, 2015	(Tehsil Shorkot District Jhang)	10:00 am	Kaki Kona	12
			11:40 am	5-Ghag	17

Sr. No.	Date	District /Tehsil	Time	Village	No. of Participants
10	December 08, 2015	(Tehsil Shorkot District Jhang)	10:00 am	17-Ghag	12
			04:00 pm	18-Ghag	8
11	December 09,2015	(Tehsil Kabeerwala (District Khanewal)	10:00 am	Throli	10
			11:40 am	Sahi Saho	15
12	December 10,2015		10:00 am	23-Ghag	12
			04:00 pm	29-Ghag	7

a) Generally, people were found to be aware of the need of the Motorway, and indicated their support for the present NHA Project. Local communities demanded that they should be the part of continuous consultative activities along with other stakeholders at different stages of the Project including the design, construction, and operational periods. **Plate 10.1** shows the pictorial presentation of public involvement (PI) process.

	
Public consultation activity at Kakki Kahna	Public consultation activity at 5 GH
	
Public consultation held at Jalla Pahor	Public consultation held at Tarholi
	
Formal meeting with XEn Irrigation	Formal meeting with DFO Jhang

Plate10.1: Consultation Meetings with Stakeholders

10.9 Outcome of Village Meetings

448. Village meetings have many uses in participatory development, including information sharing and group consultation, consensus building, prioritizing and sequencing of interventions and collaborative monitoring and evaluations. **Plate 11.2** shows the snaps of village meetings.

Village Meeting at AddaDinpur

Village Meeting at ShahadatKandla

Plate10.2: village Meetings

374. Concerns raised during village meetings have been discussed in **Table 10.4**.

Table 10.4: Village Meetings and Concerns

S. No	Date	Village Name	No of Participant	Main Concerns	Expectations
1	28/07/2015	15-V	9	Judicious compensation at market price should be given to affected persons. Agriculture land will be divided in to two portions. Title less affected persons will not be given compensation Jobs should be provided to local people during construction stage of the project	Economic opportunities for the communities. Employment opportunity for the locals. Improvement in transport sector and better travel pattern.
		Jahanpur	17		
		Hussanpur	23		
2	29/07/2015	10-D	8	Under passes should be provided at appropriate distances. Land should be acquired at market price. Compensation should be given before land acquisition.	Transport facility will be improved.
		8-D	6		
		1-KM	15		
3	30/07/2015	SahadatKandla	7	Farming land will be cut in portions. Tenants should be compensated for their crops. Underpasses and interchanges should be constructed.	Better transport facilities. Chances of job for labors during construction. Saving of travelling time and cost
		JhalaPahore	25		

S. No	Date	Village Name	No of Participant	Main Concerns	Expectations
4	31/07/2015	Noorpur	14	Accidents chances will be increased due to faster traffic Judicious compensation at market price should be given to affected persons. Flyover should be constructed rather than underpass at Noorpur. The agriculture land will be bifurcated. Title less affected persons should also be compensated. Jobs should be provided to local people during construction stage of the project.	Transport facility will be improved. Chances of job creations for labors during construction. Improved link between cities Safe travelling due to restricted access
		Alipur	15		
5	01/08/2015	Nihalawala	11	Judicious compensation at market price should be given to affected persons. Accidents chances will be increase. .	Chances of job for labors during construction
		AllahaHoo	12		
		7-V	20		

S. No	Date	Village Name	No of Participant	Main Concerns	Expectations
6	03/08/2015	Kalkanwala	26	Accidents Chances will be increase. Judicious compensation at market price should be given to affected persons. Underpass should be constructed rather than flyover. Agriculture land will be divided in to two portions. Title less affected persons should also be compensated. Jobs should be provided to local people during construction stage of the project	Unemployment will be decreased. Easy access to institutions such as hospitals, schools, universities, and work stations.
7	04/08/2015	8-V	34	Agriculture land will be divided in to two portions. Title less affected persons should also be compensated. Judicious compensation at market price should be given to affected persons. Accidents chances will be increased.	Transport facility will be improved. Unemployment will be decreased.
		9-V	11		
		13-V	25		

S. No	Date	Village Name	No of Participant	Main Concerns	Expectations
8	05/08/2015	Khanewal Khona	11	Accidents chances will be increased due to heavy traffic on local roads Land should be acquired at current market price. Flyover should be constructed. Agriculture land will be divided in to two portions. Construction camps should be away from communities	Better transport facility Business opportunities on bypass roads and service areas.
		Shamkot	16		
		Jamesabad	8		
9	07/12/2015	Kaki Kona	12	Service road should be provided. Sign boards should be provided along the settlement. Load on existing infrastructure such as roads, sewer lines, electric supply Proper arrangements should be made to avoid construction hazards. Diseases like skin and diarrhea are common among the people. Beside this no health facility like BHU, Dispensary etc are available in the area.	Business opportunities will be generated. Better transport facilities will be available. Rehabilitation of existing roads at the end of construction stage Easy access to hospitals.
		5-Ghag	17		

S. No	Date	Village Name	No of Participant	Main Concerns	Expectations
10	08/12/2015	17-Ghag	12	Agriculture land will be divided in to two portions. Cash compensation should be given through one window operation. People are not satisfied with the existing drinking water conditions.	Easy access to big cities Reduction in migration to big cities
		18-Ghag	8		
11	09/12/2015	Throli	10	Agriculture land will be divided in to two portions. Houses and shops should not be dislocated. Compensation should be given before demolition. Business will be disturbed and disruption of farming land.	Saving in travelling time and cost for big cities This road will increase the interaction of people of different cities. Economy of the area will be boosted.
		Sahi Saho	15		
12	10/12/2015	23-Ghag	12	Fair and proper compensation should be given. Compensation should be given well in time.	Availability of different kind of conveyances

S. No	Date	Village Name	No of Participant	Main Concerns	Expectations
13		29-Ghag	7	Agriculture land will be divided in to two portions. Judicious compensation at market price should be given to affected persons. Accidents chances will be increased. Jobs should be provided to local people during construction stage of the project.	Development of Industries Business opportunities will be generated. Availability of Better transport facilities Enhancement of transport business and related occupations

10.10 Outcome of Focus Group Discussions

449. In-depth discussions were held with groups and individuals having particular knowledge and interests about the activity. These include technical specialist, councilors, political representatives, Government representatives, NGOs, specific community groups, affected residents and specific businesses and occupational groups etc. The issues, specifically, related to different phases of the project were discussed with these groups.

450. The most commonly raised concerns during the meetings are listed herewith at different stages of the Project:

(a) Motorway Design phase

- Provision of underpasses at shorter distances;
- Provision of interchanges at appropriate places for easy access to motorway;
- Provision of overpasses at existing link road crossings/ secondary road network;
- Ensure better construction quality;
- Dust control by providing paved road shoulders;
- Provision of median in the center of road for the safety of moving traffic.
- Provision of proper drainage system to control the road run-off , particularly, in areas where road level is higher than that of surrounding settlements; and
- Plantation of trees along the Motorway that could reduce air and noise pollution.

(b) Motorway Construction

- Avoid dumping of construction material along the Motorway;
- Adopt measures to minimize dust, smoke, and noise pollution, and to control spillages from construction machinery;
- Development and Implementation of solid waste management plan;
- Induct local workforce as far as possible to avoid social conflict between the transitive workforce and local communities; and
- Provide proper diversion for the traffic during construction to avoid traffic congestion, related hazards, and dust emissions.

(c) Motorway Operation

- Erect cautionary and informatory signs;
- Proper signage to control use of loud horns near schools, hospitals, mosques;
- Specify speed limits and monitoring devices;
- Ensure that cross-drainage pipes and culverts are regularly cleaned; and
- Regularly remove accumulated heaps of rubbish from the ROW.

10.11 Proposed Measures to address Stakeholders' Concerns

The contractors and design consultants will include the following environmental and safety provisions at different phases of the project:

(a) Motorway Design

- Under passes, overpasses and interchanges will be provided at appropriate and shorter distance;
- A tree plantation will be developed and implemented to compensate for the anticipated loss of vegetation during the construction activities, and to abate air and noise pollution; and
- Drainage system will be provided to control surface runoff with settling basins.

(b) Motorway Construction

- Construction facilities will be located at a minimum distance of 500 meters' from existing settlements and built-up areas and the movement construction vehicles will be confined within their designated areas of movement.
- Construction camps will be located at a distance of about 1 km.
- Sensitivity towards local customs and traditions will be encouraged to avoid social conflicts. Good relations with local communities will be promoted by encouraging contractors to provide opportunities for skilled and unskilled employment to locals, as well as on job training in construction techniques for youth.
- NHA is bound to comply with the prevailing national/provincial regulations concerning pollution and waste disposal.
- Solid waste generated during construction and at camp sites will be properly treated and safely disposed off only in demarcated waste disposal sites approved by the supervision consultant; and
- All necessary measures will be taken to ensure the safety of traffic during construction.

(c) Motorway Operation

- Cautionary and informatory signs will be erected;
- Use of loud horns near schools, traffic disorders and violations of traffic regulations will be monitored and controlled by National Highway and Motorway Police (NH&MP);
- Speed limits will be defined and NH&MP will monitor; and
- Cross-drainage pipes and culverts cleaning will be ensured on regular basis.

Participation of Women in the Project

A separate survey was held to assess and understand the issues of women in the project area. Some of their major concerns are:

- Access to education institutions is difficult as they have to travel toShorkot city for schools and college.
- Health is major issue in villages due to absence of lady health worker or Mother & Child Health Care Centers in the surrounding communities. In case of emergency, they have to travel 3-4km towards Shorkot city.
- There are no vocational and learning schools for girls and women so that they can earn some money and cooperate with male family member in family expenses.
- Women have to fetch woods from the fields for cooking food which causes different respiratory issues in them.
- Basic necessities of life (Sui gas, clean drinking water, schools, hospitals, etc) are not available in the project area.

- Lack of schools for both boys and girls, the children are sent to nearby village or city for education. That is why girls are not allowed to get education and stay at home.

A view of women participation is shown in **Plate 10.3** below:

	
Gender survey meeting at 17 D	Public consultation at 29 GH

Plate10.3: Participation of Women

10.11 Future Information Disclosure Plan

451. Draft EIA report will be disclosed once again before the stake holders and general public to ensure that their concerns and remedial measures have been incorporated in the report. EIA report will be accessible to interested parties on request and the version of final report will be available in the nearest library and its summary will be available in stakeholders' mother tongue. Furthermore, public hearing will be carried out if required by EPA to seek input from stakeholders.

SECTION 11

GRIEVANCE REDRESS MECHANISM

452. In order to receive and facilitate the resolution of affected people's (AP) concerns, complaints and grievances about the Project's environmental performance, a Grievance Redress Mechanism (GRM) will be established at the Project. The GRM will address the APs' concerns and complaints proactively and promptly, using an understandable and transparent process that is gender responsive, culturally appropriate, and readily accessible to all segments of the APs at no costs and without retribution. The mechanism will not impede access to the country's judicial or administrative remedies.

453. The APs will be fully informed of their rights and of the procedures for addressing complaints verbally and in writing during consultations. A mechanism will be established to address/resolve the project related issues including the APs concerns or grievances including those related to the environment.

454. A Grievance Redress Committee (GRC) at the project level will be notified. Although the GRC will be the focal unit for grievance redress at the sub-project (local) level, an informal mechanism will also be instituted to facilitate the APs to resolve their issues at the local level.

11.1 Grievance Redress Committee, Focal Points, Complaints Reporting, Recording and Monitoring

455. NHA will assist the project affected communities/villages to identify local representatives to act as Grievance Focal Persons (GFPs). The GFPs will be responsible for i) acting as community representatives in formal meetings between the project team and the local community he/she represents; ii) communicating the community members' grievances and concerns to the contractor during project implementation.

456. A pre-mobilization public consultation meeting will be convened by NHA's EALS Unit and attended by the GFPs, Supervision Consultant, contractor, Project representative and other interested parties (e.g. district level representatives, NGOs). The objectives of the meeting will be as follows:

b) Introduction of key personnel of each stakeholder including roles and responsibilities;

c) Presentation of project information of immediate concern to the communities by the contractor (timing and location of specific construction activities, design issues, access constraints etc.) This will include a brief summary of the EMP - its purpose and implementation arrangements;

d) Establishment and clarification of the GRM to be implemented during project implementation including proactive public relations activities proposed by the project team, Supervision Consultant and contractor to ensure that communities

are continually advised of project progress and associated constraints throughout project implementation period; and

e) Elicit and address the immediate concerns of the community based on the information provided above.

457. Following the pre-mobilization public consultation meeting, environmental complaints associated with the construction activity will be routinely handled through the GRM as explained below:

- Individuals will lodge their environmental complaint/grievance with their respective community's nominated GFP.
- The GFP will bring the individual's complaint to the attention of the contractor.
- The contractor will record the complaint in the onsite Environmental Complaints Register (ECR) in the presence of the GFP.
- The GFP will discuss the complaint with the contractor and have it resolved.
- If the contractor does not resolve the complaint within one week, then the GFP will bring the complaint to the attention of the Supervision Consultant's Environmental Specialist. The SC's Environment Specialist will then be responsible for coordinating with the contractor in solving the issue.
- If the complaint is not resolved within two weeks the GFP will present the complaint to the Grievance Redress Committee (GRC).

458. The GRC will be headed by the Project Director M4 with NHA's DD/AD (land) or DD/AD (environment) – depending upon the nature of the complaint - as member and focal person. Besides, the GRC will include the environment staff of the Project Management Unit/Supervision Consultants, environment staff of the contractor and representative of the local community (preferably the relevant GFP).

459. The GRC will have a period of two weeks to resolve the complaint and communicate this back to the community. The contractor will then record the complaint as resolved and closed in the ECR. This represents the first level of the GRM.

460. If the complaint is not satisfactorily resolved at this level, it will be referred by the GRC to the second level of GRM i.e. to the Environment, Afforestation, Land and Social (EALS) at NHA Headquarters, within seven days after communicating its decision to the complainant. The EALS will communicate to the complainant immediately regarding the receipt of his complaint, will scrutinize the record of the GRC, investigate the remedies available and request the complainant to produce any record in favour of his claim. After thorough review and scrutiny of the available record on the complaint, EALS staff shall visit the field to meet the complainant, and collect additional information and evidence if required. Once the investigations are completed EALS shall get its recommendations approved by Member Aided Projects and forward them to the Project Director and the

complainant accordingly within 30 days of receipt of the complaint. Should the complaint not be resolved through the GRM, the issue will be adjudicated through local legal processes.

461. In parallel to the ECR placed with the contractor, each GFP will maintain a record of the complaints received and will follow up on their resolution.

462. NHA's project office will also keep track of the status of all complaints through the Monthly Environmental Monitoring Reports submitted by the contractor to the SC and will ensure that they are resolved in a timely manner.

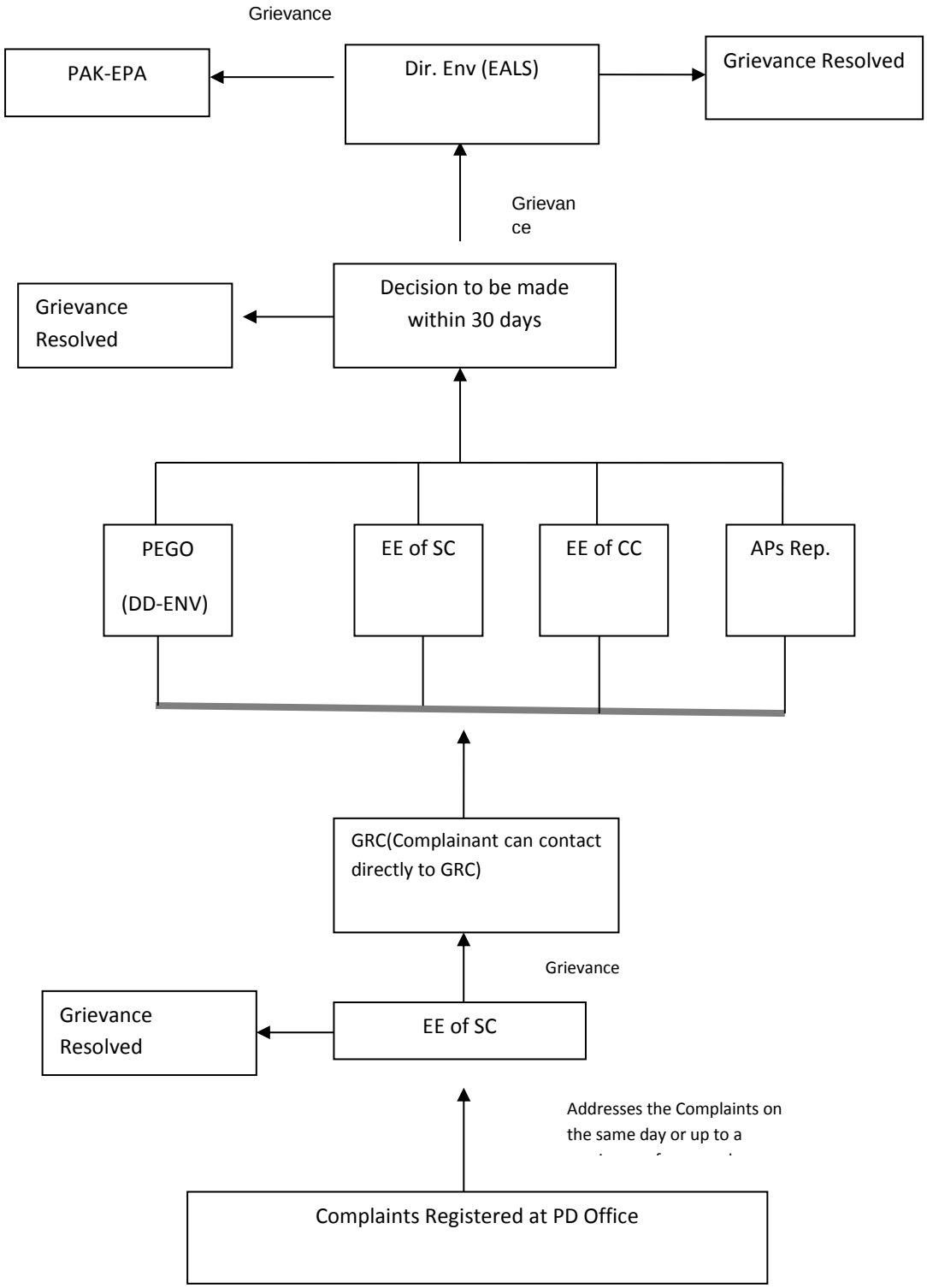

Figure 11.1: Flow Chart of the Proposed Grievance Redress Mechanism

SECTION 12
CONCLUSIONS

463. The overall objective of the project is that it will provide accessibility to South North connection across the country leading to the development of National Trade Corridor. The construction of M-4 Motorway will link major cities of the country like Peshawar, Islamabad, Lahore and Faisalabad with Multan and southern areas. At national level this facility will trigger boost to mobility, economic development. Locally the segment of society from where the motorway will traverse will get developed having improved opportunities for catering better standard of life. The main objective of NHA for planning this Motorway is to provide a safe, congestion free and high speed facility to cope with ever increasing transportation demand for freight and passengers across the country and an augmented facility to commuters of the project area as well as to tourists.

464. The proposed motorway project components include construction of four lanes dual carriageway from Faisalabad-Khanewal and construction of ten Interchanges at different local road crossings. Bridges and culverts will be constructed on Spill Channel drains and canal crossings. The total width of both carriage ways 31.5 (6 lane) and land reserved for plantation will be 30 meters both side (15 meters on one side) within the RoW width of 100 meters.The carriageway will include paved shoulders at inner and outer side. The outer shoulder of each carriageway will be 3 meters wide with 0.5 meter rounding and the inner side will be 0.6 meter. The Right of Way (RoW) of the proposed Motorway Project is 100 meters wide, while it will be 40 meters at the locations where interchanges will be constructed. Major construction work will generally remain confined within the RoW.

465. The conclusions mentioned below are based on the findings of detailed Environmental Impact Assessment which has been carried out as per requirement of the Punjab- EPA Pakistan and Asian Development Bank Social Safe Guard Policy Statement (2009).

12.1 Identification of the Main Issues and Concerns

466. During the field surveys, significant efforts were made to identify the main social,

cultural and environmental issues related to the construction and operation of the proposed Motorway. Various government departments and agencies were also contacted for obtaining salient information in this regard along with that from area residents and stakeholders. Following is the list of main issues and concerns:

- Cutting of trees/bushes falling within the proposed ROW;
- Disturbance to the public movement during construction;
- Reduction in the daily routine activities of local residents during construction;
- Noise and air pollution due to the working of construction machinery during construction and traffic operation phases of the Project;
- Solid waste generation during construction;

- Oil spillages from construction machinery, resulting in soil and groundwater contamination;
- Surface water bodies contamination due to soil erosion and construction activities.

12.2 Conclusions

467. After the construction of motorway, people living in the project area and the road users / travelers will get the following benefits:

- Less time will be required for travelling and reaching the destination;
- To accelerate the economic activity by providing smooth access to nation wide markets;
- During the construction phase, local labour will be accommodated in the construction activities leading to poverty alleviation;
- To provide sustainable delivery of a productive and efficient national highway system contributing to decreasing transportation cost;
- To provide the livelihood and to educate the poor people of the project area;
- Traffic load on N-5 will get reduced;
- It will also act as a vertiberal part of National Trade Corridor and major linking limb between Pakistan ,Central Asia and China;
- Trade among Middle Eastern countries, Pakistan and those of the land locked countries in the vicinity of Pakistan can be envisioned with the availability of this facility.

468. Project is socio-economically viable and environment friendly if EMP is implemented in true letter and spirit. Results of the EIA Study have shown that the impacts of the project activity on the physical environment will be negligible. However, there will be significant impacts on the biological and social environment. These impacts could be reduced by proper and judicious compensation to the affectees and well planned meticulous design of the facility and by implementing an appropriate tree plantation plan. The plantation in the will enhance the aesthetics; improve the landscape as well as the environmental conditions along the project area. In fact in times of diminishing economic and natural resources, using sustainable approaches in transportation infrastructure will help us to enhance quality of life and serve the transportation needs of the present leaving provision for future generations to meet their needs.