Initial Environmental Examination

October 2015

PAK: Post-flood National Highways Rehabilitation Project (PNHRP)

Prepared by National Highway Authority for the Asian Development Bank.

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List of Acronyms

BAP	Biodiversity Action Plan
BHU	Basic Health Unit
BOD	Biological Oxygen Demand
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CMS	Convention on Migratory Species of Wild Animals
COGCC	Colorado Oil and Gas Conservation Commission
COD	Chemical Oxygen Demand
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
FERP	Flood Emergency Reconstruction Project
GPS	Global Positioning System
GoP	Government of Pakistan
HSE	Health, Safety and Environment
IFC	International Finance Corporation
IEE	Initial Environmental Examination
IUCN	International Union for Conservation of Nature and Natural Resources
MHSE	Manager Health, Safety and Environment
NCCW	National Council for Conservation of Wildlife
NCS	National Conservation Strategy
NEAP	National Environmental Action Plan
NEAP-SP	National Environmental Action Plan Support Program
NEP	National Environmental Policy
NEQS	National Environment Quality Standards
NGO	Non-Government Organization
NOC	No Objection Certificate
NRSP	National Rural Support Programme
PEPA 97	Pakistan Environmental Protection Act, 1997

PEPC	Pakistan Environmental Protection Council
PNS	Pakistan National Committee
PVC	Polyvinyl Chloride
Pvt	Private
RCRA	Resource Conservation and Recovery Act
SDPI	Sustainable Development Policy Institute
TSS	Total Suspended Solids
TDS	Total Dissolved Solids
UC	Union Council
UNDP	United Nations Development Program
USEPA	United States Environmental Protection Agency
WWF	World Wildlife Fund for Nature

List of Units

°C	Degree Celsius
cm	Centimetre
cum	Cubic meter
cusecs	Cubic feet per second
db	Decibels
Kg	Kilogram
Km	Kilometer
m	Meter
mg/l	Milligram per litre
mg/Nm^3	Milligram per Normal Cubic meter
mm	millimetre
m/s	meter/second
%	Percent
ppm	Parts per million
sq	Square

1 Introduction

1.1 The IEE

1. This report presents the findings of an Initial Environmental Examination (IEE) carried out for the rehabilitation of 211.609 km road sections and reconstruction of 33 bridges damaged due to floods in 2010. The National Highway Authority intends to carry out the rehabilitation of road sections and reconstruction of bridges, details of which are presented in Chapter 4 of this report.

1.2 Proponent of the Project

2. National Highway Authority (NHA) is the proponent of the proposed project. Contact details of the responsible person at NHA and and their address is as below:

Mr Saqlain Haider
Project Director
National Highway Authority
27, Mauve Area, G-9/1,
Islamabad.
Ph: 051-9032911

1.3 Environmental Category of the Proposed Project

3. The degree and scope of the environmental assessment requirements depends on the environmental impacts the project will have. According to Asian Development Bank's Safeguard Policy Statement (SPS) 2009, the categorization of the Project is to be based upon the most environmentally sensitive component.

4. Asian Development Bank (ADB) process classifies projects requiring an IEE in environmental Category B i.e. if the project's '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 by designed more readily than for Category A projects.'

   The Project works involve the rehabilitation of the existing road, and reconstruction of bridges. The project will not require any significant clearing and cutting activities. No changes in the water courses, wildlife habitat etc. are projected.

The Project has been assigned "Category B" in accordance with ADB's 'Safeguard Policy Statement (SPS) 2009', and therefore an IEE is to be carried out.

1.4 Scope and Methodology

1.5 Scope of the IEE

5. Floods of 2010 affected the road and bridges infrastructure owned by National Highway Authority (NHA) damaging different road sections (a few sections were washed away while some sustained minor damage) and bridges (a few bridges were washed away). NHA intends to rehabilitate the damaged sections of the roads and reconstruct the bridges washed away by the floods in 2010. The proposed reconstruction and rehabilitation activities will be carried out in Khyber Pakhtunkhwa (KP), Punjab and Sindh provinces, and Federally Administered Tribal Areas (FATA). This IEE investigates the impacts likely to arise from the reconstruction and rehabilitation activities of different roads sections and bridges. The rehabilitation and reconstruction activities have been divided in 17 different packages and will overall include:

   - Reconstruction of 33 bridges (23 on N 95, 4 on N 15 and 6 on N-55) along NHA road;
   - Rehabilitation of 211.609 km road sections. Only 10km of road sections on N 95 will be realigned for which 111289 square meters (220 kanal) of land has been acquired in Swat district and compensation has been paid. The remaining 201.609 km road sections will be rehabilitated along the existing alignment.

   It is the intention of the IEE to:

   - Identify and investigate all impacts of the proposed operation on the physical, biological, and socio-economic environment of the project area.
   - To propose mitigation measures that would help NHA in conducting the operation in an environmental sustainable manner.
   - To develop an Environmental Management Plan that would assist NHA in the effective implementation of the recommendations of the IEE.

1.6 IEE Methodology

The various steps undertaken in the IEE preparation are summarized below.

1.6.1 Understanding of the Proposed Operation

6. This involved collecting information from NHA and Asian Development Bank on the proposed project activities and understanding the activities to identify potential impacts from them.

1.6.2 Review of Legislation and Guidelines

7. National legislation, international agreements, environmental guidelines, and best industry practices were reviewed to set environmental standards that NHA will be required to adhere to during the project.

1.6.3 Secondary Data Collection

8. All available published and unpublished information pertaining to the background environment was obtained and reviewed. All data sources were carefully reviewed to collect the following information.

   - Physical environment - topography, geology, geomorphology, soils, surface and groundwater resources and climate;
   - Biological environment – habitat types, flora and fauna;
   - Socio-economic environment – settlements, socio-economic conditions, infrastructure and land use; and
   - Heritage aspects – sites of cultural, archaeological or historical significance.

1.6.4 Stakeholders Consultations and Field Data Collection

9. Considering the span of the project all over Pakistan it is impossible to collect the primary data for each and every project. Moreover, since the project activities are more focussed on rehabilitation works and reconstruction of bridges almost at existing locations therefore very limited (10 km road section) clearing activities and additional land acquisition is being considered.

10. Keeping in view the limited impacts of the project on environment two locations have been sampled for stakeholder consultations; one on N 95 (Swat valley) and one on N 55 (Ramak-Peshawar-Package III). The sampling locations have been selected keeping in view the following points:

    - Major volume of construction activities (approximately 35 km of road section and 23 bridges) are concentrated in Swat and 19 km road sections will be rehabilitated on Ramak-Peshawar section (Package III).
    - Overall 60% of the road sections and 27 bridges are located in KP province; therefore field visit was focussed in KP province.
    - N-95 (located in Swat valley) passes through mountainous terrain while N-55 (Ramak-Peshawar) passes through plain areas. Hence areas with varying environmental conditions have been selected for field visit.

11. Discussions have been held with the community members and relevant stakeholders to collect the primary information about the project area and their views and concerns regarding the project activities. Detailed information about community consultation is presented in Chapter 6: Stakeholders Consultation and Information Disclosure, and other relevant sections of the report.

1.6.5 Impact Identification and Assessment

12. Potential impacts arising from each phase of the proposed project were identified. These include effects on physical, biological, socioeconomic, archaeological, and cultural environment. Impacts were identified and assessed on the basis of field data, secondary data, expert opinion, and monitoring results of construction projects in Pakistan.

1.6.6 Recommendations of Mitigation Measures

13. Mitigation measures to minimise, eliminate, or compensate the potential environmental impacts were recommended. The mitigation measures were recommended on the basis of the past experience, best industry practices, legislative requirements and professional knowledge.

1.6.7 Development of Environmental Management Plan (EMP)

14. Environmental Management Plan (EMP) was developed for effective implementation of the recommended mitigation measures. The EMP included controls to minimise the identified impacts, and monitoring programme to monitor residual impacts, if any, during the operation.

1.6.8 Reporting

15. The IEE study was compiled in a report form. The IEE report is presented as one volume and describes the proposed project, environment of the project area, relevant legislation and guidelines, assessment of the project impacts, recommendations for mitigation measures and the environmental management plan. The photographic records have been provided at the end of each section.

2 Policy, Legislation and Guidelines

2.1 Introduction

16. This chapter provides a synopsis of environmental policies, legislation, and guidelines that may have relevance to the proposed project. These include ADB Safeguards Policy Statement 2009, ADB public consultation requirements as per SPS 2009, national and provincial legislation and guidelines; as well as international conventions and guidelines. National Highway Authority (NHA) referred as Proponent hereafter will be required to adhere to the relevant requirements of the policies and legislation and recommendations of the guidelines during the proposed project activities; which have also been incorporated in the mitigation measures and the EMP provided in the IEE.

2.2 ADB Safeguard Policy Statement, 2009

17. 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. Occupational health and 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 applications and facilitate resolution of affected peoples' concerns, complaints, and grievances about the project's environmental performance is also established and provided in Chapter 7. 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:

18. 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.

19. 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.

20. 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.

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

2.3 National Legislative Categorisation

22. After the 18th amendment in 2010, the concurrent list has been abolished and a limited number of subjects on the list have been included in the federal legislative list, whereas the provincial governments have been given powers to legislate on the subjects transferred to provinces. The power to legislate and decide on the subject of "environmental pollution and ecology" now lies with the provincial government. Accordingly, the provinces have adopted PEPA 1997 with amendments. They are still in the process of formulation of proper acts. To date following Acts have been passed by the provincial assemblies whereas Islamabad and remaining provinces adopted PEPA 1997 with amendments:

- Sindh Environmental Protection Act 2014
- KP Environmental Protection Act 2014
- Baluchistan Environmental Protection Act 2013
- Punjab Environmental Protection (Amendment) Act 2012

23. The project area falls in Punjab, Sindh and KP therefore the relevant section for EIAs and IEEs in each of the provincial legislation is shown in the **Table 2-1.**

Table 2-1: Relevant Provincial Legislation

Environmental Protection Acts	With Effect From	Relevant Section
Punjab Environmental Protection Act (Amendment 2012)	April 18, 2012	Section 12
Sindh Environmental Protection Act 2014	March 4, 2014	Section 17
KP Environmental Protection Act 2014	November 2014	Section 12

24. According to IEE-EIA regulation of each province, the project does not require an IEE or EIA. The categorical illustration on transport sector is as follows:

- The Federal or Provincial highways (except maintenance, rebuilding or reconstruction of existing metaled roads) with total cost less than Rs.50 million require an IEE.
- The Federal or Provincial highways (except maintenance, rebuilding or reconstruction of existing metaled roads) with total cost of Rs.50 million require and above require an EIA.

2.4 Law Related Regulations and Guidelines

25. The rules and regulations under the PEPA 1997 have been adopted by the provinces. The provinces intend to update the related regulation and guidance according to their environmental requirements and sensitivities. Existing IEE/EIA Regulation, NEQS, Rules and Guidelines for Environmental Assessments notified by Pak-EPA are currently being used for compliance. It includes the set of EIA guidelines prepared by the federal and provincial Environmental Protection Agencies (EPAs).

2.5 National Environmental Quality Standards:

26. The NEQS were first promulgated in 1993 and were notified in 2010. Following National Environmental Quality Standards (NEQS), 2000 are being followed for compliance by all provinces. It specifies following standards with their sources of generation:
    - The National Environmental Quality Standards (NEQS) for municipal and liquid industrial effluent (Effluent from camp sites and construction)
    - NEQS for Industrial Gaseous Emission (Emissions from Asphalt Plant Exhaust)
    - NEQS for Vehicle Exhaust and Noise (Construction Noise)
    - NEQS for Ambient Air Quality (Construction dust and vehicular exhaust)
    - NEQS for Drinking Water Quality(Health and safety of Construction Crew)
    - NEQS for Noise (Construction Noise)
27. These standards also apply to the gaseous emissions and liquid effluents generated by generator, process waste etc. The standards for vehicles will apply during the construction as well as operation phase of the project.The NEQS relevant to the project specify standards for industrial and municipal effluents, gaseous emissions, vehicular emissions, noise levels (provided in **Appendix 1**). The PEPA specifies the imposition of a pollution charge in case

of non-compliance with the NEQS. Standards for disposal of solid waste have not been promulgated as yet.

2.6 Relevant Policies and Laws

2.6.1 National Environmental Policy, 2005

28. The National Environmental Policy (NEP) was approved by the Pakistan Environmental Protection (PEPC) in its 10th meeting on 27th December 2004 under the chairmanship of the Prime Minister of Pakistan and thereafter approved by the Cabinet on 29th June 2005. NEP is the primary policy of Government of Pakistan that addresses the environmental issues of the country. 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 the following set of sectoral and cross-sectoral guidelines to achieve its Goal of sustainable development.

2.6.2 Sectoral Guidelines

29. Water and sanitation, Air quality and noise, Waste management, Forestry, Biodiversity and protected areas, Climate change and ozone depletion, Energy efficiency and renewable, Agriculture and Livestock, and Multilateral environmental agreements.

2.6.3 Cross Sectoral Guidelines

30. Poverty, population, gender, health, trade and environment, environment and local governance and natural disaster management.

    The NEP suggests the following policy instruments to overcome the environmental problems throughout the country;

    - Integration of environment into development planning,
    - Legislation and regulatory framework,
    - Capacity development,
    - Economic and market based instrument,
    - Public awareness and education, and
    - Public private civil society partnership.

31. NEP is a policy document and does not apply to projects. However, proponent should ensure that the project should not add to the aggravation of the environmental issues identified in NEP and mitigation measures should be adopted to minimise or avoid any contribution of the project in these areas.

2.6.4 National Conservation Strategy

32. Before the approval of National Environmental Policy (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 in order to preserve the country's environment.

33. NCS does not directly apply to roads and bridge construction projects. However, Proponent should ensure that the project should not add to the aggravation of the 14 core environmental issues identified in the NCS and mitigation measures should be adopted to minimise or avoid any contribution of the project in these areas.

2.6.5 The Biodiversity Action Plan

34. The Plan, which has been designed to complement the National Conservation Strategy (NCS) and the proposed provincial conservation strategies, identifies the causes of biodiversity loss in Pakistan and suggests a series of proposals for action to conserve biodiversity in the country.

35. The BAP recognises that an EIA is used as a tool at a project level to identify environmental effects of a proposed project and to plan for reducing adverse effects. The BAP further stipulates that an EIA needs to be initiated at an early stage of project development and that public participation in the review of potential effects is important.

2.6.6 The Forest Act 1927

36. The act empowers the provincial forest departments to declare any forest area as reserved or protected. The project area for IEE is located outside of the any protected forest therefore the project will not contravene with any provisions of the Act. Moreover no cutting of trees will be required for rehabilitation activities. Where required, necessary mitigation measures will be followed.

2.6.7 Antiquities Act 1975

37. The protection of cultural resources in Pakistan is ensured by the Antiquities Act of 1975. Antiquities have been defined in the Act as ancient products of human activity, historical sites, or sites of anthropological or cultural interest, national monuments etc. The act is designed to protect antiquities from destruction, theft, negligence, unlawful excavation, trade and export. The law prohibits new construction in the proximity of a protected antiquity and

empowers the Government of Pakistan to prohibit excavation in any area which may contain articles of archaeological significance.

38. The rehabilitation of existing road alignment and bridges will not have any impact or will damage notified archaeological site as protected under this act.

2.6.8 Pakistan Penal Code (1860)

39. The Pakistan Penal Code (1860) authorises fines, imprisonment or both for voluntary corruption or fouling of public springs or reservoirs so as to make them less fit for ordinary use.

2.7 International Treaties and Guidelines

40. Pakistan is a signatory to various international treaties and conventions on the conservation of the environment and wildlife protection. The country is thus obliged to adhere to the commitments specified in these treaties.

2.7.1 The Convention on Biological Diversity

41. The Convention on Biological Diversity was adopted during the Earth Summit of 1992 at Rio de Janeiro. The Convention requires parties to develop national plans for the conservation and sustainable use of biodiversity, and to integrate these plans into national development programmes and policies. Parties are also required to identify components of biodiversity that are important for conservation, and to develop systems to monitor the use of such components with a view to promoting their sustainable use.

2.7.2 The Convention on Conservation of Migratory Species of Wild Animals, 1979

42. The Convention on the Conservation of Migratory Species of Wild Animals (CMS), 1979, 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 co-operate with other countries in matters of research on migratory species. The Convention contains two appendices. Appendix I contain the list of migratory species that are endangered according to the best scientific evidence available. For these species, the member states to the Convention are required endeavour to:

- Conserve and restore their habitats.
- Prohibit their hunting, fishing, capturing, harassing and deliberate killing.
- Remove obstacles and minimize activities that seriously hinder their migration.

- Control other factors that might endanger them, including control of introduced exotic species.

43. Appendix II lists the migratory species, or groups of species, that have an unfavourable conservation status as well as those that would benefit significantly from the international co-operation that could be achieved through intergovernmental agreements.

2.7.3 The Convention on Wetlands of International Importance, Ramsar 1971

44. Pakistan is a signatory to the said Convention. The principal obligations of contracting parties to the Convention are:

- To designate wetlands for the List of Wetlands of International Importance.
- To formulate and implement planning so as to promote wise use of wetlands, to make EIA before transformations of wetlands, and to make national wetland inventories.
- To establish nature reserves on wetlands and provide adequately for their wardening and through management to increase waterfowl populations on appropriate wetlands.
- To train personnel competent in wetland research, management and wardening.
- To promote conservation of wetlands by combining far-sighted national policies with coordinated international action, to consult with other contracting parties about implementing obligations arising from the Convention, especially about shared wetlands and water system.
- To promote wetland conservation concerns with development aid agencies.
- To encourage research and exchange of data.

45. So far 19 sites in Pakistan have been declared as wetlands of International Importance or Ramsar Sites. However since the proposed project involves rehabilitation of existing roads sections and bridges therefore non compliance of this convention is not expected.

2.7.4 Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

46. This convention came into effect on 3rd March 1973 in Washington. In all 130 countries are signatory to this convention with Pakistan signing the convention in 1976. The convention requires the signatories to impose strict regulation (including penalisation, confiscation of the specimen etc.) regarding trade of all species threatened with extinction or that may become so, in order not to endanger further their survival.

47. The Convention contains three appendices. Appendix I include all species threatened with extinction which are or may be affected by trade. The Convention requires that trade in these species should be subject to strict regulation. Appendix II includes species that are not necessarily threatened presently but may become so unless trade in specimens of these species is subject to strict regulation. Appendix III includes species which any contracting party identifies as subject to regulations in trade and requires other parties to co-operate in this matter.

2.7.5 International Union for Conservation of Nature and Natural Resources (IUCN) Red List

48. The red list is published by IUCN and includes those species that are under potential threat of extinction. These species have been categorised as

- Endangered: species that are sent to be facing a very high risk of extinction in the wild in the near future, reduction of 50% or more either in the last 10 years or over the last three generations, survive only in small numbers, or have very small populations.
- Vulnerable in Decline: species that are seen to be facing a risk of extinction in the wild, having apparent reductions of 20% or more in the last 10 years or three generations.
- Vulnerable: species that are seen to be facing a high risk of extinction in the wild, but not necessarily experiencing recent reductions in population size.
- Lower Risk: species that are seen to be facing a risk of extinction that is lesser in extent that for any of the above categories.
- Data Deficient: species that may be at risk of extinction in the wild but at the present time there is insufficient information available to make a firm decision about its status.

2.8 Framework of Environment and Wildlife Institution in Pakistan

49. The Ministry of Climate Change is the main government organisation responsible for the protection of environment and resource conservation. It is headed by a federal minister. The Ministry works with PEPC, and the Federal and Provincial EPAs formed under the PEPA 1997. The roles, responsibilities and authorities of PEPC and the EPA's are defined in the PEPA 1997.

50. The PEPC has been formed by the Federal Government. Its members include the Prime Minister of Pakistan, as the Chairperson; the Minister for Environment as the vice-Chairperson; Governors of the Provinces; Ministers in charge of the subject of environment in the Provinces; Secretary to the

Federal Government in-charge of the Ministry of Environment; Director General Federal EPA; heads of other federal and provincial departments; environmentalists and community representatives including scientists. The functions and powers of the Council include formulation of national environmental Policy, enforcement of PEPA 1997, approval of the NEQS, incorporation of environmental considerations in to national development plans and policies and provide guidelines for the protection and conservation of biodiversity in general and for the conservation of renewable and non-renewable resources.

The Federal government has also formed the Federal EPA, which is headed by a Director General and has wide-ranging functions given in PEPA 1997. These include the preparation and co-ordination of national environmental policy for approval by the PEPC, administering and implementing the PEPA 1997 and preparation, revision or establishment of NEQS. The Provincial Environmental Protection Agencies are formed by the respective Provincial Governments. A Director General who exercises powers delegated to him by the Provincial Government heads each Provincial EPA. IEE's and EIA's are submitted to provincial EPA's for approval.

51. The National Council for Conservation of Wildlife (NCCW) is responsible for formulation of national wildlife policies, co-ordination with provincial wildlife department on the implementation of these policies and co-ordination with international organisations on matters related to international treaties/conventions. The NCCW works under the Ministry of Climate Change, and is headed by the Inspector General Forests. NCCW comprises of an advisory council, which is chaired by the Minister of Climate Change and includes representatives from all Provinces and Northern Areas, NGO's, members of civil society and other federal ministries. A small NCCW secretariat is based in Islamabad handles the day-to-day affairs and the implementation of policies and recommendations of the advisory council. At provincial level almost each province has a wildlife department and a wildlife protection act.

2.9 International and National NGOs

52. International environmental and conservation organisations such as International Union for Conservation of Nature (IUCN) and the World Wide Fund (WWF) have been active in Pakistan for some time. Both these organisations have worked closely with government and act in an advisory role with regard to the formulation of environmental and conservation policies. Since the convening of the Rio Summit, a number of national environmental NGOs have also been formed, and have been engaged in advocacy, and in some cases, research. As mentioned earlier, environmental

NGOs have been particularly active in advocacy as proponents of sustainable development approaches. Much of the government's environmental and conservation policy has been formulated in consultation with leading NGOs, who have also been involved in drafting new legislation on conservation.

2.10 International Environmental Guidelines

53. ADB's Safeguard Policy Statement (SPS) 2009 provides guidelines for environmental assessments of development projects. These guidelines help prospective projects identify impacts on various environmental receptors. The guidelines call for carrying out EIAs or IEEs of projects based on severity of their impacts

3 Project Description

3.1 The Project

54. Floods of 2010 affected 20 million people and caused 1,800 deaths. About one-fifth of the country was under floods, with the total damage estimated at $10 billion. Basic transport infrastructure and irrigation facilities were also badly damaged In 80 of the country's 110 districts across Balochistan, Khyber-Pakhtunkhwa, Punjab and Sindh. ADB implemented an emergency reconstruction project in 2011 and most of the damage was repaired or reconstructed. However, a few sections of the roads and bridges could not be completed at that time and are now under consideration.

    The proposed Post-flood National Highways Rehabilitation Project (PNHRP) will include:

    - Reconstruction of 33 new bridges (23 bridges on River Swat-N 95, 4 bridges on N 15 in KP Province and 6 bridges in Punjab province). The span of the bridges to be reconstructed varies from 20m to 40m. All bridges will be 8.5m wide.
    - Rehabilitation of 211.609 km long different road sections spanned in Khyber Pukhtunkhawa, Punjab, FATA and Sindh provinces;

55. A total length of 10km road sections on N 95 will be realigned for which 111,289 square meters of land has been acquired in Swat district and compensation has been paid. The remaining 201.609km length of road sections will be rehabilitated along the existing alignment with no land acquisition anticipated.

56. The length of road sections to be rehabilitated varies from approximately 7 to 39km. The candidate sections of highways and bridges are government's priority for reconstruction and rehabilitation. They comprise (i) N-55 (north-south corridor) passing through Khyber-Pakhtunkhwa, Punjab and Sindh provinces; (ii) the N-95 linking Chakdara with Kalam (location: Khyber-Pakhtunkhwa province); (iii) theN-15 linking Mansehra with Chilas (location: Khyber-Pakhtunkhwa province); and (iv) the N-50 linking Dera Ismail Khan in Khyber-Pakhtunkhwa with Balochistan. N-15 and N-95 are the only transport communications link for the population in the areas served by it, which have been provided through makeshift arrangements since the 2010 floods. Temporary bailey bridges were installed by the government at the locations of swept away bridges on N-95, which are still being used, as were the 4 bridges on N-15, which were also swept away during the floods. The remaining 6 bridges are located on N-55 and are a replacement of causeways,

which were found to be of inadequate capacity to bear the impact of flood water.

57. **Table 3-1** represents the list of proposed rehabilitation of national highways and reconstruction of bridges with detailed description of their location, chainage and cost. Overall the project has been divided into 17 packages where cost of each package has also been estimated. The capital cost of the proposed projects is USD 218.8 million. Six project packages have been planned on National highway N95, seven on N 55, two on N 15 and two on N 50. Eleven project packages fall in the KP Province while the remaining six packages fall in other provinces including Punjab and Sindh.

58. The detailed designs and estimates of the proposed 211.608 km sections of damaged national highways and 33 bridges were completed under the Flood Emergency Reconstruction Project (FERP), and are in compliance with the latest applicable national standards for national highways and bridges. In addition, the revised designs include provisions for safety signage, lane markings and guard rails for improved road safety conditions.

59. Highway sections will be reconstructed / rehabilitated to the existing 2 lane facility of 3.65 meter width with 1-3 meter shoulders. The design speed is 80-110 kms per hour (kmph) and 40-60 kmph in plain and hilly terrain respectively with a maximum grade of 3% and 8% in plain and hilly terrain respectively. The scope of construction work includes earthwork and pavement works, and roadside improvements and safety engineering features such as traffic signs, road markings, traffic barriers, and guard rails. Detailed engineering designs are based on relevant guidelines, standards and specifications of American Association of State Highway and Transportation Officials (AASHTO) and Pakistan Code of Highway Bridges.

60. The proposed projects have been divided into 17 packages. NHA will engage 17 contractors and consultancy firms for the execution of projects. The contractors will establish construction camp preferably at permanent buildings. However temporary camps will also be established to house field staff and labour where required.

61. Overall approximately 60% of the road section to be rehabilitated and 27 bridges to be reconstructed are situated in KP province, 8% of the road sections and 6 bridges are situated in Punjab while remaining road sections are stretched along Sindh and FATA.

Table 3-1: List of Project Sites

#	Section/ Project	Route #	Location		Affected Length (km)	Cost of Civil Works (as per CSR-2014)		District/Province
			Km	Km		PKR	USD	
1	Chakdara - Kalam (Bridges Package-I) 11 New Bridges (Chakdara - Bahrain)	N-95	0	106	11 new bridges	677,442,216.83	6,513,867.47	Swat, KP
2	Chakdara - Kalam (Bridges Package-II) 12 New Bridges (Bahrain - Kalam)	N-95	106	134	12 new bridges	756,600,405.80	7,275,003.90	Swat, KP
3	Chakdara - Kalam (Road Package-3) (Bahrain - Chimgarh)	N-95	97+310	108+675	11.365	2,121,549,568.05	20,399,515.08	Swat, KP
4	Kashmore - Kotri(Kandhkot - Kashmore)	N-55	469	485	16	843,926,400.05	8,114,676.92	Kashmore, Sindh
5	Chakdara - Kalam (Road Package-4) (Chimgarh - Asrit)	N-95	108+675	117+250	8.575	2,160,053,174.80	20,769,742.07	Swat,KP
6	Mansehra - Naran - Jalkhad - Chilas (Naran - Batakundi Section)	N-15	123	139.21	16.21 (incl. 2 bridges)	818,026,352.29	7,865,638.00	Mansehra, KP
7	Mansehra - Naran - Jalkhad - Chilas (Batakundi - Jalkhad Section)	N-15	139.21	161.89	22.68 (2 bridges)	836,539,427.54	8,043,648.34	Mansehra, KP
8	Kashmore - D.G.Khan - Ramak (Rojhan - Chak Karya)	N-55	540+500	547+500	7	342,344,605.00	3,291,775.05	Rajanpur, Punjab
9	Kashmore - D.G.Khan – Ramak (Fazilpur - Taunsa)	N-55	640	806	9.674 3 new bridges	579,086,528.87	5,568,139.70	Rajanpur, DG Khan, Punjab
10	Kashmore - D.G.Khan - Ramak New Bridges (Taunsa - Ramak)	N-55	806	862	3 (3 new bridges)	405,433,282.59	3,898,396.95	DG Khan, Punjab

#	Section/ Project	Route #	Location		Affected Length (km)	Cost of Civil Works (as per CSR-2014)		District/Province
			Km	Km		PKR	USD	
11	Kuchlack - Zhob - D.I. Khan (Dhanasar - Sheikhmela)	N-50	387	426	39	3,427,912,286.69	32,960,695.06	FATA
12	Kuchlack - Zhob - D.I. Khan (Darzinda - Daraban)	N-50	447	457.68	10.68	597,934,564.42	5,749,370.81	FATA
13	Ramak - Peshawar (Package-I). (3 km from 872-875 & 10 km from 890-900) (Ramak - D.I. Khan)	N-55	872	932	13	712,436,159.56	6,850,347.69	DI Khan, KP
14	Ramak - Peshawar (Package-II) (15 km from 935-950 & 5 km from 960-965) (D.I. Khan - Sarai Gambila)	N-55	932	1032	20	915,009,128.19	8,798,164.69	DI Khan, Lakki Marwat, KP
15	Ramak - Peshawar (Package-III) (7 km from 1058-1065, 8 km from 1126-1134 & 5 km from 1148-1152) (Sarai Gambila - Peshawar)	N-55	1032	1228	19	808,541,304.90	7,774,435.62	Lakki Marwat, Bannu, Karak, KohatPeshawar-KP and FATA
16	Chakdara - Kalam (Road Package-5) (Asrit - Pashmal)	N-95	117+250	125+800	8.55	1,343,044,871.75	12,913,893.00	Swat, KP
17	Chakdara - Kalam (Road Package-6) (Pashmal - Kalam)	N-95	125+800	132+675	6.875	1,092,683,867.36	10,506,575.65	Swat, KP
GRAND TOTAL					**211.609**	**18,438,564,145**	**177,293,886.01**	

3.2 Geographical Boundaries

62. The National Highways of Pakistan consists of all public highways over 12,000kms (7,500 mi) of roadways that provide access to major population centres. These include the famous Grand Trunk Road, Indus Highway, Karakoram Highway and Makran Coastal Highway. The project area and surroundings include 211.609 km long 17 sections and 29 bridges of the National Highway at N 15, 50, 55 and 95. The sites for this project are located in following districts:

Table 3-2: Geographic Boundaries of the Project Area

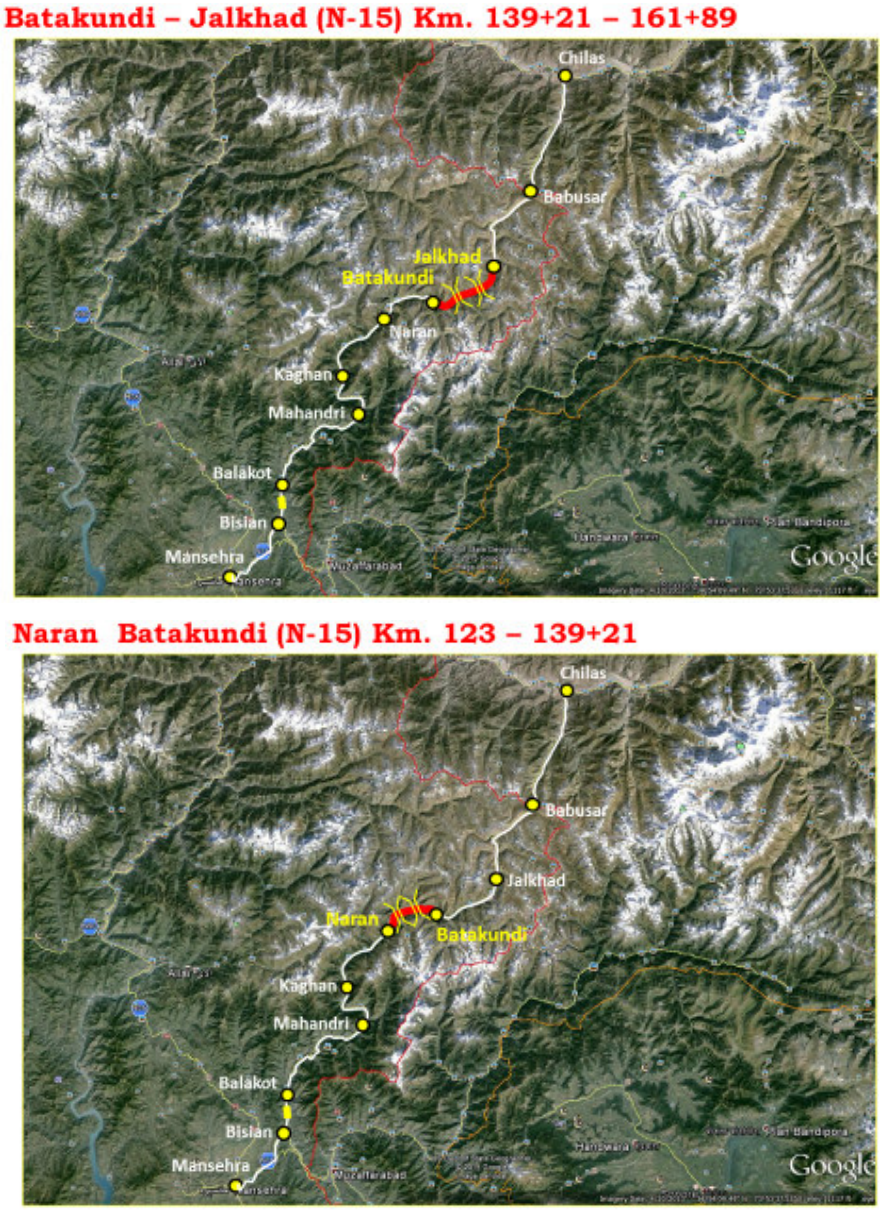
#	Districts	Highway	Province	Reconstruction Sites	Project Area Division
1.	Mansehra	N15	KP	126.255 km roads 27 new bridges	North Zone
2.	Malakand Agency	N95	KP		
3.	Swat	N95	KP		
4.	Lakki Marwat	N55	KP		
5.	Bannu	N55	KP		
6.	Karak	N55	KP		
7.	Kohat	N55	KP		
8.	Peshawar	N55	KP		
9.	D.I. Khan	N55	KP		
10.	Rajanpur	N55	Punjab	6 new bridges	South Zone
11.	D.G. Khan	N55	Punjab	16.674km roads	
12.	Kashmore	N55	Sindh	16km	
13.	Tribal Area	N50	Tribal Areas	49.68km	

The description on project area components of roads is given below:

3.2.1 N15

63. National highway 15 (240 km) is often used as a bypass for the N-35 and connects the cities of Mansehra and Chilas. It is also popular among tourist who visit Naran and the surrounding areas. The proposed rehabilitation area is 38.21 km section at two locations of the highway section and reconstruction of 4 bridges.

Figure 3-1: Rehabilitation Area on N-15



3.2.2 N50

64. The National Highway 50 or the N-50 is running from city of D.I.Khan in KP to the town of Kuchlak near Quetta via Zhob in Baluchistan, Pakistan. Its total length is 531 km divided into 143 km in KP and the remaining 388 km in the Baluchistan, Pakistan. The proposed rehabilitation area is approximately 50 km stretch of road section.

Figure 3-2: Rehabilitation Area on N-50

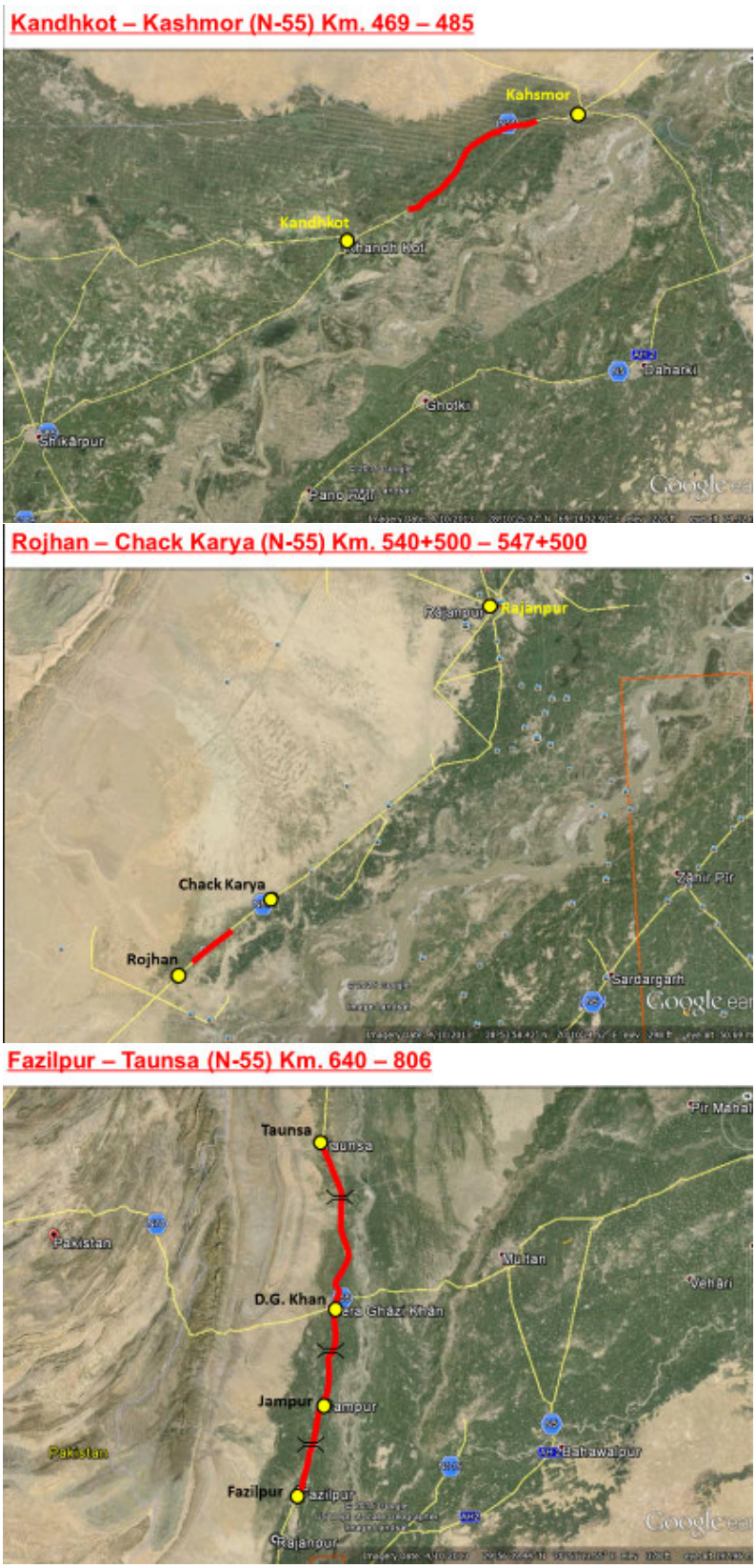
Dhanasar – Sheikhmela (N-50) Km. 387 - 426

Darazinda – Daraban (N-50) Km. 447 – 457+68

3.2.3 N55

65. The Indus Highway, also known by its technical designation N-55, is a 1,264 km long four-lane highway that runs along the Indus River in Pakistan connecting the port city of Karachi with the north-western city of Peshawar via Dera Ghazi Khan. The Indus Highway passes through the Kohat Tunnel. The proposed rehabilitation area is approximately 87 km including 6 new bridges of the highway section.

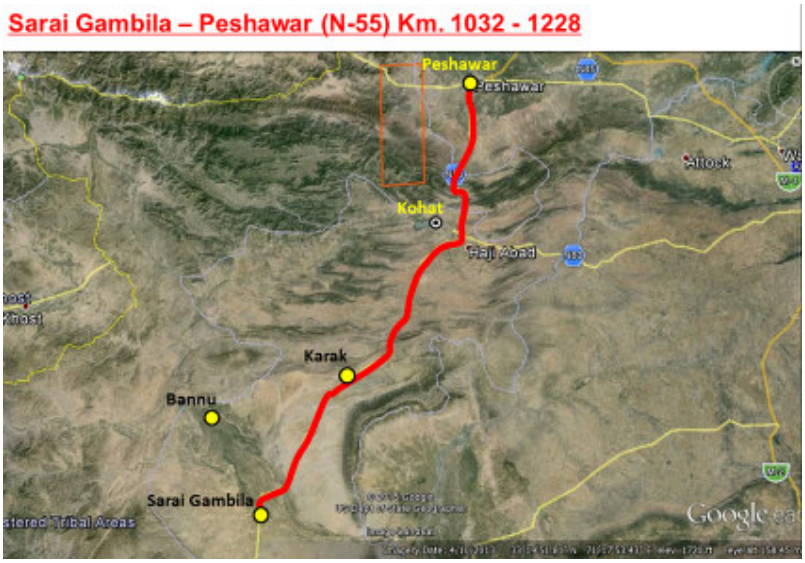
Figure 3-3: Rehabilitation Area on N-55



Taunsa - Ramak (N-55) Km. 806 - 862

Ramak – D.I. Khan (N-55) Km. 872 - 932

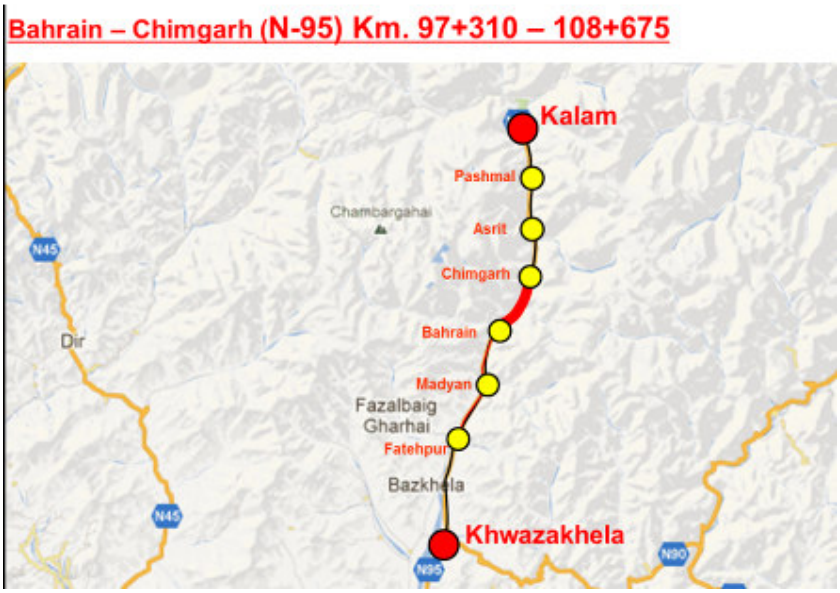
D.I. Khan – Sarai Gambila (N-55) Km. 932 - 1032



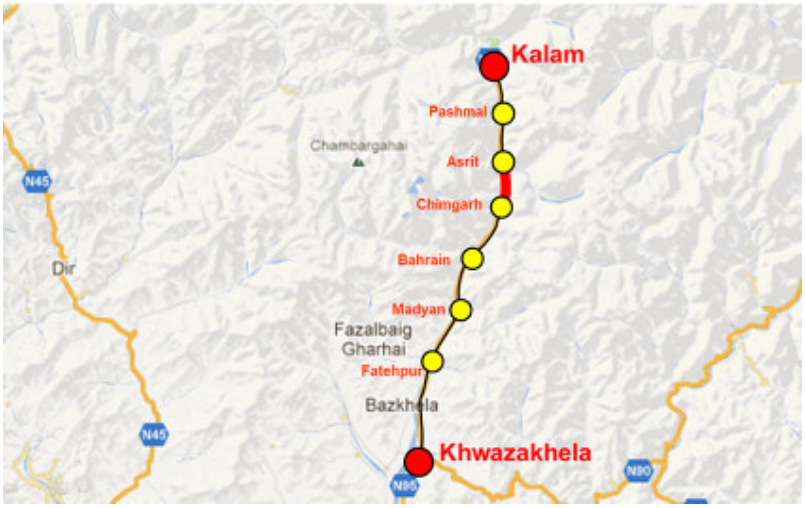
3.2.4 N95

66. The National Highway 95 or the N-95 starts from town of Chakdaram in Lower Dir District to the town of Kalam in district of Swat via Mingora, Manglour, Kwazakhela, Madyan and Bahrain in Khyber Pakhtunkhwa province of Pakistan. Its total length is 135 km. The proposed rehabilitation area includes 23 new bridges and approximately 35 km of road section.

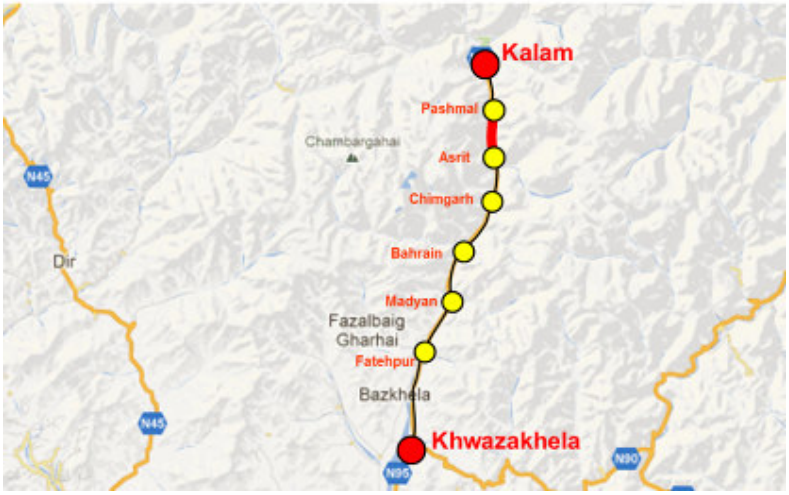
Figure 3-4: Rehabilitation Area on N-95



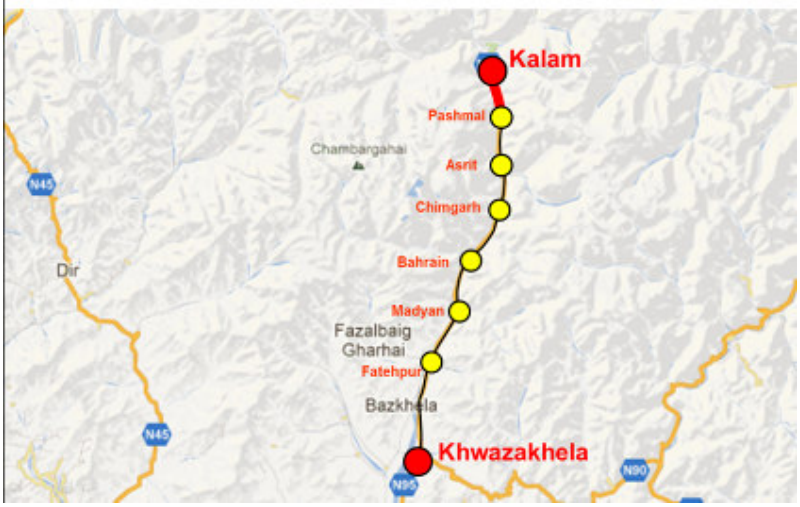
Chimgarh - Asrit (N-95) Km. 108+675 – 117+250

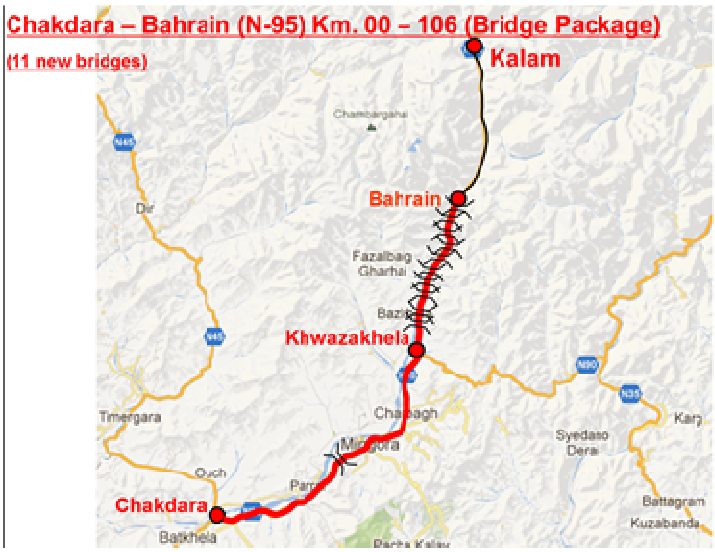


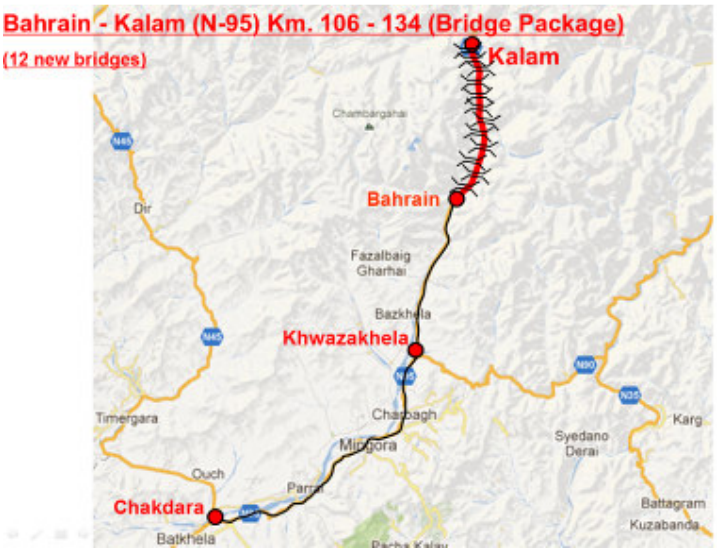
Asrit - Pashmal (N-95) Km. 117+250 – 125+800



Pashmal - Kalam (N-95) Km. 125+800 – 132+675







3.3 Technical Specifications

67. **Codes & Standards** — **AASHTO Design Guide**

Design speed	80 ~ 110 kph (plain terrain) 40 ~ 60 kph (hilly terrain)
Road Cross-Section	Follows as per existing/available

- ***Cross Slope:***

Pavement	2.5 % or as per exist

Shoulders	2.5 % or as per exist

68. **Embankment:**

Side Slope (H.V)	2 : 1 for common , 1.5:1 for Rock
Cut slopes (depending upon soil condition)	Ranging 1:1to1:2 Comm. Material Ranging 2: 1 to 4:1 Rock Material
Right of Way	Follows as per existing/available 30m (for 2-lane in hilly terrain) 20m (hill side) 10m (valley side)
Maximum Super elevation	6 % (or may follow as per the existing)
Sight distance in meters:	Stopping sight distance 300m (in plain areas) 55m (if site permits in hilly terrain)
Horizontal Curvature	Min. desirable 300m (in plain areas) in meters 45m (in hilly terrain if site permits)

69. **Gradient**

Ruling gradient	1 ~ 3 % (or may follow as exists/available
Maximum gradient	6 ~ 8% (in hilly terrain or may follow existing being site constraints)
Minimum gradient	0.25 %

70. **Vertical Curves minimum length** 100m (minimum in plain area) in meters 30m (minimum in hilly terrain)

71. **Design Life of Pavement** 10 Years

72. **Structures**

Design life of Structures 50 Years

Design return period of

- Culverts 25 Years
- Bridges 50 Years

Structures (culvert) loading Class A/AA

Culvert Type Conc. Slab

Bridge Cross-Section (For new Bridges)

73. **Functional Requirements**

i Carriageway width = 7.3 m (2-lane)
ii Shoulder width = (1 ~ 3) m

iii. Height of Railing above walkway = 1. 0 m

iv. Cross Slope = 2.5 % (or as per super-elevation)

74. **Loading**

Class AA/70 ton Tank as per West Pakistan Code of Practice for Highway Bridges 1967, or Class A whichever is severer.

75. **Structural System**

i. Deck Slab - Reinforced Concrete.

ii. Main Girders (i) Prestressed concrete girders.

76. **Pavement Lane Markings**

a) Yellow line - Edge of pavement
b) White line - Center line
c) Cat eyes - as required
d) Studs - as required

3.4 Project Activities

77. The project activities will include:

- Mobilization of Contractor and Consultant, Establishment of Construction Camps;
- Installation of Asphalt and Batching Plant;
- Excavation from Borrow sites and Restoration of sites;
- Rehabilitation and Re construction activities.

3.4.1 Mobilization of Contractor and Consultant, Establishment of Construction Camps

78. The proposed projects have been divided in overall 17 packages. It is intended to engage overall 17 contractors for different packages to ensure the delivery of the projects within the specified timeline. However, where feasible one contractor could be engaged for two or more than two packages. Each contractor will establish construction camps to accommodate the construction teams, more probably at permanent buildings where system for disposal of waste already exists and as per standard requirements for disposal practices in Pakistan. For each package work force, approximately 200-250 people will be engaged by contractors. Local labour will be hired where available. For supervision purposes one consultant firm will be engaged for the whole project. A team of approximately 10-15 staff members will be deployed at each package by the consultant.

3.4.2 Installation of Asphalt Plant and Batching Plant

79. Each contractor will install batching plant and asphalt plant. Where possible two or more than two contractors can share the facilities to minimize the impacts. The location of asphalt plants will be approved by Supervision Consultant (SC) environmental specialist prior to installation. If existing asphalt plant is used for the project, the location will be inspected by environmental specialist (SC) and in case of non-compliance of IEE recommendations, the plant will be relocated.

3.4.3 Excavation from Borrow Sites and Restoration Activities

80. Gravel will be excavated, collected and transported from nearest available borrow sites approved by the SC during execution of the project. After completion of project activities the borrow site will be restored to original conditions up to acceptable level to be verified by the SC representative.

3.4.4 Rehabilitation and Reconstruction Activities

81. Rehabilitation of road sections: The following steps are involved in the reconstruction of road sections.

82. First of all the relevant section of the road is cleared. After clearing activities the lowest soil layer is compacted using bulldozers and dumpers. Once required compaction is attained the soil layer is covered with different layers of gravel (gravel layers with varying sizes). The gravel is mixed with soil and compacted using compactors. Finally layers of asphalt are laid down for providing the final finishing to the road. Asphalt is collected from the asphalt plant installed by the contractors and transported through vehicles.

83. Bridges reconstruction: It involves diversion of water at particular location, piling and foundation work, rising of piers, construction of deck and asphalt finished road construction. During asphalt finished road construction steps for reconstruction of roads are followed as explained above.

4 Baseline Conditions

84. This section describes the prevailing environmental and social conditions present within the proposed project area, and details the importance of these resources in terms of the local, national and international context. The information presented in this section has been formulated through desk study and published literature.

4.1 Project Area

85. The details of reconstruction and rehabilitation on 211.609 km strip at N15, 50, 55 and 95 is included in project description whereas baseline information of the project area which spans three provinces and Federally Administered Tribal Areas of Pakistanis described here. The widespread project area has been divided in to two regions:

4.1.1 North Zone

86. The maximum project area (126km roads and 23 bridges) that lies in KP province is considered as the North Zone. **Table 4-1** presents details of projects falling in North zone.

Table 4-1: North Zone

#	Section/ Project	Route	Affected Length (km)	District/Province
1.	Chakdara - Kalam (Bridges Package-I) 11 New Bridges (Chakdara - Bahrain)	N-95	11 new bridges	Swat, KP
2.	Chakdara - Kalam (Bridges Package-II) 12 New Bridges (Bahrain - Kalam)	N-95	12 new bridges	Swat, KP
3.	Chakdara - Kalam (Road Package-3) (Bahrain - Chimgarh)	N-95	11.365	Swat, KP
4.	Chakdara - Kalam (Road Package-4) (Chimgarh - Asrit)	N-95	8.575	Swat,KP
5.	Mansehra - Naran - Jalkhad - Chilas (Naran - Batakundi Section)	N-15	16.21 (incl. 2 bridges)	Mansehra, KP

#	Section/ Project	Route	Affected Length (km)	District/Province
6.	Mansehra - Naran - Jalkhad - Chilas (Batakundi - Jalkhad Section)	N-15	22.68 (2 bridges)	Mansehra, KP
7.	Ramak - Peshawar (Package-I). (3 km from 872-875 & 10 km from 890-900) (Ramak - D.I. Khan)	N-55	13	DI Khan, KP
8.	Ramak - Peshawar (Package-II) (15 km from 935-950 & 5 km from 960-965) (D.I. Khan - Sarai Gambila)	N-55	20	DI Khan, Lakki Marwat, KP
9.	Ramak - Peshawar (Package-III) (7 km from 1058-1065, 8 km from 1126-1134 & 5 km from 1148-1152) (Sarai Gambila - Peshawar)	N-55	19	Lakki Marwat, Bannu, Karak, Kohat Peshawar-KP and FATA
10.	Chakdara - Kalam (Road Package-5) (Asrit - Pashmal)	N-95	8.55	Swat, KP
11.	Chakdara - Kalam (Road Package-6) (Pashmal - Kalam)	N-95	6.875	Swat, KP

4.1.2 South Zone

87. The project sites bordering the KP situated in the tribal areas, Sindh and Punjab is considered the South Zone. **Table 4-2** presents lists of projects falling in south zone.

Table 4-2: South Zone

#	Section/ Project	Route	Affected Length (km)	District/Province
1.	Kashmore - Kotri(Kandhkot - Kashmore)	N-55	16	Kashmore, Sindh
2.	Kashmore - D.G.Khan - Ramak (Rojhan - Chak Karya)	N-55	7	Rajanpur, Punjab
3.	Kashmore - D.G.Khan – Ramak (Fazilpur - Taunsa)	N-55	9.674 3 new bridges	Rajanpur, DG Khan, Punjab
4.	Kashmore - D.G.Khan - Ramak	N-55	3 (3 new	DG Khan, Punjab

#	Section/ Project	Route	Affected Length (km)	District/Province
	New Bridges(Taunsa - Ramak)		bridges)	
5.	Kuchlack - Zhob - D.I. Khan (Dhanasar - Sheikhmela)	N-50	39	FATA
6.	Kuchlack - Zhob - D.I. Khan (Darzinda - Daraban)	N-50	10.68	FATA

4.2 Physical Environment

88. The physical environment includes the abiotic component of the environment that supports the life on earth.

4.2.1 Geology and Topography

89. The region varies in topography from dry rocky and sandy areas in the south to forests and green plains/mountains in the north. Northern part of project area sits primarily on the Iranian plateau and comprises the junction where the slopes of the Hindu Kush Mountains on the Eurasian plate give way to the Indus-watered hills approaching South Asia. This situation has led to seismic activity in the past. The famous Khyber Pass links the province to Afghanistan, while the Kohalla Bridge in Abbottabad is a major crossing point over the Jhelum River in the east. Geographically the project area could be divided into two zones: the northern one extending from the ranges of the Hindu Kush to the borders of Peshawar basin and the southern one extending from Lower Punjab to Sindh. Northern part including project area is tectonically a part of Himalayan range. The region is weak and flexible portion of earth cut and a series of folds, faults and thrusts, as a result of which the whole area in the region have high dips. Himalayas have tectonic origin and has been divided in to three regions:

    i) The great Himalayas

    ii) The Lesser Himalayas

    iii) The outer Himalayas

90. In the Naran region, a regionally distributed second generation of folds results from northward-directed shear deformation. These folds are collapse structures associated with back sliding of the hanging wall, namely the Kohistan paleo–island arc. They are explained by a geometrical model that combines coeval vertical and horizontal shortening. Accordingly, they are sync- convergence collapse features that indicate at least 5 km of vertical

shortening of the imbricate thrust slices derived from the Indian continent in the northwest Himalayas. The hilly terrain of Swat, Kalam,Upper Dir, Naran and Kaghan is renowned for its beauty and attracts a great many tourists from neighbouring regions and from around the world.

91. In the south, barren mountains of Koh-Suleman (Sulaiman Mountains) and the sandy soil of the area mostly consists of an alluvial plain formed by the southward-flowing Indus River and its four major tributaries the Jhelum, Chenab, Ravi, and Sutlej rivers. General slope of the land is from northeast to southwest, but it rises in the areas between rivers. The alluvial plain has a diversity of landforms: its active floodplains are flooded every rainy season and contain changing river channels, while meander floodplains lying adjacent to the active floodplain are marked by relict and abandoned channels.

4.2.2 Climate

92. The climate of project area varies immensely for a region of its size, encompassing most of the many climate types found in Pakistan(Figure 4-1). The northern zone is cold and snowy in winters with heavy rainfall and pleasant summers with the exception of Peshawar basin, which is hot in summer and cold in winter with moderate rainfall. The southern zone is arid with hot summers and relatively cold winters and scanty rainfall. It can be intensely hot summers to freezing cold winters. Despite these extremes in weather, agriculture remains important and viable in the southern region.

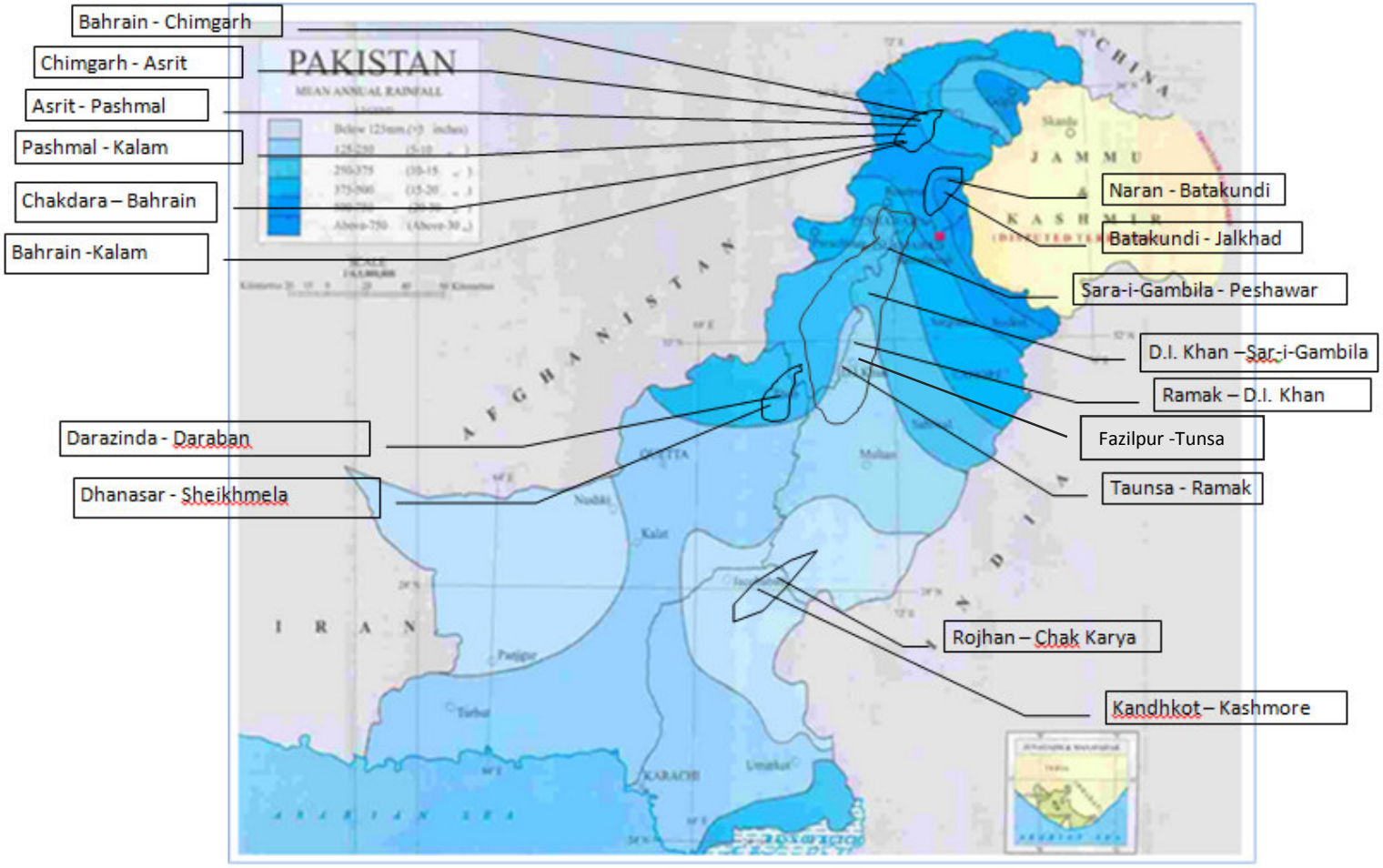
93. The KP province stretching southwards from the Baroghil Pass in the Hindu Kush covers almost six degrees of latitude; it is mainly a mountainous region. Dera Ismail Khan is one of the hottest places in South Asia while in the mountains to the north the weather is temperate in the summer and intensely cold in the winter. The air is generally very dry; consequently, the daily and annual range of temperature is quite large. Rainfall also varies widely. Although large parts of the project area are typically dry, however, it also contains the wettest parts of Pakistan in its eastern fringe. The southern slopes of KP are the wettest part of Pakistan. Annual rainfall ranges from around 500 millimetres (20 in) in the most sheltered areas to as much as 1,750 millimetres (69 in) in parts of Abbottabad and Mansehra Districts. The climate is classed at lower elevations as humid subtropical whilst at higher elevations with a southerly aspect it becomes classed as humid continental. As in central KP, the seasonal precipitation shows a very sharp gradient from west to east, but the whole region very rarely receives significant monsoon

rainfall. Even at high elevation annual rainfall are less than 400 millimetres (16 in) and in some places as little as 200 millimetres (8 in).

94. Dera Ismail Khan in the southernmost district of the KP province is known as one of the hottest places in the world with temperatures known to have reached 50 °C (122 °F). In the cooler months, nights can be cold and frosts remain frequent; snow is very rare, and daytime temperatures remain comfortably warm with abundant sunshine. Temperatures in summer are oppressively hot, and in the south around temperatures of 45 °C (113 °F) are not uncommon, whilst in Peshawar 40 °C (104 °F) is par for the course in summer. In winter, however, this region is both warmer and generally drier than the rest of project area, with temperatures being around 17 °C (62 °F) in Peshawar and over 20 °C (68 °F) in the extreme south. Nights, however, can still be quite cold during the winter. Peshawar and Dera Ismail Khan both get around 4.5 inches of rain in July and August and almost nothing in June or September. In winter, rainfall usually peaks in March but Peshawar averages less than 10 inches between December and May and Dera Ismail Khan less than 4.5 inches. On certain mountain slopes such as around Kohat, winter rainfall may predominate, though this is unpredictable.

95. Further away from the foothills of the Himalaya and Karakoram ranges in south, the climate changes from the humid subtropical climate of the foothills to the typically arid climate of Sindh, Balochistan and southern Punjab. Southern part of the project area lies on the margin of the monsoon climate. The temperature is generally hot, with marked variations between summer and winter. The winter is relatively cold and the climate is hot during the remaining part of the year, but it is very hot in summer. The temperature during summer is usually about 115 °F (46 °C), while during winter season the temperature is as low as 40 °F (4 °C). The prevailing wind direction is North-South. The average annual precipitation is low, except in the sub-Himalayan and northern areas, and decreases markedly from north to south or southwest, from 23 inches (580 mm) in east-central to just 7 inches (180 mm) in the southwest.

Figure 4-1: Rainfall Pattern



4.2.3 Hydrology

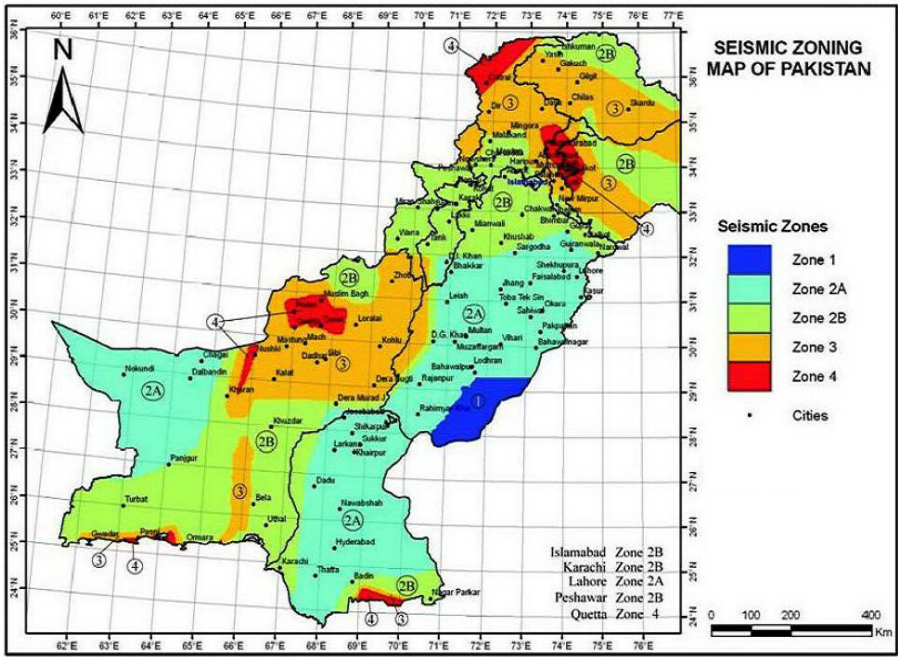
96. The major rivers that criss-cross the KP province are the Kabul, Swat, Chitral, Kunar, Siran, Panjkora, Bara, Kurram, Dor, Haroo, Gomal and Zhob. There are many hill torrents and streams which collect the rain water run–off or seepage water in the form of springs that ultimately drain into the Swat River, which flows almost all along the project corridor and ultimately meets the Kabul River. The Swat River rises from the Shandur or Mashabar Range bordering Swat district with Chitral in the north and flows south and south–west approximately dividing the district into two halves. The other prominent rivers or nalas are Harnoi khwar, Deolai khwar and Daral khwar. In addition to this, some small nalas also originate from hills and joins Swat River. Village communities have designed catch water drains and river water is diverted to these drains for irrigation purposes. The proposed project includes 23 bridges to be constructed in Swat river.

97. Main ground water recharge takes place through infiltration during rains. At places the ground water finds its way out in the form of springs and big villages have tapped the spring for a water supply to the village household. The maximum road sections to be rehabilitated and bridges to be constructed are lying near the rover water therefore surface water may be used for construction activities. The water table is expected to be high along the project area. The river water is suitable for use of cement concrete, bitumen concrete and other construction purposes.

4.2.4 Seismicity

98. National Seismic Monitoring Centre of Pakistan issued the seismic zone map for Pakistan, as shown in Figure 4. The northern part of the project area falls in high risk zone associated with the infrastructure. The geotectonic of the whole region is related to the collision of the Indian tectonic plate with Eurasian plate and subsequent formation process of the Himalayan Ranges. This tectonic process is the origin of the seismicity along the Himalayas and in particular where northern Pakistan and Kashmir are located. The north zone of the project area is close to the seismic zone 4 which is considered as high risk zone.

Figure 4-2: Seismic Zones of Pakistan



4.2.5 Floods

99. The project area is prone to floods and natural disasters. In 2010 Pakistan floods began in late July 2010, resulting from heavy monsoon rains in the KP, Sindh, Punjab and Balochistan regions of Pakistan and affected the Indus River basin. Approximately one-fifth of Pakistan's total land area was underwater, approximately 796,095 square kilometres (307,374 sq mi). According to government data the floods directly affected about 20 million people, mostly by destruction of property, livelihood and infrastructure, with a death toll of close to 2,000. This year (2015) starting from late July, heavy rains continued to fall in northern and eastern Pakistan causing floods. District Chitral in KP was badly impacted. Over 800,000 people across 2,200 villages in the five affected provinces were displaced (NDMA). The design of road sections and bridges will include mitigation for floods.

4.2.6 Noise

100. The noise level at the proposed sections of reconstruction and rehabilitation will be maintained according to NEQS. The ambient noise levels monitoring were not conducted at the project locations. The project locations are mainly on existing highway where the existing noise levels exceed the standards at times due to movement of heavy traffic. However no major industry exists along the alignment of proposed highways lowering the threat of exceeded noise levels.

4.2.7 Air Quality

101. Air quality of the project area can be divided into north and south region. The northern part of the project area has relatively cleaner air due to absence of heavy industry, whereas, the south experiences pollution due to presence of industrial zones close to project locations. The ambient air quality standards will be followed during construction.

4.3 Biological Environment

102. The biological environment of the project area includes biotic life of the project area which may be influenced by the project activities. It includes following:

4.3.1 Flora

103. The northern highlands include lower elevation areas of Potohar and Kashmir regions and higher elevation areas embracing the foothills of Himalayan, Karakorum and Hindukush mountain ranges. These areas provide an excellent habitat for wildlife in the form of alpine grazing lands, sub-alpine scrub and temperate forests. The areas are difficult for human beings to access, hence, most wildlife is present in reasonable numbers. The northern highlands of are covered with conifer and scrub forests, which have been reduced to scanty growth in most places. The biome is defined as north-western Himalayan alpine shrub and meadows.

104. The southern part across River Indus and its numerous eastern tributaries of Chenab, Ravi, Sutlej, Jhelum, Beas are spread across most of Punjab. The plain of river Indus continues towards and occupies most of western Sindh. The plains have many fluvial landforms (including bars, flood plains, levees, meanders and ox-bows) that support various natural biomes including tropical and subtropical dry and moist broadleaf forestry as well as tropical and xeric shrub lands (deserts of Thal in Punjab and of Cholistan, Nara and Tharparkar in Sindh). The banks and stream beds of the river system also support riparian woodlands that exhibit the tree species of kikar, mulberry and sheesham. The reed beds and tamarisk bushes along the rivers are also present. Such geographical landform accompanied by monsoon provides an excellent ground for diversity of flora and fauna species. However, the plains are equally appealing to humans for agricultural goals and development of civilization. Vast Indus flood plains have been cleared of natural vegetation to grow crops.

4.3.2 Fauna

105. None of endangered species is present in the northern zone of the project area, however, the northern mountainous areas embracing the Himalayan, Karakorum and Hindukush Ranges are rich in fauna and flora, as compared to the south. These habitats support a variety of wild animals. The areas are difficult for human beings to access; hence, most wildlife is present in reasonable numbers. Some of the main wildlife species are the snow leopard, the black and the brown bears, otter, wolf, lynx, Himalayan ibex, markhor, bharal, Marco Polo's sheep, shapu, musk deer, marmots, tragopan and monal pheasants. The snow partridge and snowcock reside at higher elevations. The Rhesus monkey, common langur, red fox, black bear, common leopard, a variety of cats, musk deer (over a limited area), goral, several species of flying squirrels, chakor, partridge and pheasants (koklass, kaleej and cheer) live in the lower elevations. The main threats to the population of wild animals in the northern mountainous regions include, the competition with domestic livestock for existing natural forage, increasing human interference in the form of cultivation, the construction of roads, and hunting. The Himalayan foothills and the Potohar region, including the Salt Range and Kala Chitta Range, are covered with scrub forests, which have been reduced to scanty growth in most places. Medium-sized animals like the Punjab urial, barking deer, goral, chinkara, partridges (grey and black), seesee and chakor are supported in these habitats. A variety of songbird fauna also occurs in these areas.

106. In the south, vast Indus flood plains have been cleared of natural vegetation to grow crops. The south zone of the project area does not have any endangered species. Only animals like the jackal, mongoose, jungle cat, civet cat, scaly anteater, desert cat and the wild hare occur in these areas. Hog deer is found in riverine tracts. The crop residues and wild growth support reasonable populations of black and grey partridges. Little vegetative cover, severity of climatic conditions and the great thrust of grazing animals on the deserts have left wild animals in a precarious position. Parts of Thall and Cholistan are now being irrigated, with the situation almost identical to that of the flood plains. Chinkara is the only animal, which can still be found in average numbers in Cholistan, but rarely in Thall. Grey partridge, species of sand grouse and the Indian courser are the main birds of the area. Peafowl occur in some areas in Cholistan.

4.3.3 Aquatic Fauna

107. KP is generously endowed with vast water potentials having a variety of endemic fish species. It is the only province with cold, semi cold and warm water that provides diversity in aquatic fauna of the area. Brown trout, rainbow trout and swati are found in cold waters of north. Mahasher, swati, kalaha and chun are found in semi cold waters. The warm waters of KP and Punjab are breeding ground of rahu, mori common carp, grass carp, mulli , singhara, shermahi, kalabans, liaro, khagga, torki, balm sunni and pari. A number of hatcheries have been established by the government in the area to maintain the fish population. Fish farms and dams in the region are major source of fish supply to the country.

4.3.4 Protected Areas and Wildlife

108. There are no protected areas or wildlife sanctuaries found at the project locations or in close proximity of the proposed project.

4.3.5 Forest

109. There is no Government or State reserved or protected forest along or near the project locations on road. However private people have their wood lots in their lands which add alternative aesthetics to the upper side of the road. However NOC will be attained from forest department for vegetative clearing and tree cutting (IF any) along the right way of the project.

4.3.6 Endangered Species

110. Neither the area along and nearby the project road, nor the project road itself are the habitats of any endangered species.

4.4 Socio-Economic Environment

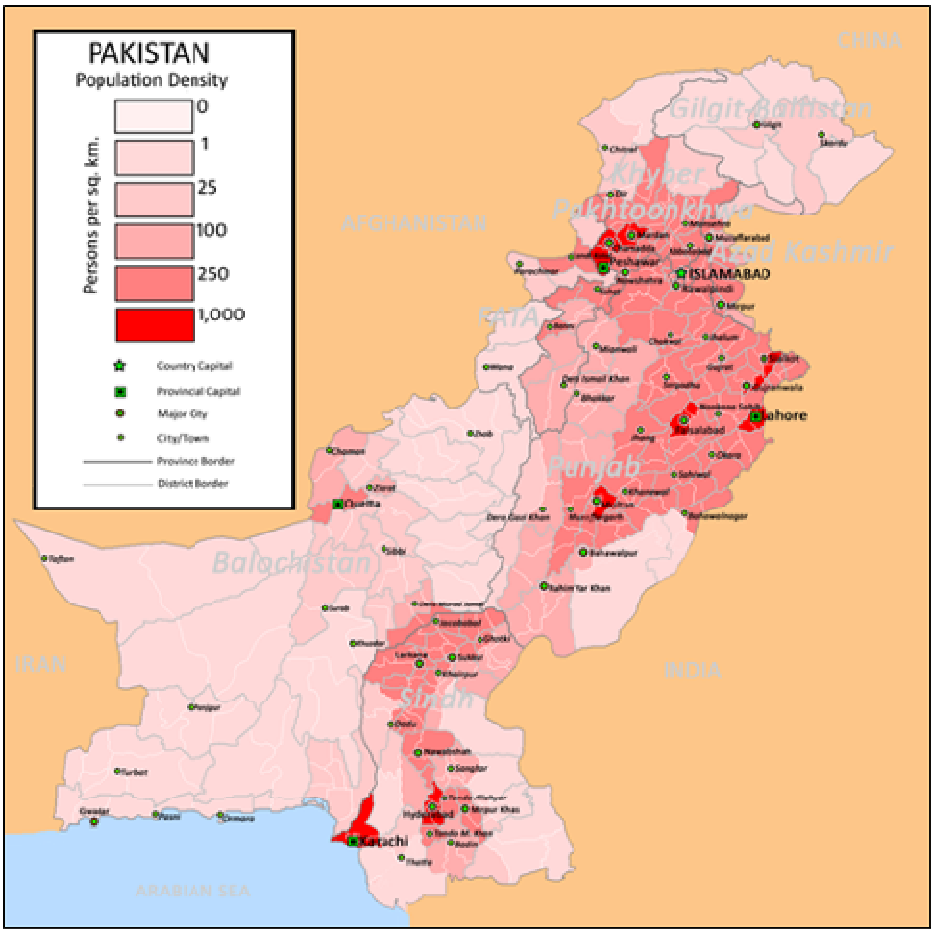
4.4.1 Population

111. According to 1998 population census reports, the total population of the project area is 15,275,675 with an average annual growth rate of 2.8 present. The population per district is given in **Table 4-3**. The population density as illustrated in the map (Figure 4-3) shows 250 number of person per square km of the major part of the project area. The urban centres are densely populated with an average of 1000 person per square kilometre. Districts located close to the city centres are thickly populated whereas districts lying in the southern and northern boundaries are relatively thinly populated.

Table 4-3: Population of Project Area and Surroundings

#	Project Districts	Population (1998 Census)
1.	Mansehra	1152839
2.	Malakand Agency	452291
3.	Swat	1257602
4.	Lakki Marwat	490025
5.	Bannu	675667
6.	Karak	430796
7.	Kohat	562644
8.	Peshawar	2019118
9.	D.I. Khan	852995
10.	Rajanpur	1103618
11.	D.G. Khan	2643118
12.	Kashmore	662462
13.	Tribal Areas	2972500
	Total	**15,275,675**

Figure 4-3 : Population Density



4.4.2 Administrative Setup

112. The country is divided into provinces and federally administered areas. Geographically each district comprises of subdivisions called Tehsils. The tehsils are further divided into Qanungo Halqas that are further segregated into patwar circles and mauzas(revenue state). A mauza is the basic administrative unit defined by revenue state in the revenue record. Administrative setup is run through union councils which are classification based on the population density of the area. The revenue generated by the provinces is deposited with federal government which is responsible for allocations of funds to the provinces according to the needs of each provincial government.

4.4.3 Ethnicity

113. Pakistan's diversity is more visible along cultural differences and less along linguistic, religious or genetic lines. Almost all Pakistanis belong to the Indo-Iranian linguistic group of the Indo-European branch. Pashtuns (Pakhtuns) present in larger part of the project area make up the second largest ethnic group in Pakistan. In south, Punjabis are the largest ethnic group whereas Sindhi are the third-largest ethnic group. Saraikis (a transitional group between Punjabis and Sindhis) make up 10.53% of the total population.

4.4.4 Occupation

114. Agriculture is the main source of income and employment in rural north and south of the project area. The 80 % of the population is directly or indirectly dependent on agriculture. Wheat, gram, rice, bajra, oilseed (mustard), lentil, sugarcane, and maize are the main crops of north. A number of fruits and vegetables are also major source of income in the region. North region is less industrialised than the south. Other than agriculture, manufacturing industries have provided employment to the skilled and unskilled residents. A number of people are employed by the government, banks, private firms and NGOs in the region. Fisheries and tourism are also one of the major sources of income during the peak season.

115. Much of the Punjab and Sindh Province once consisted of desert wastes that were unfavourable for settlement, but its character changed after an extensive network of irrigation canals was built in the early 20th century using the waters of the Indus tributaries. The area of settlement, which had formerly been limited to the north and northeast, was enlarged to include the whole province, and now about three-quarters of the provinces cultivable

land is irrigated. Wheat and cotton are the principal crops. Other crops grown include rice, sugarcane, millet, corn (maize), oilseeds, pulses, fruits, and vegetables. Livestock and poultry are raised in large numbers.

4.4.5 Religion

116. A major population of the project area are sunni Muslims. People are religious and practising Islam. They respect the religious practices of minorities including Christians and Hindus.

4.4.6 Literacy

117. Literacy can be defined as percentage of population that can read and write at the age of 10 or above. Overall 60% population of the project area including 69% male and 45% female is literate. The education institutes present in the project area are categorized as follows:

- Primary schools
- Middle schools
- High schools
- College of Arts and Sciences
- Degree colleges
- Technical and vocational institutions
- Universities

4.4.7 Gender

118. The social and cultural context of Pakistani society is predominantly patriarchal. Men and women are conceptually divided into two separate worlds. Home is defined as a woman's legitimate ideological and physical space, while a man dominates the world outside the home. In the given social context, Pakistani women lack social value and status because of negation of their roles as producers and providers in all social roles. The preference for sons due to their productive role dictates the allocation of household resources in their favour. Male members of the family are given better education and are equipped with skills to compete for resources in the public arena, while female members are imparted domestic skills to be good mothers and wives (ADB, 2000).

4.4.8 Health

119. The government is active in the health care sector in all districts of the project area. The provinces in line with federal ministry of health are making efforts to provide quality health care services to the general public. A network of government hospitals and basic health units is operational but limited services are available due lack of resources. The situation is almost

same in north and south of the project area. Other than government hospital, high quality private hospital and clinics are present to fulfil the needs of the public. **Table 4-4** presents the list of health institutions which are functional in the province:

Table 4-4: Categorical Distribution of Healthcare Institutions

#	Institutions
1.	District Head Quarters Hospitals(DHQ)
2.	Tehsil Headquaters Hospitals (DHQ)
3.	Civil Hospitals
4.	Women Hospitals
5.	Rural Health Centres
6.	Basic Health units
7.	Sub Health Centres
8.	Dispensaries
9.	Materenity care (MCH) Centres
10.	Tuberculosisi Clinics
11.	Leprosy Clinics
12.	Private Hospitals
13.	Private Clinics

4.4.9 Archaeological Sites / Chance Finds

120. No sites of archaeological, historical, cultural, or religious significance are known to exist along the selected alignments and are not likely to lie in the path where construction will take place or where different project facilities will be established / located. In case there is a chance find, it can be handled as per law and procedures provided in section 5.

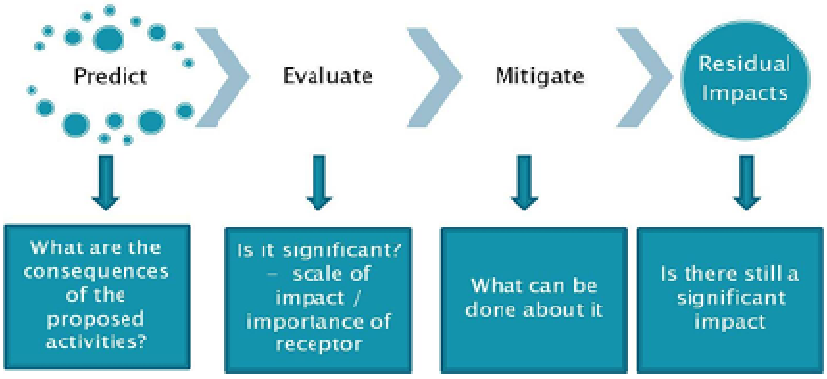
5 Impacts and Mitigation

121. This section discusses the potential environmental impacts that may arise from the project activities and the mitigation measures proposed to avoid, minimize and reduce these impacts. The mitigation measures are based on the magnitude of the impact, sensitivity and behaviour of the environmental and social receptors at the Project site, regulatory requirements, and best management practices.

5.1 Impact Assessment Approach

122. To screen, identify and evaluate the impacts, the nature, extent, duration, scale and other parameters of the Project activities are to be studied along with conditions of the environmental and social receptors (baseline). Following approach has been adopted for impacts identification, assessment and mitigation.

Figure 5-1:Approach to Identify, Assess and Mitigate Impacts



123. The reconstruction and rehabilitation along the National Highway is likely to improve the current road and disaster management infrastructure of the country leading to improvement in socio-economic condition of the area. It is a smaller scale construction project with lesser impacts on environmental and social receptors, however, the reduced impacts are assessed further to minimize and/or offset, if not entirely eliminate impacts by devising appropriate mitigation measures. The potential environmental and social impacts during construction and operation phases were identified and evaluated in accordance with the impact characteristics considering the parameters listed in **Table 5-1.**

Table 5-1: Impact Assessment Parameters and their Characteristics

Parameter	Characteristics
Nature	Direct: when an environmental receptor is directly affected by the project activity Indirect: when an environmental receptor is affected by change in another environmental receptor. Indirect impacts are less obvious and can occur later in time.
Magnitude	Estimating the magnitude of the impact is of primary importance. Typically, it is expressed in terms of relative severity, such as major, moderate or minimal.
Extent/Location	The spatial extent or zone of impact influence is predicted as local at site / regional / global.
Phase	During construction phase
Duration	Short-term; impacts lasting for short duration such as noise from construction activities. Long-term; impacts lasting for life of the project such as inundation caused be reservoir filling. Intermittent; impacts occurring in intervals such as industrial operations occurring only for few hours. Continuous; persistent impacts occurring continuously without any break
Reversibility	Reversible; when an environmental receptor can resume to its original state after ending the project activity Irreversible; when an environmental receptor cannot regain its original state even the impacting activity has been stopped.
Likelihood	Almost Certain; expected to occur under most circumstances. Likely; probable to occur under most circumstances. Possible; may possibly occur at some time. Unlikely; could possibly occur but only under exceptional circumstances.
Significance	Impact significance depends on the sensitivity and value of the impact receptor. For instance, drinking water resources are critically important to the local communities and likewise endangered species have global importance. Significance can be categorized as High, Medium and Low.

5.1.1 Project Area of Impact

124. The project area of impact includes immediate area and wider area surrounding the construction locations at each section.

Immediate Area of Impact

125. It includes area surrounding the construction sites that may likely have major impact due to the project activities. The immediate area of impact may include but is not limited to following:

- Road and bridge reconstruction sites and its surroundings, including the river corridor;
- The labor and construction camps, site offices, equipment and vehicle yards and additional depots;
- Haul tracks to transport construction material;
- Batching plants;
- Borrow areas, from where the fill material will be obtained;
- Waste disposal sites; and
- Unplanned development induced by the project

Wider Area of Impact

126. It includes the wide spread area around the immediate area that is likely to have positive or negative impact due to the project activities. It may include the project districts, province or the whole country.

The salient features of the project area and surroundings are described in following sections.

5.2 Potential Impacts and Mitigation Measures

127. The road reconstruction is the significant part of the Project that may cause serious environmental impacts. It involves various activities, which can impair various components of physical and ecological environment and social settings of the area.

5.2.1 Land

128. Reconstruction at various sites is likely to carry out site clearance, vehicular and machinery movement, and construction of labour camps that may impact landscape in terms of change in land use, soil erosion and compaction. There is also a potential for contamination of soil via runoff from construction activities including oil spills, construction material, dredged / spoil materials and construction waste. However, the duration of the impact

would be confined to re-construction and rehabilitation phase It is characterized below;

Nature:	Direct (in case of waste water disposal – Indirect)
Duration:	Short
Spatial Extent:	Local
Reversibility	Reversible
Magnitude	Small
Likelihood	Almost Certain
Significance	Low

Mitigation Measures

129. Following measures will be taken to avoid, minimize and reduce the impacts on soil;

- Project will strictly follow the existing route on National Highway. The excavation will be carried out from the existing sites near the project construction area according to environmental law and guidelines by environmental protection agencies of each province. It is not likely to cause change in landscape.
- Excavated slopes will not be left unattended and unprotected. They will be stabilized with temporary installations and handed over to the contractor for further maintenance. Following slope stabilization methods can be used:
    - Geometric methods, in which the geometry of the hillside is changed (in general the slope);
    - Hydrogeological methods, in which an attempt is made to lower the groundwater level or to reduce the water content of the material
    - Chemical and mechanical methods, in which attempts are made to increase the shear strength of the unstable mass or to introduce active external forces (e.g. anchors, rock or ground nailing) or passive (e.g. structural wells, piles or reinforced ground) to counteract the destabilizing forces.
- Construction materials will be stored in proper stores on impervious sheets to avoid any soil contamination.
- Machinery and vehicles will be operated at existing designated routes to avoid erosion and compaction of un-impacted soils.
- Periodic trainings will be provided to drivers on mitigation measures related to off-road travel and speeds limits.

- Visual Inspection will be carried out for land contamination and dust emissions.
- The soil contaminated from minor and moderate spills will be removed and will be handed over to waste contractor for proper treatment. Whereas major spills may require specialized treatment such as incineration or bioremediation. By introducing biological agents to the spill hasten biodegradation. Most of the components of oil can be broken down by bacteria and other microorganisms into harmless substances such as fatty acids and carbon dioxide. This action is called biodegradation. The natural process can be speeded up by the addition of fertilizing nutrients like nitrogen and phosphorous, which stimulate growth of the microorganisms concerned. The nearest incineration facility to the project area is at National Cleaner and Production centre of Attock Oil Refinery Rawalpindi.

5.2.2 Air and Climate

130. Excavation of construction material, vehicles, camps, asphalt and batching plant is likely to generate dust and exhaust emissions such as Carbon Monoxide (CO), Carbon Dioxide (CO2), Sulphur Oxides and Nitrogen Oxides. During these activities, local air quality may decline as a result of gaseous and particulate emissions from vehicle movements on and off site. Movement of the machinery and soil excavation will release particulate matter and fugitive dust which will deteriorate ambient air quality in the project site vicinity. The construction work is not likely to impact the climate of the area, however, it is likely to cause GHG emission from above mentioned sources. The unmitigated impacts related to air quality deterioration can be characterized as under;

Nature:	Direct
Duration:	Short
Spatial Extent:	Local
Reversibility	Irreversible
Magnitude	Small
Likelihood	Likely
Significance	Medium

NEQS for vehicular emission, particulate matter and exhaust emission will be adhered with and used for compliance.

Mitigation Measures

131. Following measures will be implemented to minimize the impacts on the air quality;

- Construction machinery and vehicles will be kept in good conditions and will be properly tuned to ensure that emissions are within the range of NEQS for vehicular exhaust;
- Water will be sprayed at twice a day to avoid fugitive dust emissions;
- Unnecessary movement of vehicles will be avoided at the construction locations;
- In areas not expected to handle vehicle traffic, vegetative stabilization of disturbed soil is often desirable. Vegetative cover provides coverage to surface soils and slows wind velocity at the ground surface, thus reducing the potential for dust to become airborne;
- Wind breaks are barriers (either natural or constructed) that reduce wind velocity through a site and, therefore, reduce the possibility of suspended particles. Wind breaks can be trees or shrubs left in place during site clearing or constructed barriers such as a wind fence, snow fence, tarp curtain, hay bale, crate wall, or sediment wall;
- Deep tillage in large open areas brings soil clods to the surface where they rest on top of dust, preventing it from becoming airborne.
- Stone can be an effective dust deterrent for construction roads and entrances or as a mulch in areas where vegetation cannot be established;
- Construction materials such as cement, gravels and sand will be kept under sheet covers;
- Air quality testing for SOx, NOx, PM10, PM2.5 quarterly at the site of asphalt plant, batching plant and at selected locations along the road.

5.2.3 Water

Quality

132. Water quality could be affected by a number of factors during operations on site. A number of permanent camp sites and temporary sites will be constructed at appropriate location to expedite construction work. Construction activities may encourage soil erosion and increase the sediment loads of nearby streams, while accidental leaks/spills of oil/fuel from storage tanks or construction, maintenance and decommissioning vehicles can also pollute surface waters. If not contained leaching from oil spills may contaminate soil and of first water table. The possible source of contamination and wastewater may likely to generate from the following sources:

- Possible oil spills from fuel tanks;

- the camps and machinery, vehicle and equipment washing;
- Surface runoff due to rainfall;
- Used oil, paints, cleaning solvents and other chemicals may generate liquid hazardous wastes.

The NEQS for municipal and liquid industrial effluent will be used as the criteria for compliance for wastewater.

Hydrology

133. Construction of roads and bridges consume significant amount of water which can affect the surface water hydrology. Water consumption at civil works, sprinkling, concrete structures, asphalt and batching plant and, construction camps may increase pressure on water resources of the area. Sites close to surface water bodies will abstract water with due permission from relevant authorities mainly irrigation department and WAPDA. Ground water may be used for construction purposes after due permission from owner of the source. Sources closer to surface water bodies will be preferred to ensure recharge.

134. Rehabilitation at bridges can also result in compaction of soils and an increase in impermeable (or slowly permeable) surfaces. The subsequent increase in surface runoff may, in turn, increase the risk of flooding. Bridges and culverts can potentially alter the flow regimes of the river thereby affecting water velocity, depth, river bed, depositional patterns and channel morphology. These changes in turn may increase the risk of flooding and erosion.

Nature:	Direct
Duration:	Short
Spatial Extent:	Local
Reversibility	Reversible
Magnitude	Moderate
Likelihood	Likely
Significance	High

Mitigation Measures

135. The following mitigation measures will be followed:

- Construction camps will be housed at permanent locations. In case of temporary camp sites proper soak pits and septic tanks will be constructed;
- Sewage generated at the campsites will be disposed off in septic systems comprising of septic tanks and soak pits;

- Soak pits will be built in absorbent soil and located 300 m away from a surface water source or ground water well. Soak pits will be designed to accommodate wastewater generated during the total duration of the operation;
- All fuel tanks will be properly marked to highlight their contents with a concrete pad underneath to prevent water contamination in case of leaks or spills. Daily monitoring will be carried out for leaks. Shovels, plastic bags, and absorbent material will be placed near fuel and oil storage or handling areas to attend spills and leaks;
- Used oil and vehicle related waste will be transported to local contractors for recycling.
- Waste oil shall be provided to contractors for reuse;
- All vehicles washing will be limited to designated washing area and the resulting liquid effluent will be directed to sewer lines;
- The existing water sources will be used during the entire construction phase with due permission from relevant authorities;
- Discharge of water well will be monitored regularly;
- The bridges will be rehabilitated during lean season when the water flow is minimal to avoid the risk of flooding. Flow diversion will be constructed on sites having continual flow throughout the year;
- Fuel tanks will be bonded 110% volume enclosure;
- Coffer dams will be constructed and dismantled carefully.

If the mitigation measures are implemented properly, then the impacts will remain within permissible limits.

5.2.4 Noise

136. **Table 5-2** presents the typical noise levels from construction equipment. Civil and mechanical work during the project may generate higher levels of noise from following sources:
    - Asphalt and batching plant;
    - Material loading/offloading vehicles and other transport used by construction contractor.
    - Construction and excavation work such as heavy earth moving equipment/ machinery, pilling work, welding, cuttings, drilling, grinding etc.

- Use of pressure horns

Table 5-2: Construction Equipment Noise Levels

Equipment	Typical Noise Level (dBA) 50 ft from Source
Air Compressor	81
Backhoe	80
Ballast Equalizer	82
Ballast Tamper	83
Compactor	82
Concrete Mixer	85
Concrete Pump	82
Concrete Vibrator	76
Crane, Derrick	88
Crane, Mobile	83
Dozer	85
Generator	81
Grader	85
Impact Wrench	85
Jack Hammer	88
Loader	85
Paver	89
Pile Driver (Impact)	101
---"------ (Sonic)	96
Pneumatic Tool	85
Pump	76
Rail Saw	90
Rock Drill	98
Roller	74
Saw	76
Scarifier	83
Scraper	89
Shovel	82
Spike Driver	77
Tie Cutter	84
Tie Handler	80
Tie Inserter	85
Truck	88

Table based on an EPA Report,[3] measured data from railroad construction equipment taken during the Northeast Corridor Improvement Project[4] and other measured data.[5][6]

137. Noise is one of the aspects which may cause hearing impacts on workers and communities in immediate vicinity especially during early morning and night time. Problems related to noise include stress related illnesses, high blood pressure, speech interference, hearing loss, sleep disruption, and lost productivity. Noise Induced Hearing Loss (NIHL) is the most common and often discussed health effect, but research has shown that exposure to constant or high levels of noise can cause countless adverse health effects .In case of the proposed project, construction activities are restricted to national highway that encounters higher noise levels due to movement of heavy

traffic. Construction activities is likely to cause none or minimal increase from baseline noise levels. Noise impact will be minimal to the communities and moderate to the workers not likely to cause hearing loss. **Table 5-3** detail the impact of noise at various levels.

Table 5-3: Noise Impact

#	Noise level dB	Impact
1.	60	Hearing damage in 8 hours
2.	80	Hearing damage in 8 hours
3.	85	Hearing damage in 2 hours
4.	100	Hearing damage in 2 hours
5.	110	Hearing damage in 30 min
6.	120	Hearing damage in 7.5 min
7.	130	Pain threshold
8.	150	Hearing damage in 30 sec
9.	300	Complete hearing loss[1]

138. The NEQS will be used as compliance criteria for noise level.

Nature:	Direct
Duration:	Short / intermittent
Spatial Extent:	Local
Reversibility	Reversible
Magnitude	Minimal
Likelihood	Almost Certain
Significance	Medium

Mitigation Measures

139. The following measures will be followed by project management in order to minimize the impact of noise on construction workers and people living in close proximity.

- Specific working hours will be managed for the movement of construction material, equipment and other machinery for construction;
- Noise monitoring will be carried out at various locations using noise meters. Site labour working in high noise area where noise level exceeds 85 dB (A), should wear earplugs and ear muffs;
- Monitoring of noise from noise generating sources on biannual basis ensuring compliance of NEQS;

[1] Source: Urbanization and Sustainable Cities 100: Environmental Science, International Science, 5th edition (1991) Cunningham Saigo

- The site for stationary sources of noise such as concrete mixers, batching plant, and pumps will be selected at a reasonable distance from residing communities.
- Blowing of horn by the project related vehicles will be strictly prohibited;
- Noise level of 55 dB at day and 45 dB at night time will be maintained. Late night construction activities will be avoided close to the residential area;
- Noise level of 65 dB at day and 55 dB at night time will be maintained for commercial area.
- Construction camps will be located at reasonable distance from the communities to avoid nuisance due to noise.

If the mitigation measures are implemented, the impacts will remain within permissible limits.

5.2.5 Traffic

140. The rehabilitation work may likely impact the traffic flow on highway. Increase the traffic flow will occur as a result of:

- Construction of the road, bridges and associated installations;
- Mobilization and demobilization of the equipment;
- Use of trucks and heavy equipment;

141. This slight increase may also cause accidental injuries, deteriorate ambient air quality and generate noise. The reconstruction and rehabilitation may also cause restrictions to access, traffic congestion and nuisance to the travellers.

Nature:	Direct
Duration:	Short / intermittent
Spatial Extent:	Local
Reversibility	Reversible
Magnitude	Minimal
Likelihood	Almost Certain
Significance	Medium

Mitigation Measures

142. The following mitigation measures will be adopted in order to minimize the traffic impact:

- Alternate routes will be created to avoid irregularity in traffic on the highway;

- Construction sites will be barricaded to minimize accidental injuries and visual nuisance to the travellers;
- The construction trucks will be adequately covered with tarpaulin covers;
- Movement of construction equipment will be limited to specific locations and duration;
- Adequate and appropriate road signs will be erected to warn travellers crossing construction sites;
- Construction vehicles will be maintained regularly by the contractor to reduce exhaust emissions;
- Raw materials will be adequately covered within the trucks to prevent air flow along the roadway.

5.2.6 Solid Waste

143. During construction phase, solid waste can be generated from discarded equipment parts, scrap metals, equipment boxes, wood parts, empty bags, and leftover construction debris, asphalt and batch plant etc. The excavated material may also be considered as solid waste as it would require disposal. The project is not likely to generate any hazardous waste. From rest of the construction the unmitigated solid waste impacts can be characterized as below;

Nature:	Direct
Duration:	Short
Spatial Extent:	Local
Reversibility	Reversible
Magnitude	Small
Likelihood	Likely
Significance	Low

Mitigation Measures

- A proper solid waste collection, segregation, storage and disposal system will be implemented. Recyclable material will be segregated whereas solid waste will be disposed-off properly at approved disposal site;
- Construction workers will be trained on handling the waste;
- Hazardous waste 'if generated' will be marked separately and disposed using international best practices through registered contractor;
- On completion of the construction phase of the project, the contractor will be required to rehabilitate the site. The purposes of site rehabilitation will be to minimize the potential for soil erosion, enhance the aesthetic

appearance of the site and restore safe public access to the surrounding area. Rehabilitation will include removal of all construction materials and wastes, and the grading and revegetation of all exposed sites that may be prone to erosion. Where natural erosion protection measures may not be possible or practical, suitable physical erosion protection methods will be used.

5.2.7 Health and Safety

144. Various construction activities can pose a risk to the health and safety of the workers which can be mitigated through proper management of all the activities. Construction work will be confined to the highway therefore there is high risk of accidental injuries. Use of heavy machinery may also cause serious accidents. The unavailability of clean water for drinking purposes and unhygienic practises at camps may cause spread of water borne diseases.

Safety of workers is prime concern for NHA and its contractors. The impact on human is likely to be higher depending on situation. It is characterized as below;

Nature:	Direct
Duration:	Short
Spatial Extent:	Local
Reversibility:	Reversible /Irreversible
Magnitude:	Depends on accident
Likelihood:	Likely
Significance:	High

Mitigation Measures

145. Following measures are and will be adopted to reduce the risks to health and safety of the workers.

- Information regarding health facilities and emergency response centres (fire, earthquake and floods) and police stations situated near the construction sites disseminated at sites.
- Provision of personal protective equipment to all the workers and proper training to use/wear those PPEs.
- Provision of clean drinking water will be ensured for the construction crew.
- Hygiene inspections will be carried out at camps to avoid disease epidemic.
- Awareness of workers about the risks associated with each activity.

- In case of unlikely incidents (fire, vandalism) the camps will be evacuated emergency response and law enforcement agencies will be engaged.
- Safety and travel alerts for the staff and construction workers.
- Hazards indicator signs and fire fighting equipment will be installed at prone sites.
- The construction crew will be trained on important aspects of workplace safety.
- Construction machinery operators and drivers will be trained to avoid associated accidents using machines and vehicles.
- Flammables and other toxic materials will be stored at secured sites.
- First aid boxes will be kept at construction sites and randomly moving vehicles\machinery.
- An ambulance, a well-equipped dispensary and a doctor shall be made available for 24 hours at permanent construction site for immediate response in case of emergency.

5.2.8 Flora and Fauna

146. The rehabilitation of the highway will generate noise, solid waste, dust, wastewater and gaseous emissions causing disturbance to residing flora and fauna. Vegetative clearing for construction may require tree cutting at the right of way.During rehabilitation of bridge foundation piling up of waste materials on natural flow of river may impact on the river ecology. It may also be an obstruction for fish migration which is necessary for habitat and reproductive adjustments. In the absence of any species of interest found in close proximity to the construction sites, these impacts are considered medium in proposed development's area. It is not likely to have impact beyond the immediate footprint of the rehabilitation sites and construction duration. Construction of earth fill cofferdams can result in significant sedimentation into rivers, streams and great ponds. This is especially true during cofferdam installation and removal. Sedimentation can cause a decline in water quality, the loss of fish spawning habitat, and damage to aquatic organisms, and can interfere with scenic, aesthetic and recreational uses.

Nature:	Direct
Duration:	Short
Spatial Extent:	Local
Reversibility	Reversible
Magnitude	Small
Likelihood	Likely

Significance Medium

Mitigation Measures

147. The mitigation measures proposed will minimize the impact to as low as reasonably possible.

- NOC will be attained from the forest department for tree cutting (if any) at the road alignment right of way.
- The construction work over the water bodies will be carried out during the lean season when the water flow is minimal also considering breeding season of fish;
- Minimizing the size of the cleared and disturbed areas at the construction site, particularly those adjacent to the watercourse;
- Phasing of construction to minimize the time that soils are exposed;
- Restricting work areas to minimize the overall amount of soil disturbance during construction;
- Providing an adequate supply of erosion control devices (e.g., geotextiles, vegetation materials) and sediment control devices (e.g., in-water silt barriers, silt fences, straw bales) to be provided on site to control erosion and sediment transport and respond to unexpected events;
- Diverting work area runoff through vegetated areas or into properly designed and constructed sediment traps or a drainage collection system to ensure that exposed soils are not eroded. Runoff velocities in ditches or other drainage routes, or along slopes, to be kept low to minimize erosion potential. Runoff outfall locations to be protected with erosion resistant material, if required;
- Excavation and cofferdam dewatering activities will pump water from the work areas to a setting pond away from the watercourse;
- Use of only clean materials (i.e., free of fine sediment) in water (e.g., cofferdam and working platform construction), or shoreline works (e.g., embankment riprapping);
- Grading disturbed slopes or stockpiles to a stable angle as soon as possible after disturbance to eliminate potential slumping;
- Revegetating or stabilizing exposed sites as soon as possible after they have been disturbed, using quick growing grasses or other vegetation. Where revegetation is not possible other erosion protection methods, such as riprapping, bioengineering, or erosion matting to be used;

- Stockpiling of excavated erodible material in suitable designated areas away from the river (i.e., outside the floodplain, away from drainage channels) and install silt fences around the stockpiles to limit the transport of sediment;
- Night time construction activities will be avoided to the extent possible;
- Construction workers will be provided instructions to avoid unnecessary cutting of trees and limit their movement to construction sites;
- The damaged plants and grass will be restored after completion of construction work;
- If the animals commonly found the area are encountered during the construction activities, they will not be harmed and drawn back to the open area;
- Hunting will be strictly prohibited.
- Water quality monitoring will be carried out in order to ensure that the water bodies are not contaminated by the construction activities.

5.2.9 Socioeconomic Impacts

148. The potential socioeconomic impacts can be:-

1. Disturbance to existing services: education, health, electricity, water supply or signboards.
2. Aggravation or disputes among tribal and local rivalries on river water and aquatic life.
3. Access to other construction materials.
4. Dealing with graveyards or burials.
5. Employment of locals on the project.
6. Rise in prices of essential commodities.
7. Social reunion over the new bridge.
8. Gender Issues.
9. Recreational facilities for public.
10. Any spots of religious significance e.g. Mosques, Tombs and Shrines etc.

Mitigation

1. For matters pertaining to social obligation and benefits of the communities, a Social Framework Agreement shall be signed by the Project Director (NHA) with communities to ensure their participation and full satisfaction in matters pertaining to them. SFA shall be singed when the construction work is about to start.

2. The camps will be located at a reasonable distance from the communities and population centres.
3. Grievance Redress System will facilitate any complainant (Section 7).
4. All matters where contractor is involved, these should be made as his contractual obligations.

5.2.10 Land Acquisition and Resettlement

149. The rehabilitation work will be carried out at the existing highway on land owned by the NHA. For additional requirement on N95 ADB land acquisition all land acquisition and resettlement impacts have been addressed in the LARP (Land Acquisition and Resettlement Plan).

5.2.11 Archaeology, Culture and Heritage

150. There are no documented sites of archaeological or historical significance notified as world heritage site in project area. However, there are a number of shrines, mosques, tombs and museums along the passage of proposed reconstruction. It is unlikely that any archaeological sites or artefacts will be encountered during the construction activities of the proposed project. All contractors hired for construction work will be instructed to notify the management immediately if any sign of archaeological or heritage value is found. Cultural values of most of the districts that fall in proposed project area are conservative. There is a possibility of conflict among the crew and communities on gender and cultural differences.

Mitigation Measures

151. In case evidence of archaeological remains is found during construction activities, the actions listed below will be undertaken.

- Excavation work in the vicinity of the find will be stopped;
- Assistance will be sought from the nearest office of the Department of Archaeology and Museums to identify the remains;
- If the department decides to salvage the find, the NHA will provide assistance.
- The crew will be instructed and trained to respect the cultural values of residing population.

For cultural concerns:

- Public concerns regarding cultural concerns will be addressed through proper grievance redress mechanism provided in section 7;

- All complains will be documented and responded with in due time to avoid conflict among the crew and communities;
- Locals will be given preference during hiring of required staff.

6 Stakeholders Consultations and Information Disclosure

6.1 General

152. This section describes the outcome of the public consultations sessions held with different stakeholders/groups that may be impacted by the project. The consultation were held during the field visit conducted from 10th to 12th September 2015 in Kohat and Karak district and 16th to 19th September 2015 in Swat district. The consultation process was carried out in accordance with the) Asian Development Bank's Safeguard Policy Statement (SPS) 2009. The process of the public consultation proceeded as follows during the month of September 2015:

- Meetings with national and regional officers of NHA.
- Semi-structured interaction held with communities on rehabilitation and re-construction of roads and bridges.
- Focused Group Discussions (FGD) held with communities groups residing in the vicinity of the project area.

6.2 Objective of Consultation Process

153. The objective of consultation process was to:

- Share information with stakeholders on the rehabilitation and re-construction of the proposed road sections and bridges 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 available transport facilities, rehabilitation and re-construction of road sections and bridges and the likely impacts of construction related activities and operation of the project;
- Understand the perceptions, assessment of social impacts and concerns of the affected people/ communities in the nearby vicinity of the project area;
- Provide an opportunity to the public to provide valuable suggestions in the project design in a positive manner; and

- Reduce the chances of conflict through the early identification of controversial issues, and consult them to find acceptable solutions.

6.3 Identification of Stakeholders

154. 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. Overall two types of stakeholders were identified; primary and secondary stakeholders. Primary stakeholders include communities residing and working in the vicinity of the project area while secondary stakeholders include representatives of private and public department representatives.

155. Subsequent to the stakeholder identification, guidelines and questionnaires were prepared for conducting the focus group discussions/meetings, which were arranged through contacting the key persons from the community, such as, village heads, and patwaris. After completing the preparatory steps described above, the consultations were carried out in the nearby communities. During the IEE study, stakeholder meetings and focus group discussions were held around Project area. To meaningfully include the women of the area in the consultation process, separate focus group discussions were arranged during the IEE study.

    The consultations with the secondary stakeholders were carried out in parallel to the community meetings. These consultations were held with officials and representatives of public and private departments/institutions.

6.4 Consultation Findings

156. During individual meetings held with elders of the villages (accompanied by tenants of respective villages) and focused group discussions held with the people working in the markets situated in the vicinity of the project area; in depth discussions were held and people asked questions about the details of the projects. The respective communities welcome the project highlighting that damages to infrastructure effected the livelihood and quality of life. In Swat due to absence of concrete bridges transportation of fruit grown locally has been a challenge and re construction of bridges and rehabilitation of road sections is expecting to revive the livelihood. Similarly people residing in the vicinity of N-55 (proposed alignment for rehabilitation) were apprised about the project and welcome the proposed interventions contributing in the improvement of transport and livelihood opportunities.

157. During the meetings with private and public institutions representatives no major concern were raised as proposed project involves re construction and rehabilitation activities. It was recommended that locals should be preferred in employment by project contractors and consultants. The forest department official highlighted that in case of cutting of trees an NOC should be secured from concerned forest department.

158. Overall following major concerns were raised during the stakeholder's consultations:

    1. Abating dust emissions and increased particulate matter during construction through sprinkling and provision of paved shoulders for operational phase;
    2. Road blockages suggesting proper diversions during the road and bridges re-construction;
    3. Avoiding dumping construction material limiting the blockages;
    4. Ensuring the construction of speed breakers near school crossings;
    5. Employment of locals as project staff;
    6. Erection of cautionary and information sign during construction as well as operation phase;
    7. Specify speed limits where required
    8. Secure NOC from forest department in case of cutting of trees for construction purposes.

159. **Table 6-1** and **Table 6-2** exhibits the list of stakeholders consulted along with details of concerns raised during the meetings. **Appendix 2** provided photographs of consultations.

6.5 Proposed Measures for Addressing Stakeholders Concerns

160. NHA through contractors and consultants will include following environmental and safety provisions during project design and implementation:

    1. Design and construction of speed breakers near school crossings and public installations;
    2. Securing Non Objection Certificate (NOC) from the Forest Department in case of cutting of trees. With guidance of the Forest Department, a tree plantation program to compensate for the anticipated loss of vegetation during the construction activities, and to help abate

pollution caused by emissions, dust, and noise during operational phase;

3. Ensuring provision of safety signs and information during road construction and operational phase;
4. Project facilities to be located at least 500m away from communities to avoid interference and disturbance;
5. Sensitivity towards local customs and traditions will be encouraged to minimize social friction. Good relations with local communities will be promoted by encouraging contractor to provide opportunities for skilled and unskilled employment to locals, as well as on job training in construction for young people;
6. Ensuring provision of sufficient diversions with information sign avoiding road blockages facilitating the traffic during peak hours;
7. Use of loud horns near schools, traffic disorders and violations of traffic regulations will be monitored and controlled by NH&MP during operation phase;
8. During operation phase speed limits will be specified and NH&MP will control it.

Table 6-1: List of Stakeholders Consulted-Communities

#	Location	Consultation type	Concern raised	No of households	Details/Name of persons consulted
1	Tabi khan village Karak district	Community/resident	Dust emissions, temporary road blockage	350	Rasool Khan
2	Yakheel village Karak district	Community/resident	Road accidents during construction	150	Dr Israr uddin
3	Mitha khel village karak district	Community/resident	Dust emissions, traffic distrubance	550	Sanaullah
4	Village Chungi Karak district	Community/resident	Road blockage	400	Noor Saeed
5	TarkhaKhel village Karak district	Community/resident	Dust emissions	700	Mr Toor Khan
6	Serakhanva village karak district	Community/resident	Temorary road blockage, dust emissions	300	Mr Asfer Khan
7	Ayakhel village karak district	Community/resident	Dust emissions	150	Saleemullah
8	Mithakhel Ada karak district	Focussed group discussions	Speed breaker for school children, dust emissions	x	Group of 10 people
9	Sakhi baba stop karak district	Focussed group discussions	Traffic management during construction, dust	x	Group of 9 people
10	Madyan Bazar	Focussed group discussions	Provision of by pass and traffic management during construction	x	Group of 7 people
11	Quz Kalay, Madyan, Swat District	Community/resident	Storage of wastes/cutting material/avoid dumping	300	Mian Sharafat Ali-Politician
12	Bar Kalay, Madyan, Swat District	Community/resident	Avoid road accident, safety signs	400	Ehsan Uddin
13	Chail, Madyan, Swat	Community/resident	No concern	300	Riaz Ahmad

#	Location	Consultation type	Concern raised	No of households	Details/Name of persons consulted
	District				
14	Chum Village, Madyan, Swat District	Community/resident	No concern	80	Noorani shah
15	Village Satal, Madyan, Swat	Community/resident	Avoid dumping of wastes	200	Imranullah
16	Bahrain Market	Focused group discussions	provide by pass and avoid dust emissions	x	Group of 9 people
17	Village Massomabad,Bahrain, Swat district	Community/resident	No concerns	200	M Ali
18	Toorwal, Bahrain, Swat district	Focused group discussions	Provision of safety signs	x	Group of 12 people
19	Kedam, Kalam District Swat	Community/resident	Regular sprinkling during construction	250	Fazal Rahim Khan
20	Chamgarhi village, Kalam, Swat district	Community/resident	No concern	350	M Iqbal
21	Mankyal village, Kalam, Swat District	Community/resident	No concern	450	Zahir Shah
22	Gormi village, Kalam, Swat	Community/resident	Provide by pass during construction	360	Iqbal Hussain
23	Piya village, Madyan, District Swat	Community/resident	Avoid dust emissions, provide by pass	300	Ahmed sher badshah
24	Fateh Put village, Madyan, Swat District	Community/resident	No concern	400	Gul Khan
25	Tehsil village, Madyan, Swat District	Community/resident	No concern	350	Umer Saeed
26	Soor Qamar village, Gulabad, district Swat	Community/resident	Provide by pass	50	M Adnan

Table 6-2:List of Stakeholder Consulted: Institutions/Organizations

#	Location	Consultation type	Concern raised	Details/Name of persons consulted
1	Ministry of Climate Change, Islamabad	Public sector department	No concern/Project area is not in the vicinity of protected areas	Mr Umeed Khalid-Concervator Wildlife
2	NHA Islamabad	Project Executing agency/Focal person	Shared project information	Mr Ikram Saqlain Haider-Director RAMP
3	NHA Islamabad	Project Executing agency/Deputy Director Environment	Information about institutional arrangements shared	Ms Nosheen Yaqoob Butt-Deputy Director Environment
4	Madyan and Bahrain, Swat district	Idara barai Taleem o Taraqi/NGO	protection of water springs during construction	(Mr Aftab Ahmad-Program Director)
5	Project Office Madyan, Swat district	NHA/Executing agency	N/A	(Mr M Imtiaz-Project Director)
6	Environment Protection Society-Migora, Swat District	NGO		Shakeel Ahmad-Program Manager WASH
7	District Forest Officer, Malakand Agency	Public sector department	Noc need to be secured from respective forest department for cutting of trees if any	Pervaiz Manan

7 Environmental Management Plan

161. EMP is a tool to manage environmental impacts and specifically focuses on implementation of mitigation measures on ground against likely environmental impacts. The activities related to the Project will be managed according to management plan elaborated in this chapter. However, this is an indicative EMP. After the mobilization of the contractors NHA will ensure that Site Specific Environmental Management Plans (SSEMPs) are prepared for each subproject as relevant. The SSEMPs are to be prepared by the contractors with the assistance of the Supervision Consultants.

7.1 Purpose and Objectives of the EMP

162. The primary objectives of the EMP with respect to project activities are to:

- Define the responsibilities of the Project proponent during construction phase (institutional and organizational arrangements) to ensure effective communication of environmental issues;
- Define Monitoring mechanism, identify monitoring parameters and training requirements in order to ensure the effectiveness of the mitigation measures and provide a plan for implementation of training session and monitoring plan;
- Provide a mechanism for taking timely action against any unanticipated environmental situations;
- Identify the resources required to implement the EMP and outline the required budget.

7.2 Organizational Structure, Roles and Responsibilities

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

7.2.1 National Highway Authority

164. The Executing Agency (EA) of the Project will be the National Highway Authority (NHA). General Manager Flood Emergency Rehabilitation Project (FERP) will be the overall In charge of the Project. The GM NHA (FERP) will delegate the supervisory responsibilities of the Project to the Project Director.

The Project Director (NHA) will be responsible for following:

- Successful implementation of project with environmental and social safeguards;
- Support supervision consultants and staff;
- Ensure that all the mitigation measures committed for the design phase are incorporated in the design and included in the bidding and contract documents;
- Ensure that EMP be made a part of the contract agreement.

165. The Deputy Director Environment (FERP) will be the overall in charge for handling the NHA's obligations with respect to EMP implementation. Deputy Director Environment (FERP) will be supported by professional staff of consultants including Environmental Monitoring Specialists/Consultants for implementation of EMP.

7.2.2 Environmental Specialist

166. The NHA will appoint Design and Supervision Consultants (DSC) will appoint a dedicated Environmental Specialist. The Environmental Specialist along with the Deputy Director Environment (FERP) will oversee the working of contractor in accordance with the EMP:

- The DSC Environmental Specialist will liaise with the Project staff to monitor environmental compliance during the construction;
- He/she will supervise the construction and provide technical support to help ensure compliance with the EMP;
- He/she will assess the environmental impact of road/bridge reconstruction and rehabilitation;
- He/she will monitor the progress of work and adherence of the contractor to the EMP;
- He/she will direct the Contractor to work in such a manner that all Project activities are in compliance with the EMP and NEQS;
- He/she will organize periodic environmental training programs and workshops for the Contractors' staff and NHA site staff in consultation with the NHA;
- He/she will assist NHA in preparing the biannual environmental monitoring reports

7.2.3 Construction Contractor

167. Construction Contractor (CC) will ensure that all Project activities are in compliance with the EMP and NEQS. The provision will be made in the agreement with CC with following responsibilities:

- Delegate responsibilities of Environment, Health and Safety compliance to one the project staff;
- Implement EMP in the field;
- Safe Working conditions;
- Provisions of PPEs to workers;
- Traffic signage and control;
- Avoid conflicts with locals;
- Reporting of every incident/accident to NHA;
- Regular monitoring and reporting of compliance with contractual environmental mitigation measures as per EMP.

7.2.4 Management Responsibilities

Specific roles and responsibilities are included in **Table 7-1**.

Table 7-1: Roles and Responsibilities for Environmental Monitoring

Aspect	NHA Responsibilities	Contractor's Responsibilities	Relevant Documentation
Contracting	Ensure monitoring requirements to be included in the contract between NHA and construction ontractor	Understand the requirements and estimating the required resources	Contract between the Company and CC
Mitigation and Monitoring plan	Finalize the monitoring plan prior to commencement of construction	Implementation of the EMP	Revised monitoring plan
Resources	Ensure the availability of finances required	Ensure the availability of resources	EMP budget

Aspect	NHA Responsibilities	Contractor's Responsibilities	Relevant Documentation
	for environmental monitoring	required for environmental monitoring	
Environmental staff	Designate an environmental Staff for the project	Appoint an officer dedicated to environment, health and safety	Job descriptions
Corrective Actions	Verify that the activities are carried out comply with the EMP and identify corrective actions, if needed	Carry-out the required corrective actions	Corrective action record

7.2.5 Environmental Training

168. In order to implement the mitigation measures proposed, there is a need to upgrade the knowledge of the project staff in the environmental practices. Environmental training will help to ensure that the requirements of the EMP are clearly understood and followed by all Project personnel in the course of the Project. The Environmental Specialist of DSC with support of Construction contractor Environmental officer will be primarily responsible to provide all the necessary trainings to all Project personnel. The training modules will include air, noise and water pollution monitoring, social awareness, Environmental Laws, "National Environmental Quality Standards (NEQS)", use of personal protection equipment, and health and safety related issues on the construction site. Moreover, the contractor will train all construction workers in basic sanitation and health care issues. The training plan is proposed in **Table 7-2**.

Table 7-2: Environmental Training Plan

#	Responsibility	Contents	Duration
1.	Consultants/ organizations specialized in environmental management and monitoring	Environmental laws and regulations daily monitoring and supervision	4 days
2.	ADB	ADB Environmental Safeguard Policy	4 days
3.	Consultants/ organizations specialized in Occupational	Occupational Safety and Health	4 days

#	Responsibility	Contents	Duration
	Health and Safety		
4.	IEE Consultant	Environmental Mitigation Implementation of IEE on Field	4 days

7.2.6 Emergency Preparedness and Response

169. National Highway Authority (NHA) will develop an Emergency Preparedness and Response Procedure (EPRP) to handle any emergency arising during any operational activity as follows:

- Large scale leakage (over 200 liters) of oil and any other hazardous material.
- Uncontrolled fire in diesel or oil tanks etc.
- Accidental Injury related to construction and operations ;
- Natural Disasters like earthquake and floods;
- Vandalism and Terrorism.

7.3 Environmental Management Plan

170. The EMP consists of the following:

7.3.1 Environmental Mitigation Plan (Bridges, Roads and Camps)

171. The Environmental Mitigation Plan provides the framework for implementation of the mitigating measures of the proposed Project. The purpose of the plan is to provide precise information on mitigation to the project proponent and enable it to implement the measures with marginal influence on execution. Separate Mitigation plan for bridges, roads and camps is provided in **Appendix 3, 4 and 5** of the report.

7.3.2 Environmental Monitoring Plan (Bridges, Roads and Camps)

172. Environmental monitoring is a key component of the EMP. It is a mechanism through which the effectiveness of the EMP in protecting the environment is measured. The feedback provided by the environmental monitoring is instrumental in identifying issues and planning corrective actions accordingly. It lists all the monitoring parameters associated with environmental or social aspect identified in the IEE .The environmental and social mitigation measures are presented in Chapter 5 of the report. The assessed environmental monitoring requirements are presented in **Table 7-3**.The

detailed monitoring frequency of each environmental parameter is provided in **Appendix 3, 4 and 5**.

Table 7-3: Environmental Monitoring Plan

Impacts	Parameters to be Monitored	Locations	Monitoring Frequency	Responsibility
Equipment/machinery /heavy vehicles Emisssions and, Noise	NEQS for Vehicular Emissions	Construction sites RoW (Right of Way)	Quarterly	CC
Machinery and Asphalt Plant Exaust	NEQS for Stack Emissions	Construction Sites RoW	Quarterly	CC
Noise	NEQS for Noise	Construction Sites RoW	Quarterly	CC
Site Land Clearance and Excavation	Soil erosion and Spoil disposal	Construction Sites near water bodies (rivers and streams)	Continuous	CC
Emergencies and Accidents	Frequency of accidental injury and care provided	Construction sites RoW	Daily during peak construction period	CC
Traffic	Traffic flow and number of accidents due to site vehicles.	Construction sites RoW	Sudden inspection on road and routes at the peak construction time	NHA
Water Quality	NEQS for Effluent	Construction sites near rivers/streams	Start, mid, and end of the bridge construction	CC
Water Hydrology	River and stream flow	Construction sites near rivers/streams	Start, mid, and end of the bridge construction	CC
Construction Dust	Air quality through visual dust emission	Construction sites and camps RoW	Continuous	CC
Terrestrial Ecosystem	Land disturbance and vegetation removal	Construction sites and camps RoW	Continuous	CC
Solid Waste	Waste generation and disposal	Construction sites RoW and camps	Continuous	CC
Helth and safety	Employee yearly medical , acccidental injuries, Death	Construction sites RoW and camps	Continuous	Cc
Employment	Local employee record at the time of staff deployment	Construction sites RoW and camps	At the time of recruitment	CC
Flora and Fauna	Tree count and aquatic fauna	Construction sites RoW and camps	Start, mid, and end of construction	NHA/CC

7.3.3 Budget Estimation EMP (Bridges, Roads and Camps)

173. The overall estimate budget for the environmental compliance is provided in Table 7-4. Detailed budget estimation for implementation of mitigation measures of environmental compliance for bridges, roads and camp management is provided in **Appendix 3, 4, 5.**

Table 7-4: Estimated Budget Environmental Compliance

Components	Estimate Cost(PKR)
Environmental Monitoring (Bridge Construction)	3,384,000
Environmental Monitoring (Road Construction)	2,520,000
Environmental Monitoring (Camp Management)	1,950,00
Site Visits and Sampling	500,000
Purchase of PPEs	350,000
Maintenance of equipment	600,000
Traffic Management	350,000
Water Sprinkling	400,000
Waste Disposal	500,000.
Environment Compliance (Expert visit)	1,000,000
EHS Training	120000
Total	9,725,950

7.4 Grievance Redress Mechanism

7.4.1 Purpose

- ADB maintains Social and Environmental Safeguard Standards in its all funded projects.
- NHA will maintain these Safeguard Standards at FERP works.
- The Grievance Redressal Unit is set up to assist members of the community, contractors, vulnerable groups and especially women seeking to redress their grievances, if any.

7.4.2 Grievance Redress Process

174. In order to receive and facilitate the resolution of affected people's concerns, complaints and grievances about the project's environmental performance a Grievance Redress Mechanism (GRM) will be established for proposed project, The GRM will include a proactive component whereby at the commencement of construction of each project the community will be formally advised of project implementation details by Deputy Director Environment (FERP), the design and supervision consultant (DSC) and the contractor (designs, scheduled activities, access constraints etc.) so that all necessary project information is communicated effectively to the community and their immediate concerns can be addressed. This project approach with communities will be pursued throughout the implementation of each project.

175. The GRM will address affected people's 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 affected people at no costs and without retribution. The mechanism will not impede access to the Country's judicial or administrative remedies. Deputy Director Environment (FERP) will establish a Grievance Redress Committee (GRC), and Grievance Focal Persons (GFPs) from each of the project locations will be identified prior to the Contractor's mobilization to site. The constitution of the GRC will remain the same, with participation of the GFP from the relevant area of the grievance/complaint. The functions of the GRC and GFPs are to address concerns and grievances of the local communities and affected parties as necessary.

176. The GRC will comprise representative from local authorities, affected parties, and other well-reputed persons from health or education sectors, as mutually agreed with the local authorities and affected persons. It will also comprise the Contractor's Environmental representative, DSC's Environmental Specialist and DD Environment (FERP). The role of the GRC is to address the project related grievances of the affected parties that have not been resolved satisfactorily through the initial stages of the Grievance Redress Mechanism (GRM).

    DD Environment (FERP) will assist affected communities/villages to identify local representative to act as Grievance Focal Points (GFPs) for each of the communities/ villages.

177. GFPs are designated personnel from within the community who will be responsible for i) acting as community representatives in formal meetings between the project team (contractor, DSC, PIU) and the local community he/she represents and ii) communicating community members' grievances and concerns to the contractor during project implementation. The number of GFPs to be identified for each project will depend on the number and distribution of affected communities.

7.5 Grievance Redress Unit (GRU)

178. The GRUs will examine complaints received from the community, vulnerable groups and women due to project work.

7.5.1 Composition of Grievance Redress Committee (GRC)

179. The GRC will work directly under the supervision of Deputy Director Environment (FERP). The following members are recommended to form a GRC to look into the environmental matters.

- DD Environment (FERP)
- Representative from APs Grievance Focal Persons (GFP)
- Environmental representative of Construction Contractor
- Environmental Specialist of Design Supervision Consultant

180. A pre-mobilization public consultation meeting will be convened by the DD Environment (FERP). The Environmental Specialist (DSC) will act as the secretary of the Environmental Committee for each project and the meetings would be attended by GFPs, contractor representative, NHA-PIU representative and other interested parties (e.g. District level representatives, NGOs). The objectives of the meeting will be as follows:

- Introduction of key personnel of each stakeholder including roles and responsibilities;
- 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;
- Establishment and clarification of the GRM to be implemented during project implementation including routine (proactive) public relations activities proposed by the project team (contractor, DSC, NHA-PIU) to ensure communities are continually advised of project progress and associated constraints throughout project implementation;
- Identification of members of the Grievance Redress Committee (GRC);
- Elicit and address the immediate concerns of the community based on information provided above.

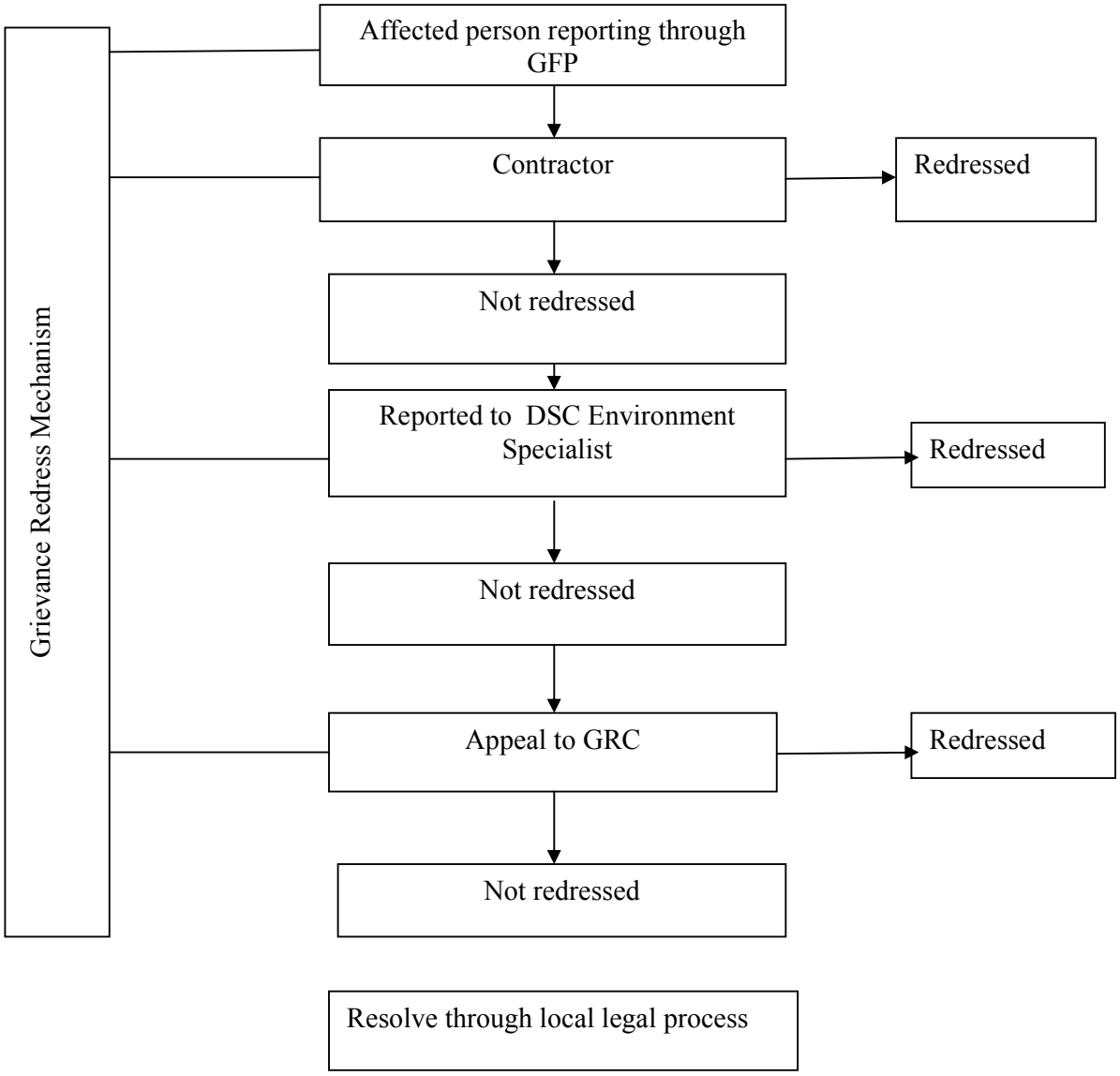
181. Following the pre-mobilization public consultation meeting, environmental complaints associated with the construction activity will be routinely handled through the GRM as explained below:

- 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 DSC's Environmental Specialist. The DSC's Environment Specialist will then be responsible for coordinating with the Contractor in solving the issue.
- If the Complaint is not resolved within 2 weeks the GFP will present the complaint to the Grievance Redress Committee (GRC).
- The GRC will have to resolve the complaint within a period of 2 weeks and the resolved complaint will have to be communicated back to the community.
- The Contractor will then record the complaint as resolved and closed in the Environmental Complaints Register. Should the complaint not be resolved through the GRC, the issue will be adjudicated through local legal processes.
- In parallel to the Environment Complaint Register (ECR) placed with the Contractor, each GFP will maintain a record of the complaints received and will follow up on their rapid resolution.

NHA Deputy Director Environment(FERP) will also keep track of the status of all complaints through the Monthly Environmental Monitoring Report submitted by the Contractor to the DSC and will ensure that they are resolved in a timely manner. The flow chart of proposed grievances mechanism is as below:

Figure 7-1: Flow Chart for Grievance Redress Mechanism



7.5.2 Types of Complaints

182. GRU may receive the following types of complaints. However its scope will not be limited to these complaints only:

- Damage to environment,
- Damage/access to natural reservoirs,
- Impact on livelihoods,
- Violation of rights,
- Damage to property,
- Waste disposal
- Any other inconvenience caused by project work.

8 Conclusions and Recommendations

The project involves reconstruction and rehabilitation activities, which will be focussed along the existing project locations. Therefore ecological changes/changes in habitat are expected to be minimum. The mitigation measures and environmental monitoring plan should be followed to minimize the impacts of construction activities on the environment which are likely to be temporary during the construction activities.

Appendix 1: NEQS

Table 1: **NEQS for Municipal and Liquid Industrial effluents**

Parameters	Into Inland Water	Into Sewage Treatment[b]
Temperature or temperature increase[c]	≤3°C	≤3°C
pH	6-9	6-9
Biochemical Oxygen Demand (BOD5) at 20°C[d]	80	250
Chemical Oxygen Demand (COD)[d]	150	400
Total Suspended Solids (TSS)	200	400
Total Dissolved Solids (TDS)	3,500	3,500
Grease and oil	10	10
Phenolic compounds (as phenol)	0.1	0.3
Chloride (as Cl^-)	1,000	1,000
Fluoride (as F)	10	10
Total cyanide (as CN-)	1.0	1.0
An-ionic detergents (as MBAS)[e]	20	20
Sulphate (SO_4)	600	1000
Sulphide (S-)	1.0	1.0
Ammonia (NH_3)	40	40
Pesticides[f]	0.15	0.15
Cadmium[g]	0.1	0.1
Chromium (trivalent & hexavalent)[g]	1.0	1.0
Copper[g]	1.0	1.0
Lead[g]	0.5	0.5
Mercury[g]	0.01	0.01
Selenium[g]	0.5	0.5
Nickel[g]	1.0	1.0
Silver[g]	1.0	1.0
Total Toxic metals	2.0	2.0
Zinc	5.0	5.0
Arsenic[g]	1.0	1.0
Barium[g]	1.5	1.5
Iron	8.0	8.0
Manganese	1.5	1.5
Boron[g]	6.0	6.0
Chlorine	1.0	1.0

Source: Qadar (2003)

Notes

[a] All values are in mg/L, unless otherwise defined

[b] Applicable only when and where sewage treatment is operational and BOD5=80 mg/L is achieved by the sewage treatment system

[c] The effluent should not result in temperature increase of more than 30°C at the edge of zone where initial mixing and dilution take place in the receiving body. In case zone is defined, use 100 meters from the point of discharge

[d] Assuming minimum dilution 1:10 on discharge, lower ratio would attract progressively stringent standards to be determined by the Federal Environmental Protection Agency. By 1:10 dilution means, for example that for each one cubic meter of treated effluent, the recipient water body should have 10 cubic meter of water for dilution of this effluent

[e] Modified Benzene Alkyl Sulphate; assuming surfactant as biodegradable

[f] Pesticides include herbicide, fungicides and insecticides

[g] Subject to the total toxic metals discharge should not exceed level of total toxic metals

Table 2: NEQS for Industrial Gaseous Emission

Parameter	Source of emission	Standard
Smoke	Any	40% or 2 Ringlemann scale or equivalent smoke number
Particulate matter[b]	Boilers and furnaces:	
	Oil fired	300
	Coal fired	500
	Cement kilns	300
	Grinding, crushing, clinker coolers and related processes, metallurgical processes, converter blast furnaces and cupolas	500
Hydrogen chloride	Any	400
Chlorine	Any	150
Hydrogen fluoride	Any	150
Hydrogen sulfide	Any	10
Sulfur oxides[c]	Sulfuric acid/Sulfonic acid plants	5,000
	Other plants except power plants operating on oil and coal	1,700
Carbon monoxide	Any	800
Lead	Any	50
Mercury	Any	10
Cadmium	Any	20
Arsenic	Any	20
Copper	Any	50
Antimony	Any	20
Zinc	Any	200
Oxides of nitrogen[d]	Nitric acid manufacturing unit	3,000
	Other plants except power plants operating on oil or coal:	
	Oil Fired	400
	Coal fired	600
	Cement kilns	1,200

Source: Qadar (2003)

Notes:

[a] All values are in mg/Nm^3, unless otherwise defined

[b] Based on the assumption that the size of the particulates is 10 micron or more

[c] Based on 1% sulphur content in fuel oil. Higher content of sulphur will cause standards to be pro-rated

[d] In respect of the emissions of the sulfur dioxide and nitrogen oxides, the power plants operating on oil or coal as fuel shall, in addition to NEQS specified above, comply with the following standards

Table 3: NEQS for Motor Vehicle Exhaust and Noise

Parameter	Standard	Measuring Method
Smoke	40% or 2 on the Ringlemann scale during engine acceleration mode	To be compared with Ringlemann Chart at a distance of 6 meters or more
Carbon Monoxide	New vehicles: 4.5% Used vehicles: 6%	Under idling conditions, non-dispersive infrared detection through gas analyzer
Noise	85 dB (A)	Sound-meter at 7.5 meters from the source

Source: Qadar (2003) **Notes:**[a]

10 years or older

Table 4: NEQS for Ambient Air Quality

Pollutants	Time-weighted average	Concentration in Ambient Air		Method of measurement
		Effective from 1st January 2008	Effective from 1st January 2012	
Sulphur Dioxide (SO_2)	Annual Average*	80 µg/m^3	80µg/m^3	Ultraviolet Fluorescence method
	24 hours**	120 µg/m^3	120 µg/m^3	
Oxides of Nitrogen as (NO)	Annual Average*	40 µg/m^3	40 µg/m^3	Gas Phase Chemiluminescence
	24 hours**	40 µg/m^3	40 µg/m^3	
Oxides of Nitrogen as (NO_2)	Annual Average*	40 µg/m^3	40 µg/m^3	Gas Phase Chemiluminescence
	24 hours**	80 µg/m^3	80 µg/m^3	
Ozone (O_3)	1 hour	180 µg/m^3	130 µg/m^3	Non dispersive UV absorption method
Suspended Particulate Matter (SPM)	Annual Average*	400 µg/m^3	360 µg/m^3	High Volume Sampling, (Average flow rate not less than 1.1 m^3/minute
	24 hours**	550 µg/m^3	500 µg/m^3	
Respirable Particulate Matter PM_{10}	Annual Average*	200 µg/m^3	120 µg/m^3	β Ray absorption method
	24 hours**	250 µg/m^3	150 µg/m^3	
Respirable Particulate Matter $PM_{2.5}$	Annual Average*	25 µg/m^3	15 µg/m^3	β Ray absorption method
	24 hours**	40 µg/m^3	35 µg/m^3	
	1 hour	25 µg/m^3	15 µg/m^3	
Lead (Pb)	Annual Average*	1.5 µg/m^3	1 µg/m^3	ASS Method after sampling using EMP 2000 or equivalent Filter paper
	24 hours**	2 µg/m^3	1.5 µg/m^3	
Carbon Monoxide (CO)	8 hours**	5 µg/m^3	5 µg/m^3	Non Dispersive Infrared (NDIR) method
	1 hour**	10 µg/m^3	10 µg/m^3	

* Annual Arithmetic mean of minimum 104 measurements in a year taken twice a week 24 hourly at uniform interval** 24 hourly/ 8 hourly values should be met 98 % of the in a year. 2 % of the time it may exceed but not on two consecutive days

Table 5: NEQS for Noise

#	Category of Area/Zone	Effective from Ist July, 2010 Limit dB(A) Leq*		Effective from 1st July, 2012	
		Day Time	Night Time	Day Time	Night Time
1	Residential Area (A)	65	50	55	45
2	Commercial Area (B)	70	60	65	55
3	Industrial Area (C)	80	75	75	65
4	Silence Zone (D)	55	45	50	45

*dB(A) Leq: Time Weighted average of the level of sound in decibels on scale A which is relatable to human hearing

Note: 1. Day time hours: 6.00 a.m to 10.00 p.m

2. Night time hours: 10.00 p.m. to 6 a.m.

3. Silence zone: Zones which are declared as such by the competent authority. An area comprising not less than 100 meters around hospitals, educational institutions and courts

4. Mixed categories of area may be declared as one of the four above-mentioned categories by the competent authority

Appendix 2: Photographic Record

View of Existing Bahrain Bridge in Swat to be reconstructed

Behram-Kedam Road section to be reconstructed

Bridge Near village Piya on Kalam Road Madyan to be reconstructed

Kohat-Karak Road section to be rehabilitated

Project Area-N 55

View of Village Tabi Khan adjacent to N 55

Satal Village and River Swat adjacent to Madyan Bridge to be reconstructed

Cham Garhi Bridge Kalam Swat and road section to be reconstructed

Consultations with Project Director NHA-Swat

Consultation with Idara Barai Taleem o Taraqi Madyan Swat-NGO

Consultations with District Forest officer Malakand Agency

Consultations with Environment Protection Society Swat-NGO

Community consultations Chamgarhi village-Kalam Swat

Focused Group Discussion at Mitha Khel Ada Karak

Photograph **Error! No text of specified style in document.**-1: Consultations-Madyan Bazar Swat-adjacent to Madyan bridge to be reconstructed

Consultations on Mankyal-Kalam Road section Swat

Consultations in Tabi Khan Village Karak near N 55

Consultation with Political Leader-Madyan-Swat

Appendix 3: Environmental Management Plan (Bridges Reconstruction)

Table 1: Environmental Mitigation Plan (Bridge Construction)

Environmental Impact/Issue	Mitigation Measures	Location	Monitoring Frequency	Responsibility	
				Implementation	Supervision/Monitoring
Soil erosion	1. All excavation will be carried out at the existing sites near the project construction area according to environmental law and guidelines by environmental protection agencies of each province. 2. Excavated slopes will not be left unattended and unprotected. They will be stabilized with temporary installations. 3. Machinery and vehicles will be operated at existing designated routes to avoid erosion and compaction of un-impacted soils. 4. Periodic trainings will be provided to drivers on mitigation measures related to off-road travel and speeds limits.	Bridge construction sites Coffer dam installation sites	Continuous	Construction Contractor	Environment Specialist SC Deputy Director Environment (FERP)
Soil/Land contamination	1. Construction materials will be stored in proper stores on impervious sheets to avoid any soil contamination. 2. Visual Inspection will be carried out for land contamination. 3. The soil contaminated from minor and moderate spills will be removed and will be handed over to waste contractor for proper treatment. Major spills (over 200	Material storage areas Asphalt and batching plant sites	Continuous	Construction Contractor	Environment Specialist SC Deputy Director Environment (FERP)

Environmental Impact/Issue	Mitigation Measures	Location	Monitoring Frequency	Responsibility	
				Implementation	Supervision/Monitoring
	liters) may require specialized treatment such as incineration or bioremediation. The nearest incineration facility to the project area is at National Cleaner Production centre of Attock Oil Refinery in Rawalpindi. 4. All fuel tanks will be properly marked to highlight their contents with a concrete pad underneath to prevent contamination in case of leaks or spills. Daily monitoring will be carried out for leaks. Shovels, plastic bags, and absorbent material will be placed near fuel and oil storage or handling areas to attend to spills and leaks. 5. Used oil and vehicle related waste will be transported to local contractors for recycling. 6. Waste oil shall be provided to contractors for reuse.				
Impacts on air quality	1. Construction machinery and vehicles will be kept in good condition and will be properly tuned to ensure that emissions are within the range of NEQS for vehicular exhaust. 2. Water will be sprinkled at least twice a day to minimize fugitive dust emissions. The frequency of water sprinkling will be increased in hot and dry weather as per requirement. 3. Unnecessary movement of vehicles will	Asphalt plant, power generators and heavy machinery used for bridge construction	Quarterly	Construction Contractor	Environment Specialist SC Deputy Director Environment (FERP)

Environmental Impact/Issue	Mitigation Measures	Location	Monitoring Frequency	Responsibility	
				Implementation	Supervision/Monitoring
	be avoided at the construction locations. 4. Construction materials such as cement, gravel and sand will be kept under sheet covers. 5. Air quality testing for SOx, NOx, PM_{10}, $PM_{2.5}$ will be conducted at the sites of asphalt plant, batching plant and at selected locations along the bridge construction site. The monitoring locations will be identified by the Environment Specialist of the SC.				
Impacts on water quality	1. All vehicle washing will be limited to designated washing area and the resulting liquid effluent will be directed to sewer lines. 2. The existing water sources will be used during the entire construction phase with due permission from relevant authorities. 3. Discharge of water will be monitored regularly. 4. The bridges will be rehabilitated during lean season when the water flow is minimal to avoid the risk of flooding. Flow diversion will be constructed on sites having continual flow throughout the year. 5. Fuel tanks will be bonded by 110% volume enclosure. 6. Coffer dams will be constructed and dismantled carefully.	Rivers, streams, wetlands, Coffer dams	Start, mid, and end of the bridge construction	Construction Contractor	Environment Specialist SC Deputy Director Environment (FERP)

Environmental Impact/Issue	Mitigation Measures	Location	Monitoring Frequency	Responsibility	
				Implementation	Supervision/Monitoring
Noise and vibration impacts generated by construction activities, potentially causing health impacts and damages to structures	1. Specific working hours will be defined for the movement of construction material, equipment and other machinery to ensure minimal disturbance to local communities. 2. Noise monitoring will be carried out at various locations using noise meters. Site labour working in high noise area where noise level exceeds 85 dB (A), should wear earplugs and ear muffs. 3. Monitoring of noise from noise generating sources will be carried out on a biannual basis ensuring compliance of NEQS. 4. The site for stationary sources of noise such as concrete mixers, batching plant, and pumps will be selected at a distance of at least 500m from residing communities. 5. Blowing of horn by the project related vehicles will be strictly prohibited. 6. Noise level of 55 dB at day and 45 dB at night time will be maintained. Late night construction activities will be avoided close to the residential area. 7. Noise level of 65 dB at day and 55 dB at night time will be maintained for commercial areas.	Near population centres Asphalt plant Labour working area	Quarterly	Construction Contractor	Environment Specialist SC Deputy Director Environment (FERP)
Public hindrances due to traffic diversions and	1. Alternate routes will be designated to avoid irregularity in traffic on the highway.	Material and machinery transportation routes	Sudden/ bimonthly inspection on	Construction Contractor	Environment Specialist SC Deputy Director

Environmental Impact/Issue	Mitigation Measures	Location	Monitoring Frequency	Responsibility	
				Implementation	Supervision/Monitoring
hauling routes	2. Construction sites will be barricaded to minimize accidental injuries and visual nuisance to the travellers. 3. The construction trucks will be adequately covered with tarpaulin covers. 4. Movement of construction equipment will be limited to specific locations and duration. 5. Adequate and appropriate road signs will be erected to warn travellers crossing construction sites. 6. Construction vehicles will be maintained regularly by the contractor to reduce exhaust emissions. 7. Raw materials will be adequately covered within the trucks to prevent air flow along the roadway.		bridge construction site and routes at the peak construction time		Environment (FERP)
Impacts caused by improper solid waste management practices	1. A proper solid waste collection, segregation, storage and disposal system will be implemented. Recyclable material will be segregated whereas solid waste will be disposed-off properly at approved disposal site. 2. Construction workers will be trained on handling the waste. 3. Hazardous waste 'if generated' will be marked separately and disposed using international best practices through registered contractor. 4. On completion of the construction phase of the project, the contractor will be	Bridge construction site Cofferdam	Continuous	Construction Contractor	

Environmental Impact/Issue	Mitigation Measures	Location	Monitoring Frequency	Responsibility	
				Implementation	Supervision/Monitoring
	required to rehabilitate the site. The purposes of site rehabilitation will be to minimize the potential for soil erosion, enhance the aesthetic appearance of the site and restore safe public access to the surrounding area. Rehabilitation will include removal of all construction materials and wastes, and the grading and re-vegetation of all exposed sites that may be prone to erosion. Where natural erosion protection measures may not be possible or practical, suitable physical erosion protection methods will be used.				
Health and safety of workers	1. Information regarding health facilities and emergency response centres (fire, earthquake and floods) and police stations situated near the construction sites disseminated at sites. 2. Provision of personal protective equipment to all the workers and proper training to use/wear those PPEs. 3. Provision of clean drinking water will be ensured for the construction crew. 4. Awareness of workers about the risks associated with each activity. 5. Safety and travel alerts for the staff and construction workers. 6. Hazards indicator signs and fire fighting equipment will be installed at prone sites. 7. The construction crew will be trained on important aspects of workplace safety.	Bridge construction site Cofferdam	Continuous	Construction Contractor	Environment Specialist SC Deputy Director Environment (FERP)

Environmental Impact/Issue	Mitigation Measures	Location	Monitoring Frequency	Responsibility	
				Implementation	Supervision/Monitoring
	8. Construction machinery operators and drivers will be trained to avoid associated accidents using machines and vehicles. 9. Flammables and other toxic materials will be stored at secured sites. 10. First aid boxes will be kept at construction sites and randomly moving vehicles\machinery. 11. An ambulance, a well-equipped dispensary and a doctor shall be made available for 24 hours at permanent construction site for immediate response in case of emergency.				
Impacts on Flora and Fauna	1. NOC will be attained from the forest department for tree cutting (if any) at the bridge construction site. 2. The construction work over the water bodies will be carried out during the lean season when the water flow is minimal also considering breeding season of fish. 3. The size of the cleared and disturbed areas at the construction site will be minimize, particularly those adjacent to the watercourse. 4. Construction will be phased to minimize the time that soils are exposed. 5. Work areas will be restricted to minimize the overall amount of soil disturbance during construction. 6. An adequate supply of erosion control	Rivers, water streams and wetlands	Start, mid, and end of construction for aquatic fauna and continuous for flora	Construction Contractor	Environment Specialist SC Deputy Director Environment (FERP)

Environmental Impact/Issue	Mitigation Measures	Location	Monitoring Frequency	Responsibility	
				Implementation	Supervision/Monitoring
	devices (e.g., geotextiles, vegetation materials) and sediment control devices (e.g., in-water silt barriers, silt fences, straw bales) will be provided on site to control erosion and sediment transport and respond to unexpected events. 7. Work area runoff will be diverted through vegetated areas or into properly designed and constructed sediment traps or a drainage collection system to ensure that exposed soils are not eroded. Runoff velocities in ditches or other drainage routes, or along slopes, will be kept low to minimize erosion potential. Runoff outfall locations to be protected with erosion resistant material, if required. 8. Excavation and cofferdam dewatering activities will pump water from the work areas to a settling pond away from the watercourse. 9. Only clean materials (i.e., free of fine sediment) will be used in water (e.g., cofferdam and working platform construction), or shoreline works (e.g., embankment riprapping). 10. Disturbed slopes or stockpiles will be grated to a stable angle as soon as possible after disturbance to eliminate potential slumping. 11. Exposed sites will be re-vegetated or stabilised as soon as possible after they				

Environmental Impact/Issue	Mitigation Measures	Location	Monitoring Frequency	Responsibility	
				Implementation	Supervision/Monitoring
	have been disturbed, using quick growing grasses or other vegetation. Where re-vegetation is not possible other erosion protection methods, such as riprapping, bioengineering, or erosion matting will be used. 12. Stockpiling of excavated erodible material in suitable designated areas away from the river (i.e., outside the floodplain, away from drainage channels) and installing silt fences around the stockpiles to limit the transport of sediment. 13. Night time construction activities will be avoided to the extent possible. 14. Construction workers will be provided instructions to avoid unnecessary cutting of trees and limit their movement to construction sites. 15. The damaged plants and grass will be restored after completion of construction work. 16. If the animals commonly found in the area are encountered during the construction activities, they will not be harmed and drawn back to the open area. 17. Hunting will be strictly prohibited. 18. Water quality monitoring will be carried out in order to ensure that the water bodies are not contaminated by the construction activities.				
Impacts on the	1. For matters pertaining to social obligation	Communities near	Continuous	Construction	Deputy Director

Environmental Impact/Issue	Mitigation Measures	Location	Monitoring Frequency	Responsibility	
				Implementation	Supervision/Monitoring
socio-economic environment	and benefits of the communities, a Social Framework Agreement (SFA) shall be signed by the Project Director (NHA) with communities to ensure their participation and full satisfaction in matters pertaining to them. SFA shall be singed when the construction work is about to start. 2. Grievance Redress System will facilitate any complainant (Section 7). 3. In all matters where contractor is involved should be made his contractual obligations.	the bridge construction sites		Contractor Environmental Specialist SC	Environment (FERP)
Impacts caused by Land Acquisition and Resettlement	1. The rehabilitation work will be carried out at the existing highway on land owned by the NHA. For additional requirement on N95, all land acquisition and resettlement impacts have been addressed in the LARP (Land Acquisition and Resettlement Plan).		Continuous	Deputy Director Environment (FERP)	Director FERP
Impacts on archaeology, and physical and cultural resources	1. Excavation work in the vicinity of any chance find will be stopped. 2. Assistance will be sought from the nearest office of the Department of Archaeology and Museums to identify and evaluate the chance find. 3. If the department decides to salvage the find, the NHA will provide assistance. 4. The crew will be instructed and trained to respect the cultural values of residing population. For cultural concerns: 5. Public concerns regarding cultural aspects	Bridge construction area and surroundings	Continuous	Deputy Director Environment (FERP) Environmental Specialist SC Construction Contractor	Environment Specialist SC Deputy Director Environment (FERP)

Environmental Impact/Issue	Mitigation Measures	Location	Monitoring Frequency	Responsibility	
				Implementation	Supervision/Monitoring
	will be addressed through a proper Grievance Redress Mechanism provided in Chapter 7. 6. All complains will be documented and responded within due time to avoid conflict among the crew and communities. 7. Locals will be given preference during hiring of required staff.				

Table 2: Estimate Budget Environmental Monitoring (Bridges)

#	Section/ Project	Bridge Site Monitoring Locations	Affected Length (km)	Moitoring Patrameters	No of samples (No. of locations ×frequency× year)	Cost PKR
1.	Chakdara - Kalam (Bridges Package-I) 11 New Bridges (Chakdara - Bahrain)	11	11 new bridges	Water Quality(Rivers/streams), Noise, Equipment/machinery/ heavy vehicles Emissions, Asphalt Plant Emissions	11×4×3=132	1,98000
					11×4×3=132	1,32000
					11×4×3=132	3,30000
					4×4×3=48	3,84000
2.	Chakdara - Kalam (Bridges Package-II) 12 New Bridges (Bahrain - Kalam)	12	12 new bridges		12×4×3=144	2,16000
					12×4×3=144	1,44000
					12×4×3=144	3,60000
					4×4×3=48	3,84000
3.	Mansehra - Naran - Jalkhad - Chilas (Naran - Batakundi Section)	2	16.21 (2 bridges)		2×4×3=24	36000
					2×4×3=24	24000
					2×4×3=24	60000
					2×4×3=24	1,92000
4.	Mansehra - Naran - Jalkhad - Chilas (Batakundi - Jalkhad Section)	4	22.68 (2 bridges)		4×4×3=48	72000
					4×4×3=48	48000
					4×4×3=48	1,20000
					1×4×3=12	96000
5.	Kashmore - D.G.Khan – Ramak (Fazilpur - Taunsa)	2	9.674 (3 new bridges)		2×4×3=24	36000
					2×4×3=24	24000
					2×4×3=24	60000
					1×4×3=12	96000
6.	Kashmore - D.G.Khan - Ramak New Bridges (Taunsa - Ramak)	3	3 (3 new bridges)		3×4×3=36	54000
					3×4×3=36	36000
					3×4×3=36	90000
					2×4×3=24	1,92000
	Total	34	33 bridges			3,384,000

Note: Per Sample cost provided Water quality=1500, Noise =1000, Vehicular emission =2500, Stack emission= 8000

Appendix 4: Environmental Management Plan (Road Rehabilitation)

Table 1: Environmental Mitigation Plan (Road Construction)

Environmental Impact/Issue	Mitigation Measures	Location	Monitoring Frequency	Responsibility	
				Implementation	Supervision/Monitoring
Soil erosion	1. Project will strictly follow the existing route on National Highway. The excavation will be carried out from the existing sites near the project construction area according to environmental law and guidelines by environmental protection agencies of each province. It is not likely to cause change in landscape. 2. Excavated slopes will not be left unattended and unprotected. They will be stabilized with temporary installations. 3. Machinery and vehicles will be operated at existing designated routes to avoid erosion and compaction of un-impacted soils. 4. Periodic trainings will be provided to drivers on mitigation measures related to off-road travel and speeds limits.	Road sections on hilly terrain and at every 5km of the road construction Right of Way (RoW)	Continuous	Construction Contractor	Environment Specialist SC Deputy Director Environment (FERP)
Soil/Land contamination	1. Construction materials will be stored in proper stores on impervious sheets to avoid any soil contamination. 2. Visual Inspection will be carried out for land contamination. 3. The soil contaminated from minor and moderate spills will be removed and will be handed over to waste contractor for proper	Road sections on hilly terrain and at every 5km of the road construction Right of Way (RoW)	Continuous	Construction Contractor	Environment Specialist SC Deputy Director Environment (FERP)

Environmental Impact/Issue	Mitigation Measures	Location	Monitoring Frequency	Responsibility	
				Implementation	Supervision/Monitoring
	treatment. Major spills (over 200 liters) may require specialized treatment such as incineration or bioremediation. The nearest incineration facility to the project area is at National Cleaner Production centre of Attock Oil Refinery in Rawalpindi. 4. All fuel tanks will be properly marked to highlight their contents with a concrete pad underneath to prevent contamination in case of leaks or spills. Daily monitoring will be carried out for leaks. Shovels, plastic bags, and absorbent material will be placed near fuel and oil storage or handling areas to attend to spills and leaks. 5. Used oil and vehicle related waste will be transported to local contractors for recycling. 6. Waste oil shall be provided to contractors for reuse.				
Impacts on air quality	1. Construction machinery and vehicles will be kept in good condition and will be properly tuned to ensure that emissions are within the range of NEQS for vehicular exhaust. 2. Water will be sprinkled at least twice a day to minimize fugitive dust emissions. The frequency of water sprinkling will be increased in hot and dry weather as per requirement. 3. Unnecessary movement of vehicles will be avoided at the construction locations. 4. Construction materials such as cement, gravel and sand will be kept under sheet	Asphalt plant, power generators and heavy machinery used at road construction sites	Quarterly	Construction Contractor	Environment Specialist SC Deputy Director Environment (FERP)

Environmental Impact/Issue	Mitigation Measures	Location	Monitoring Frequency	Responsibility	
				Implementation	Supervision/Monitoring
	covers. 5. Air quality testing for SOx, NOx, PM_{10}, $PM_{2.5}$ will be conducted at the sites of asphalt plant, batching plant and at selected locations along the bridge construction site. The monitoring locations will be identified by the Environment Specialist of the SC.				
Impacts on water quality	1. All fuel tanks will be properly marked to highlight their contents with a concrete pad underneath to prevent water contamination in case of leaks or spills. Daily monitoring will be carried out for leaks. Shovels, plastic bags, and absorbent material will be placed near fuel and oil storage or handling areas to attend spills and leaks. 2. Used oil and vehicle related waste will be transported to local contractors for recycling. 3. All vehicle washing will be limited to designated washing area and the resulting liquid effluent will be directed to sewer lines. 4. The existing water sources will be used during the entire construction phase with due permission from relevant authorities. 5. Discharge of water well will be monitored regularly. 6. Fuel tanks will be bonded with 110% volume enclosure. 7. Coffer dams will be constructed and dismantled carefully.	Within every 5km of road construction RoW	Start, mid, and end of the construction	Construction Contractor	Environment Specialist SC Deputy Director Environment (FERP)
Noise and	1. Specific working hours will be defined for the	Near population	Quarterly	Construction	Environment Specialist

Environmental Impact/Issue	Mitigation Measures	Location	Monitoring Frequency	Responsibility	
				Implementation	Supervision/Monitoring
vibration impacts generated by construction activities, potentially causing health impacts and damages to structures	movement of construction material, equipment and other machinery to ensure minimal disturbance to local communities. 2. Noise monitoring will be carried out at various locations using noise meters. Site labour working in high noise area where noise level exceeds 85 dB (A), should wear earplugs and ear muffs. 3. Monitoring of noise from noise generating sources will be carried out on a biannual basis ensuring compliance of NEQS. 4. The site for stationary sources of noise such as concrete mixers, batching plant, and pumps will be selected at a distance of at least 500m from residing communities. 5. Blowing of horn by the project related vehicles will be strictly prohibited. 6. Noise level of 55 dB at day and 45 dB at night time will be maintained. Late night construction activities will be avoided close to the residential area. 7. Noise level of 65 dB at day and 55 dB at night time will be maintained for commercial areas.	centres, asphalt plant, labour working areas.		Contractor	SC Deputy Director Environment (FERP)
Public hindrances due to traffic diversions and hauling routes	1. Alternate routes will be designated to avoid irregularity in traffic on the highway. 2. Construction sites will be barricaded to minimize accidental injuries and visual nuisance to the travellers. 3. The construction trucks will be adequately covered with tarpaulin covers. 4. Movement of construction equipment will be	Material and machinery transportation routes	Sudden bimonthly inspection on road and routes at the peak construction time	Construction Contractor	Environment Specialist SC Deputy Director Environment (FERP)

Environmental Impact/Issue	Mitigation Measures	Location	Monitoring Frequency	Responsibility	
				Implementation	Supervision/Monitoring
	limited to specific locations and duration. 5. Adequate and appropriate road signs will be erected to warn travellers crossing construction sites. 6. Construction vehicles will be maintained regularly by the contractor to reduce exhaust emissions. 7. Raw materials will be adequately covered within the trucks to prevent air flow along the roadway.				
Impacts caused by improper solid waste management practices	1. A proper solid waste collection, segregation, storage and disposal system will be implemented. Recyclable material will be segregated whereas solid waste will be disposed-off properly at approved disposal site. 2. Construction workers will be trained on handling the waste. 3. Hazardous waste 'if generated' will be marked separately and disposed using international best practices through registered contractor. 4. On completion of the construction phase of the project, the contractor will be required to rehabilitate the site. The purposes of site rehabilitation will be to minimize the potential for soil erosion, enhance the aesthetic appearance of the site and restore safe public access to the surrounding area. Rehabilitation will include removal of all construction materials and wastes, and the	Road construction RoW	Continuous	Construction Contractor	Environment Specialist SC Deputy Director Environment (FERP)

Environmental Impact/Issue	Mitigation Measures	Location	Monitoring Frequency	Responsibility	
				Implementation	Supervision/Monitoring
	grading and re-vegetation of all exposed sites that may be prone to erosion. Where natural erosion protection measures may not be possible or practical, suitable physical erosion protection methods will be used.				
Health and safety of workers	1. Information regarding health facilities and emergency response centres (fire, earthquake and floods) and police stations situated near the construction sites disseminated at sites. 2. Provision of personal protective equipment to all the workers and proper training to use/wear those PPEs. 3. Provision of clean drinking water will be ensured for the construction crew. 4. Awareness of workers about the risks associated with each activity. 5. Safety and travel alerts for the staff and construction workers. 6. Hazards indicator signs and fire fighting equipment will be installed at prone sites. 7. The construction crew will be trained on important aspects of workplace safety. 8. Construction machinery operators and drivers will be trained to avoid associated accidents using machines and vehicles. 9. Flammables and other toxic materials will be stored at secured sites. 10. First aid boxes will be kept at construction sites and randomly moving vehicles\machinery. 11. An ambulance, a well-equipped dispensary	Labour working areas	Continuous	Construction Contractor	Environment Specialist SC Deputy Director Environment (FERP)

Environmental Impact/Issue	Mitigation Measures	Location	Monitoring Frequency	Responsibility	
				Implementation	Supervision/Monitoring
	and a doctor shall be made available for 24 hours at permanent construction site for immediate response in case of emergency.				
Impacts on Flora and Fauna	1. NOC will be attained from the forest department for tree cutting (if any) at the bridge construction site. 2. The construction work over the water bodies will be carried out during the lean season when the water flow is minimal also considering breeding season of fish. 3. The size of the cleared and disturbed areas at the construction site will be minimize, particularly those adjacent to the watercourse. 4. Construction will be phased to minimize the time that soils are exposed. 5. Work areas will be restricted to minimize the overall amount of soil disturbance during construction. 6. An adequate supply of erosion control devices (e.g., geotextiles, vegetation materials) and sediment control devices (e.g., in-water silt barriers, silt fences, straw bales) will be provided on site to control erosion and sediment transport and respond to unexpected events. 7. Work area runoff will be diverted through vegetated areas or into properly designed and constructed sediment traps or a drainage collection system to ensure that exposed soils are not eroded. Runoff velocities in ditches or	ROW of road construction	Start, mid, and end of construction for aquatic fauna and continuous for flora	Construction Contractor	Environment Specialist SC Deputy Director Environment (FERP)

Environmental Impact/Issue	Mitigation Measures	Location	Monitoring Frequency	Responsibility	
				Implementation	Supervision/Monitoring
	other drainage routes, or along slopes, will be kept low to minimize erosion potential. Runoff outfall locations to be protected with erosion resistant material, if required. 8. Excavation and cofferdam dewatering activities will pump water from the work areas to a settling pond away from the watercourse. 9. Only clean materials (i.e., free of fine sediment) will be used in water (e.g., cofferdam and working platform construction), or shoreline works (e.g., embankment riprapping). 10. Disturbed slopes or stockpiles will be grated to a stable angle as soon as possible after disturbance to eliminate potential slumping. 11. Exposed sites will be re-vegetated or stabilised as soon as possible after they have been disturbed, using quick growing grasses or other vegetation. Where re-vegetation is not possible other erosion protection methods, such as riprapping, bioengineering, or erosion matting will be used. 12. Stockpiling of excavated erodible material in suitable designated areas away from the river (i.e., outside the floodplain, away from drainage channels) and installing silt fences around the stockpiles to limit the transport of sediment. 13. Night time construction activities will be avoided to the extent possible.				

Environmental Impact/Issue	Mitigation Measures	Location	Monitoring Frequency	Responsibility	
				Implementation	Supervision/Monitoring
	14. Construction workers will be provided instructions to avoid unnecessary cutting of trees and limit their movement to construction sites. 15. The damaged plants and grass will be restored after completion of construction work. 16. If the animals commonly found in the area are encountered during the construction activities, they will not be harmed and drawn back to the open area. 17. Hunting will be strictly prohibited. 18. Water quality monitoring will be carried out in order to ensure that the water bodies are not contaminated by the construction activities.				
Impacts on the socio-economic environment	1. For matters pertaining to social obligation and benefits of the communities, a Social Framework Agreement shall be signed by the Project Director (NHA) with communities to ensure their participation and full satisfaction in matters pertaining to them. SFA shall be singed when the construction work is about to start. 2. Grievance Redress System will facilitate any complainant (Section 7). 3. All matters where contractor is involved, these should be made as his contractual obligations.	Communities near RoW of road construction	Continuous	Deputy Director Environment (FERP) / Environmental Specialist Construction Contractor	
Impacts caused by Land Acquisition	1. The rehabilitation work will be carried out at the existing highway on land owned by the	Acquired land at RoW	Continuous	Deputy Director Environment	Director FERP

Environmental Impact/Issue	Mitigation Measures	Location	Monitoring Frequency	Responsibility	
				Implementation	Supervision/Monitoring
and Resettlement	NHA. For additional requirement on N95, all land acquisition and resettlement impacts have been addressed in the LARP (Land Acquisition and Resettlement Plan).			(FERP)	
Impacts on archaeology, and physical and cultural resources	1. Excavation work in the vicinity of any chance find will be stopped. 2. Assistance will be sought from the nearest office of the Department of Archaeology and Museums to identify and evaluate the chance find. 3. If the department decides to salvage the find, the NHA will provide assistance. 4. The crew will be instructed and trained to respect the cultural values of residing population. For cultural concerns: 5. Public concerns regarding cultural aspects will be addressed through a proper Grievance Redress Mechanism provided in Chapter 7. 6. All complains will be documented and responded within due time to avoid conflict among the crew and communities. 7. Locals will be given preference during hiring of required staff.	RoW of road construction and surroundings	Continuous	Deputy Director Environment (FERP) Environmental Specialist SC Construction Contractor	Environment Specialist SC Deputy Director Environment (FERP)

Table 2: Estimate Budget Environmental Monitoring (Road Rehabilitation)

Section/ Project	Road Sites Monitoring Locations	Affected Length (km)	Moitoring Patrameters	No of samples (No. of locations×frequency×year)	Cost PKR
Kashmore - D.G.Khan - Ramak (Rojhan - Chak Karya)	1	7	Noise ; Equipment/machinery/ heavy vehicles Emissions; Asphalt Plant Emissions	1×4×3=12	12000
				1×4×3=12	30000
				1×4×3=12	96000
Chakdara - Kalam (Road Package-3) (Bahrain - Chimgarh)	2	11.365		2×4×3=24	24000
				2×4×3=24	60000
				1×4×3=12	96000
Kashmore - Kotri(Kandhkot - Kashmore)	3	16		3×4×3=36	36000
				3×4×3=36	90000
				1×4×3=12	96000
Chakdara - Kalam (Road Package-4) (Chimgarh - Asrit)	2	8.575		2×4×3=24	24000
				2×4×3=24	60000
				1×4×3=12	96000
Kuchlack - Zhob - D.I. Khan (Dhanasar - Sheikhmela)	8	39		8×4×3=96	96000
				8×4×3=96	2,40000
				2×4×3=24	1,92000
Kuchlack - Zhob - D.I. Khan (Darzinda - Daraban)	2	10.68		2×4×3=24	24000
				2×4×3=24	60000
				1×4×3=12	96000
Ramak - Peshawar (Package-I). (3 km from 872-875 & 10 km from 890-900) (Ramak - D.I. Khan)	2	13		2×4×3=24	24000
				2×4×3=24	60000
				1×4×3=12	96000
Ramak - Peshawar (Package-II) (15 km from 935-950 & 5 km from 960-965) (D.I. Khan - Sarai Gambila)	4	20		4×4×3=48	48000
				4×4×3=48	1,20000
				2×4×3=36	2,88000
Ramak - Peshawar (Package-III) (7 km from 1058-1065, 8 km from 1126-1134 & 5 km from 1148-1152) (Sarai Gambila - Peshawar)	2	19		2×4×3=24	24000
				2×4×3=24	60000
				1×4×3=12	96000

Section/ Project	Road Sites Monitoring Locations	Affected Length (km)	Moitoring Patrameters	No of samples (No. of locations×frequency×year)	Cost PKR
Chakdara - Kalam (Road Package-5) (Asrit - Pashmal)	1	8.55		1×4×3=12	12000
				1×4×3=12	30000
				1×4×3=12	96000
Chakdara - Kalam (Road Package-6) (Pashmal - Kalam)	1	6.875		1×4×3=12	12000
				1×4×3=12	30000
				1×4×3=12	96000
Total	28	160.045			2,520,000

Note: Per Sample cost water quality=1500, Noise =1000, vehicular emission =2500, Stack emission= 8000. One monitoring location selected within 5km of road construction.

Appendix 5: Environmental Management Plan (Campsites)

Table 1: Environmental Mitigation Plan (Campsite Management)

Environmental Impact/Issue	Mitigation Measures	Location	Monitoring Frequency	Responsibility	
				Implementation	Supervision/Monitoring
Soil erosion	1. The campsites will be located at permanent residential facilities. No additional clearing will be done. 2. For establishing temporary construction camps prior approval from SC Environment Specialist will be secured. The site will be selected at existing clear land.	Campsites	Continuous/Approval of camp site prior to camp establishment will be obtained from the SC Environment Specialist	Construction Contractor	Environment Specialist SC Deputy Director Environment (FERP)
Soil/Land contamination	1. Construction materials will be stored in proper stores on impervious sheets to avoid any soil contamination. 2. Visual Inspection will be carried out for land contamination. 3. The soil contaminated from minor and moderate spills will be removed and will be handed over to waste contractor for proper treatment. Major spills (over 200 liters) may require specialized treatment such as incineration or bioremediation. 4. In case of temporary camp sites proper soak pits and septic tanks will be constructed for domestic effluents. 5. All fuel tanks will be properly marked to highlight their contents with a concrete pad underneath to prevent contamination in case of leaks or spills. Daily monitoring will be carried out for leaks. Shovels, plastic bags, and absorbent material will be	Campsites	Continuous	Construction Contractor	Environment Specialist SC Deputy Director Environment (FERP)

Environmental Impact/Issue	Mitigation Measures	Location	Monitoring Frequency	Responsibility	
				Implementation	Supervision/Monitoring
	placed near fuel and oil storage or handling areas to attend to spills and leaks. 6. Used oil and vehicle related waste will be transported to local contractors for recycling. 7. Waste oil shall be provided to contractors for reuse.				
Impacts on air quality	1. Construction machinery and vehicles will be kept in good condition and will be properly tuned to ensure that emissions are within the range of NEQS for vehicular exhaust. 2. Construction materials such as cement, gravel and sand will be kept under sheet covers. 3. Air quality testing for SOx, NOx, PM_{10}, $PM_{2.5}$ will be conducted at the sites of asphalt plant and batching plant. 4. Water sprinkling will be carried out as and when required to minimize dust generation.	Camp sites	Quarterly	Construction Contractor	Environment Specialist SC Deputy Director Environment (FERP)
Impacts on water quality	1. Construction camps will be housed at permanent locations. 2. Sewage generated at the campsites will be disposed off in septic systems comprising of septic tanks and soak pits. 3. Soak pits will be built in absorbent soil and located 300 m away from a surface water source or ground water well. Soak pits will be designed to accommodate wastewater generated during the total duration of the operation. 4. All fuel tanks will be properly marked to highlight their contents with a concrete pad underneath to prevent water contamination in case of leaks or spills. Daily monitoring will be carried out for leaks. Shovels, plastic bags, and absorbent material will be	Campsites	Start, mid, and end of Construction period	Construction Contractor	Environment Specialist SC Deputy Director Environment (FERP)

Environmental Impact/Issue	Mitigation Measures	Location	Monitoring Frequency	Responsibility	
				Implementation	Supervision/Monitoring
	placed near fuel and oil storage or handling areas to attend spills and leaks. 5. All vehicle washing will be limited to designated washing area and the resulting liquid effluent will be directed to sewer lines. 6. Fuel tanks will be bonded by 110% volume enclosure. 7. Coffer dams will be constructed and dismantled carefully.				
Noise and vibration impacts generated by construction activities, potentially causing health impacts and damages to structures	1. Noise monitoring will be carried out at camp sites using noise meters. Site labour working in high noise area where noise level exceeds 85 dB (A), should wear earplugs and ear muffs. 2. Monitoring of noise from noise generating sources will be conducted on biannual basis ensuring compliance of NEQS. 3. The site for stationary sources of noise such as concrete mixers, batching plant, generators and pumps will be selected at a distance of at least 500m from residing communities. 4. Blowing of horn by the project related vehicles will be strictly prohibited. 5. Noise level of 55 dB at day and 45 dB at night time will be maintained. Noise level of 65 dB at day and 55 dB at night time will be maintained for commercial area. 6. Construction camps will be located at reasonable distance from the communities to avoid nuisance due to noise.	Labour Camps	Quarterly	Construction Contractor	Environment Specialist SC Deputy Director Environment (FERP)
Impacts caused by	1. A proper solid waste collection, segregation, storage and disposal system will be implemented.	Labour camps	Continuous	Construction Contractor	Environment Specialist SC

Environmental Impact/Issue	Mitigation Measures	Location	Monitoring Frequency	Responsibility	
				Implementation	Supervision/Monitoring
improper solid waste management practices	Recyclable material will be segregated whereas solid waste will be disposed off properly at approved disposal site. 2. Hazardous waste 'if generated' will be marked separately and disposed using international best practices through registered contractor. 3. On completion of the construction phase of the project, the contractor will be required to rehabilitate the camp site. The purposes of site rehabilitation will be to minimize the potential for soil erosion, enhance the aesthetic appearance of the site and restore safe public access to the surrounding area. Rehabilitation will include removal of all construction materials and wastes, and the grading and re vegetation of all exposed sites that may be prone to erosion. Where natural erosion protection measures may not be possible or practical, suitable physical erosion protection methods will be used.				Deputy Director Environment (FERP)
Health and safety of workers	1. Information regarding health facilities and emergency response centres (fire, earthquake and floods) and police stations situated near the construction sites disseminated at sites. 2. Provision of clean drinking water will be ensured for the construction crew. 3. Hygiene inspections will be carried out at camps to avoid disease epidemic. 4. Awareness of workers about the risks associated with each activity. 5. In case of unlikely incidents (fire, vandalism) the camps will be evacuated and emergency response	Campsites	Continuous	Construction Contractor	Environment Specialist SC Deputy Director Environment (FERP)

Environmental Impact/Issue	Mitigation Measures	Location	Monitoring Frequency	Responsibility	
				Implementation	Supervision/Monitoring
	and law enforcement agencies will be engaged. 6. Safety and travel alerts will be provided for the staff and construction workers. 7. Hazards indicator signs and fire fighting equipment will be installed at prone sites. 8. Flammables and other toxic materials will be stored at secured sites. 9. First aid boxes will be kept at camp sites. 10. Drinking water will be tested to avoid spread of water borne diseases. 11. An ambulance, a well-equipped dispensary and a doctor shall be made available for 24 hours at permanent camp site/construction site for immediate response in case of emergency.				
Impacts on the socio-economic environment	1. The camps will be located at a reasonable distance from the communities and population centers. 2. Grievance Redress System should be implemented effectively to facilitate any complainant. 3. All matters where contractor is involved, these should be made as his contractual obligations.	Communities near the campsites	Continuous	Construction Contractor	Environment Specialist SC Deputy Director Environment (FERP)
Impacts on archaeology, and physical and cultural resources	1. Excavation work in the vicinity of any chance find will be stopped. 2. Assistance will be sought from the nearest office of the Department of Archaeology and Museums to identify and evaluate the chance find. 3. If the department decides to salvage the find, the NHA will provide assistance. 4. The crew will be instructed and trained to respect the cultural values of residing population. For cultural concerns: 5. Public concerns regarding cultural aspects will be	Campsites	Continuous	Construction Contractor	Environment Specialist SC Deputy Director Environment (FERP)

Environmental Impact/Issue	Mitigation Measures	Location	Monitoring Frequency	Responsibility	
				Implementation	Supervision/Monitoring
	addressed through a proper Grievance Redress Mechanism provided in Chapter 7. 6. All complains will be documented and responded within due time to avoid conflict among the crew and communities. 7. Locals will be given preference during hiring of required staff.				

Table 2: Estimate Budget Environmental Monitoring (Campsite Management)

#	Section/ Project	Length	Monitoring Parameters	Campsite Monitoring Locations	No of samples (No.of locations ×frequency×year)	Cost
1.	Chakdara - Kalam (Bridges Package-I) 11 New Bridges (Chakdara - Bahrain)	11 new bridges	Drinking Water Quality, Effluent, Noise, Equipment/machinery emissions	1	1×4×3=12	30,000
					1×4×3=12	30,000
					1×4×3=12	30,000
					1×4×3=12	30,000
					1×4×3=12	30,000
2.	Chakdara - Kalam (Bridges Package-II) 12 New Bridges (Bahrain - Kalam)	12 new bridges		1	1×4×3=12	30,000
					1×4×3=12	30,000
					1×4×3=12	30,000
					1×4×3=12	30,000
					1×4×3=12	30,000
3.	Chakdara - Kalam (Road Package-3) (Bahrain - Chimgarh)	11.365		1	1×4×3=12	30,000
					1×4×3=12	30,000
					1×4×3=12	30,000
					1×4×3=12	30,000
					1×4×3=12	30,000
4.	Kashmore - Kotri(Kandhkot - Kashmore)	16		1	1×4×3=12	30,000
					1×4×3=12	30,000
					1×4×3=12	30,000
					1×4×3=12	30,000
					1×4×3=12	30,000
5.	Chakdara - Kalam (Road Package-4) (Chimgarh - Asrit)	8.575		1	1×4×3=12	30,000
					1×4×3=12	30,000
					1×4×3=12	30,000
					1×4×3=12	30,000
					1×4×3=12	30,000
6.	Mansehra - Naran - Jalkhad - Chilas (Naran - Batakundi Section)	16.21 (incl. 2 bridges)		1	1×4×3=12	30,000
					1×4×3=12	30,000
					1×4×3=12	30,000
					1×4×3=12	30,000

#	Section/ Project	Length	Monitoring Parameters	Campsite Monitoring Locations	No of samples (No.of locations ×frequency×year)	Cost
					1×4×3=12	30,000
7.	Mansehra - Naran - Jalkhad - Chilas (Batakundi - Jalkhad Section)	22.68 (2 bridges)		1	1×4×3=12	30,000
					1×4×3=12	30,000
					1×4×3=12	30,000
					1×4×3=12	30,000
					1×4×3=12	30,000
8.	Kashmore - D.G.Khan - Ramak (Rojhan - Chak Karya)	7		1	1×4×3=12	30,000
					1×4×3=12	30,000
					1×4×3=12	30,000
					1×4×3=12	30,000
					1×4×3=12	30,000
9.	Kashmore - D.G.Khan – Ramak (Fazilpur - Taunsa)	9.674 3 new bridges		1	1×4×3=12	30,000
					1×4×3=12	30,000
					1×4×3=12	30,000
					1×4×3=12	30,000
					1×4×3=12	30,000
10.	Kashmore - D.G.Khan - Ramak New Bridges (Taunsa - Ramak)	3 (3 new bridges)		1	1×4×3=12	30,000
					1×4×3=12	30,000
					1×4×3=12	30,000
					1×4×3=12	30,000
					1×4×3=12	30,000
11.	Kuchlack - Zhob - D.I. Khan (Dhanasar - Sheikhmela)	39		1	1×4×3=12	30,000
					1×4×3=12	30,000
					1×4×3=12	30,000
					1×4×3=12	30,000
					1×4×3=12	30,000
12.	Kuchlack - Zhob - D.I. Khan (Darzinda - Daraban)	10.68		1	1×4×3=12	30,000
					1×4×3=12	30,000
					1×4×3=12	30,000
					1×4×3=12	30,000
					1×4×3=12	30,000

#	Section/ Project	Length	Monitoring Parameters	Campsite Monitoring Locations	No of samples (No.of locations ×frequency×year)	Cost
13.	Ramak - Peshawar (Package-I). (3 km from 872-875 & 10 km from 890-900) (Ramak - D.I. Khan)	13		1	1×4×3=12	30,000
					1×4×3=12	30,000
					1×4×3=12	30,000
					1×4×3=12	30,000
					1×4×3=12	30,000
14.	Ramak - Peshawar (Package-II) (15 km from 935-950 & 5 km from 960-965) (D.I. Khan - Sarai Gambila)	20		1	1×4×3=12	30,000
					1×4×3=12	30,000
					1×4×3=12	30,000
					1×4×3=12	30,000
					1×4×3=12	30,000
15.	Ramak - Peshawar (Package-III) (7 km from 1058-1065, 8 km from 1126-1134 & 5 km from 1148-1152) (Sarai Gambila - Peshawar)	19		1	1×4×3=12	30,000
					1×4×3=12	30,000
					1×4×3=12	30,000
					1×4×3=12	30,000
					1×4×3=12	30,000
16.	Chakdara - Kalam (Road Package-5) (Asrit - Pashmal)	8.55		1	1×4×3=12	30,000
					1×4×3=12	30,000
					1×4×3=12	30,000
					1×4×3=12	30,000
					1×4×3=12	30,000
17.	Chakdara - Kalam (Road Package-6) (Pashmal - Kalam)	6.875		1	1×4×3=12	30,000
					1×4×3=12	30,000
					1×4×3=12	30,000
					1×4×3=12	30,000
					1×4×3=12	30,000
18.	Total			17		1,950,000

Note: Per Sample cost Drinking Water =2500, water quality=1500, Noise =1000, vehicular emission =2500, Stack emission= 8000.