# Initial Environmental Examination

Draft IEE Report
Improvement and Widening of Qila Saifullah-Loralai-Waigum Rud Section of N-70
January 2014

# PAK: National Highway Network Development in Balochistan Project

Prepared by National Highway Authority for the Asian Development Bank.

## ABBREVIATIONS USED IN THE STUDY

| | |
|---|---|
| ADT | Average Daily Traffic |
| BEPA | Balochistan Environmental Protection Act |
| CCBOs: | Community Citizen Board Organizations. |
| EIA: | Environmental Impact Assessment. |
| EMP: | Environment Management Plan. |
| EMAP: | Environmental Management Assessment Plan. |
| IEE: | Initial Environmental Examination. |
| IUCN: | International Union for Conservation of Nature. (IUCN). |
| NEQS: | National Environmental Quality Standards |
| NHA: | National Highway Authority. |
| PAPs: | Project Affected People |
| PD/PC: | Project Director/Project Coordinator |
| PEPA: | Pakistan Environmental Protection Agency. |
| PMU: | Project Management Unit |
| ROW: | Right of Way |
| VOC: | Vehicle Operating Costs |

# IMPROVEMENT AND WIDENING OF QILA SAIFULLAH-LORALAI-WAIGUM RUD SECTION OF N-70

# INITIAL ENVIRONMENTAL EXAMINATION (IEE)

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# 1. INTRODUCTION

## 1.1 General

1. National Highways Authority (NHA) intends to carry out the "Improvement and Widening of the Existing Qila Saifullah-Loralai-Waigum Rud Section of National Highway N-70 (128Km).

2. This report presents the Initial Environmental Examination (IEE) of the above mentioned project. Originally the length of the proposed Project road was 128 km, including an 11 km bypass around the Loralai city through a new alignment. The current project however, comprises of the rehabilitation and reconstruction of the existing road, and all construction activities are confined within the existing ROW limits. The total length of the project road is now 117 km, and the project now does not include the Loralai bypass. The construction works also include replacement of the superstructure of 5 existing bridges, construction of 9 new bridges at different locations, and the reconstruction of 264 culverts for cross-drainage of water at all known water passages.

## 1.2 Proponent of the Project

3. National Highway Authority (NHA) is the proponent of the proposed project with the address given below:

National Highway Authority
27, Mauve Area, G-9/1,
Islamabad.
Ph: 051-9032911

## 1.3 Overview of the Project

4. The length of section is 117 km. The Project includes the Improvement and widening of the existing Qila Saifullah-Loralai-Waigum Rud section of N-70.

## 1.4 Objective of the Study

5. The Project will improve transport efficiency, support growth in trade by improving regional connectivity – thereby contributing to economic growth, poverty reduction and enhancing the efficacy of the existing road. This project consists of widening, rehabilitation and improvement of N-70 starting from Qila Saifullah through Loralai to Waigum Rud.

6. Following are the legal requirements of Government of Pakistan to address the environmental issues in development projects:

- Pakistan Environmental Protection Act (PEPA), 1997 amended under 18th Constitutional Amendment as Balochistan Environmental Protection Act (2012) requires that no development project shall be commenced without prior approval of IEE/EIA from Balochistan Environmental Protection Agency (BEPA).
- Pakistan Environmental Protection Agency (EPA) Review of Initial Environmental Examination and Environmental Impact Assessment Regulations, 2000.
- Pakistan EPA Guidelines and procedures for Environmental Assessment of new projects.

- The Pakistan National Environmental Quality Standards (NEQS) for gaseous, liquid and vehicle emissions.

## 1.5 Scope of the Study

7. The scope of study is:

- To establish and identify the Corridor of Impact (COI).
- To identify the potential environmental impacts and to establish the significance of the potential environmental impacts on Project surroundings in the short and long term.
- To establish and propose mitigation measures on the basis of the nature and the level of severity of potential environmental impacts after their identification.

8. The firm "Environmental Management Consultant (EMC)" was appointed to conduct air, water and noise tests and compile primary and secondary data collected from the relevant publications. Site visits were also made to collect first hand environmental, geological and social features of project area.

9. The physical, biological and social environments have been defined by data collected using a variety of methods described below:

- Literature review of all available and relevant physical and biological environmental information.
- Collection of biodiversity information through a survey of fauna and flora in habitats found within a 500 meter radius of the Project Road. Information was collected through direct observations and from relevant published literature. (Please see Annexure II Biotic Information Profile)
- Collection of socio-economic data through a short survey of sources, such as statistics available on the World Wide Web and local community based organizations (CBOs).
- Collection of all other relevant data such as impact of the Project on land use, water quality, air and noise pollution, health of the people etc through surveys within 500 meter radius of the Project Road.

10. These survey results are attached as **Annexure II** to this report.

## 1.6 Environmental Categorization of the Project

11. 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.

12. Pakistan Environment Protection Agency (Review of IEE/EIA) Regulations 2000, Schedule II, lists down the projects requiring an EIA study. Schedule-II describes the requirements of EIA for transportation projects as 'Federal or Provincial Highways or major roads greater than 50 Million Rupees in value'. Maintenance (rebuilding or reconstruction of existing roads), as in the case of the subject project, is exempted from the requirement of an

IEE or an EIA. However, since the cost of the project is above Rs. 50 million rupees, an IEE will be submitted to BEPA for review and approval.

13. 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.'

14. The Project works involve the widening, rehabilitation and upgrading of the existing road, as well as the construction of new bridges and culverts. The Project road has been in use by traffic but since there have been encroachments in the form of small hutments and roadside shops along the right of way, the widening of road road will require removal of these, involving compensation and resettlement.

15. Some adverse environmental impacts are anticipated during construction which are expected to be short term in nature and can easily be mitigated. No changes in the water courses, wildlife habitat etc. are projected.

16. **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.***

## 1.7 Regulations/Legislation to be followed

17. Following environmental regulations and legislations will be followed:

| | | |
|---|---|---|
| **Environmental Protection** | **:** | Balochistan Environmental Protection Act (2012); The Pakistan Penal Code (1860); Pakistan Environmental Protection Act (1997); IEE/EIA regulations 2000 |
| **Pollution Control** | **:** | National Environmental Quality Standards (NEQS) for gaseous, liquid (water), vehicular emissions and noise. |
| **Public Health and Safety** | **:** | The Pakistan Penal Code (1860). |

## 1.8 Components of the Report

18. This IEE Report has been prepared to fulfill the requirements of ADB's Safeguard Policy Statement (SPS) 2009. The report format comprises of the following components:

Chapter 1: Introduction

19. This section presents an overview of the entire IEE report. It provides information about the Project location and its benefits to the public; discusses the scope of study and overview of the Project. The section also discusses the Project categorization as per EPA and ADB criteria. Besides, it provides information about the standards and guidelines that have to be followed.

Chapter 2: Policy, Legal and Administrative Framework

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

Chapter 3: Description of the Project

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

a) General;
b) Location of the Project;
c) Villages connected by the Project Road
c) Key components of the Project;
d) Project Implementation Schedule;
e) Sources of construction material;
f) Schedule of construction;
g) Construction camps; and work force;
h) Machinery requirements.

Chapter 4: Description of the Environment

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

a) Physical environment of Project area of influence;
b) Geology and seismology of the Project area;
c) Hydrology and drainage;
d) Ecological resources;
e) Socio-economic environment.

Chapter 5: Anticipated Environmental Impacts and Mitigation Measures

23. This section provides the information on the anticipated environmental impacts and mitigation measures. It discusses the following:

a) Project corridor;
b) Pre construction/design phase;
c) Construction phase; and
d) Operation phase.

Chapter 6: Environmental Management and Monitoring Plan

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

a) Objectives of EMP;
b) Key Environmental and social components;
c) Institutional Requirements;
d) Role of Functionaries;
e) Environmental Training.

Chapter 7: Public Participation and Consultation

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

a) Identification of main stakeholder;
b) Approach for public consultations;
c) Meetings and Conclusions;

26. Chapter 8: Grievance Redress Mechanism

27. Chapter 9: Conclusions and Recommendations

## 2. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

### 2.1 General

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

### 2.2 National Policy and Legal Framework

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

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

31. Prior to the adoption of the 18$^{th}$ Constitutional Amendment, the Pakistan Environmental Protection Act (PEPA) 1997 was the governing law for environmental conservation in the country. Under PEPA 1997 the Pakistan Environmental Protection Council (PEPC) and Pak EPA were primarily responsible for administering PEPA 1997. Post the adoption of the 18$^{th}$ Constitutional Amendment in 2011, the subject of environment was devolved and the provinces have been empowered for environmental protection and conservation. Subsequently, the Balochistan government amended PEPA 1997 as Balochistan Environmental Protection Act 2012, and Balochistan EPA (BEPA) is responsible for ensuring the implementation of provisions of the Act in Balochistan's territorial jurisdiction. BEPA is also required to ensure compliance with the NEQS and establish monitoring and evaluation systems.

### 2.3 Regulations for Environmental Assessment, Pakistan EPA

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

### 2.4 Regulatory Clearances, Balochistan EPA

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

## 2.5 Guidelines for Environmental Assessment, Pakistan EPA

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

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

## 2.6 National Environmental Quality Standards (NEQS) 2000

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

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

36. These standards apply to the gaseous emissions and liquid effluents discharged by batching plants, campsites and construction machinery. The standards for vehicles will apply during the construction as well as operation phase of the project. Standards for air quality have not been prescribed as yet.

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

37. 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 & safety of the local population should also be addressed as well as the project workers as stated in SPS. A Grievance Redress Mechanism to receive application and facilitate resolution of affected peoples' concerns, complaints, and grievances about the project's environmental performance is also established and provided in Chapter 8.

38. 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:

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

40. 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.

41. 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.

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

### 2.8 Interaction with other Agencies

43. NHA is responsible for ensuring that the project complies with the laws and regulations controlling the environmental concerns of highway construction and operation, and that all preconstruction requisites, such as permits and clearances are met. This section describes the nature of the relationship between the NHA and concerned departments.

### 2.9 Provincial EPAs

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

### 2.10 Provincial Departments of Forests and Wildlife

45. The clearing and grubbing for the Project road will involve clearing and uprooting of trees falling under construction limits (60-65 ft.) within the right of way. However, any removed trees of vegetation under private ownership will be compensated as per provision of the there is some disruption to vegetation or trees the project contractor will be responsible for acquiring a 'No-Objection Certificate' (NOC) from the concerned federal or provincial forest department. The application for an NOC will need to be endorsed by the NHA.

### 2.11 Provincial Governments

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

### 2.12 Other Environment Related Legislations

47. Following Table gives a summary of all legislations, guidelines, conventions and corporate requirements:

***Table 2-1: Environmental Guidelines and Legislations***

| Sr. No. | Legislation/guideline | Description |
|---|---|---|
| 1 | Balochistan Environmental Protection Act, 2012 | **Post the adoption of the 18th Constitutional Amendment in 2011, the subject of environment was devolved and the provinces have been empowered for environmental protection and conservation. Subsequently, the Balochistan government amended PEPA 1997 as Balochistan Environmental Protection Act 2012, and Balochistan EPA (BEPA) is responsible for ensuring the implementation of provisions of the Act in Balochistan's territorial jurisdiction. BEPA is also required to ensure compliance with the NEQS and establish monitoring and evaluation systems.** |
| 2 | Pakistan Environmental Protection Act (PEPA) 1997 | **Basic legislative tool empowering the Government of Pakistan to frame and enforce regulations for the protection of environment. The PEPA 1997 is broadly applicable to air, water, soil, marine and noise pollution, and handling of hazardous wastes. Penalties have been prescribed for those contravening provisions of the Act. Under section 12 of the PEPA 1997, no project involving construction activities or any change in the physical environment can be undertaken unless an IEE or EIA is conducted and a report submitted to the federal or provincial EPA.** |
| 3 | Pakistan Environmental Protection Agency Review of IEE and EIA Regulations, (2000) | **The Regulation classifies projects on the basis of expected degree of adverse environmental impacts and lists them in two separate schedules. Schedule I lists projects that may not have significant environmental impacts and therefore require an IEE. Schedule II lists projects of potentially significant environmental impacts requiring preparation of an EIA. The Regulations also require that all projects located in environmentally sensitive areas require preparation of an EIA. It also lists Projects not requiring either an EIA or an IEE.** |
| 4 | National Environmental Quality Standards (1993 and 2000) | **The NEQS specify standards for industrial and municipal effluents, gaseous emissions, ambient air requirements and emission levels for Sulfur dioxide and Nitrogen oxide, vehicular emissions and noise levels. The PEPA specifies the imposition of a pollution charge in case of non-compliance with the NEQS. The standards were last revised in 2000.** |
| 5 | National Environmental Policy (2005) (NEP) | **NEP is the primary policy of Government of Pakistan addressing environmental issues. The broad Goal of NEP is, "to protect, conserve and restore Pakistan's environment in order to improve the quality of life of the citizens through sustainable development". The NEP identifies a set of sectoral and cross-sectoral guidelines to achieve its goal of sustainable development. It also suggests various policy instruments to overcome the environmental problems throughout the country:** |

| Sr. No. | Legislation/guideline | Description |
|---|---|---|
| 6 | Land Acquisition Act, 1894 Including Later Amendments | **The Land Acquisition Act, 1894, is a "law for the acquisition of land needed for public purposes and for companies and for determining the amount of compensation to be paid on account of such acquisition". The exercise of the power of acquisition has been limited to public purposes. The principles laid down for the determination of compensation, as clarified by judicial pronouncements made from time to time, reflect the anxiety of the law-giver to compensate those who have been deprived of property, adequately. The land needed for the construction of road will be acquired under normal conditions based on prevailing market prices or negotiated prices between NHA and the owners of land. Section 17(4) of the LAA will not be used in the absence of an emergency. Instead, the land will be purchased under willing-seller willing-buyer deal at agreed upon market rates and the seller will have the option not to sell the land, in case an acceptable deal for both the parties is not reached.** |
| 7 | The Forest Act (1927) | **The Act empowers the provincial forest departments to declare any forest area as reserved or protected. It empowers the provincial forest departments to prohibit the clearing of forest for cultivation, grazing, hunting, removing forest produce, quarrying and felling, lopping and topping of trees, branches in reserved and protected forests. No protected forest is situated in the Project Area.** |
| 8 | Canal and Drainage Act (1873) | **This Act prohibits corruption or fouling of water in canals (defined to include channels, tube wells, reservoirs and watercourses), or obstruction of drainage.** |
| 9 | Pakistan Penal Code (1860) | **It authorizes fines, imprisonment or both for voluntary corruption or fouling of public springs or reservoirs so as to make them less fit for ordinary use.** |
| 10 | Protection of Trees and Brushwood Act, 1949 | **This Act prohibits cutting or lopping of trees and brushwood without permission of the Forest Department. The Forest Department will be approached for permission to cut trees along the road alignment.** |
| **NATIONAL ENVIRONMENTAL AND CONSERVATION STRATEGIES** | | |
| 11 | National Conservation Strategy | **Before the approval of NEP the National Conservation Strategy (NCS) was considered as the Government's primary policy document on national environmental issues. At the moment this strategy just exists as a national conservation program. The NCS identifies 14 core areas including conservation of biodiversity, pollution prevention and abatement, soil and water conservation and preservation of cultural heritage and recommends immediate attention to these core areas.** |
| 12 | Biodiversity Action Plan | **The plan recognizes EIA as an effective tool for identifying and assessing the effects of a proposed operation on** |

| Sr. No. | Legislation/guideline | Description |
|---|---|---|
| | | **biodiversity** |
| **INSTITUTIONAL FRAMEWORK** | | |
| 13 | Environment and Conservation | **There is a well-established framework for environmental management in Pakistan. The Ministry of Environment deals with environment and biological resources. Within the ministry, the NCS unit established in 1992 is responsible for overseeing the implementation of the strategy. Two organizations, The Pakistan Environmental Protection Council (PEPC) and the Pak EPA are primarily responsible for administering the provisions of the PEPA, 1997. The PEPC oversees the functioning of the Pak EPA. Its members include representatives of the government, industry, non-governmental organizations, and the private sector. The Pak EPA is required to ensure compliance with the NEQS, establish monitoring and evaluation systems, and both identify the need to and institution of legislations whenever necessary. It is thus the primary implementing agency in the hierarchy. The Provincial Environmental Protection Agencies are formed by the respective provinces.** |
| **INTERNATIONAL CONVENTIONS** | | |
| 14 | The Convention on Conservation of Migratory Species of Wild Animals, (1979) | **The Convention requires countries to take action to avoid endangering migratory species. The term "migratory species" refers to the species of wild animals, a significant proportion of whose members cyclically and predictably cross one or more national jurisdictional boundaries. The parties are also required to promote or cooperate with other countries in matters of research on migratory species. There are no endangered species of plant life or animal life in the vicinity of the Project.** |
| 15 | Convention on International Trade in Endangered Species of Wild Fauna and Flora (1973) | **The convention requires Pakistan to impose strict regulation (including penalization, confiscation of the specimen) regarding trade of all species threatened with extinction or that may become so, in order not to endanger their survival further.** |
| 16 | International Union for Conservation of Nature and Natural Resources Red List (2000) | **Lists wildlife species experiencing various levels of threats internationally. Some of the species indicated in the IUCN red list are also present in the wetlands of Larkana** |
| **INTERNATIONAL ENVIRONMENTAL GUIDELINES** | | |
| **17** | **ADB's Safeguard Policy Statement (SPS), 2009** | **ADB's Safeguard Policy Statement (SPS), 2009 provides guidelines for environmental assessments of development projects. These guidelines help prospective projects identify impacts they will have on various environmental receptors. The guidelines call for carrying out EIAs or IEEs of projects based on severity of their impacts.** |

# 3. DESCRIPTION OF THE PROJECT

## 3.1 Location of the Project

48. Qila Saifullah-Loralai-Waigum Rud Section of National Highway N-70 is about 117 km long, situated in Qila Saifullah and Loralai Districts of northern Balochistan.

49. National Highway N-70 is a direct and only link between Balochistan and Punjab provinces. It starts at Qila Saifullah on N-50 and terminates at Multan on N-5. The total length is about 441 km. Out of this total length, approximately 256 km is situated in Balochistan Province i.e. from Qila Saifullah to Bewata and the remaining 182 km i.e. from Bewata to Multan is situated in Punjab Province. The Project part of the National Highway N-70 starts at Qila Saifullah on N-50, and terminates at Waigum Rud with a total length of 117 km. For construction activities the project has been divided into two sections: one is from RD 0+000 to 67+200 (before entering into Loralai city), and second component starts after crossing Loralai city at RD 78+500 to 128+000.

## 3.2 Objectives of the Project

50. The existing 2 lane road is insufficient for the inter-provincial transport needs of present population of the Project Area. To meet the requirements of increasing traffic volume, NHA plans to upgrade the existing road. Length of the road section from Qila Saifullah to Loralai is 117 km.

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

- Improved inter-provincial connectivity.
- Increase the access of the rural and urban population to social services and markets, leading to improved quality of travel/livelihood.
- Enhance the efficiency of road network to minimize transportation cost through improvement and vehicle operating cost.
- Reduce the number of accidents.
- Improve inter-provincial trade among Punjab, Balochistan and Sindh.

## 3.3 Key Components of the Project

52. The length of the proposed project is 117 km, which is divided into two components: one is from RD 0+000 to 67+200 (before entering into Loralai city), and second component starts after crossing Loralai city at RD 78+500 to 128+000.

53. Following are thus the key components of the Project Road after final survey and design:

| | |
|---|---|
| Rehabilitation of existing Road | 117 km |
| New construction of bridges | 9 |
| Rehabilitation of bridges (replacement of superstructure) | 5 |
| Rehabilitation/ new Construction of Culverts | 264 |

54. Following is the geometric design criteria of the Project Road

- Road width (Travel Lanes) : Two lanes of 7.3 m with each lane of 3.65m
- Shoulder (outer) : 2.5m wide, with 50cm rounding
- Formation width : 13.30 m wide
- Minimum passing sight distance
  - Plain areas : 615m
  - Hilly Areas : 410m
- Minimum Stopping Sight Distance
  - Plain Areas : 160m
  - Hilly Areas : 85m
- Maximum super elevation
  - Plain Areas : 6.0%
  - Hilly Areas : 6.0%
- Minimum Radius of horizontal
  - Curve (Plain Areas) : 336m
  - Hilly Areas : 123m
- Minimum radius without Super
  - Elevation (Plain Areas) : 2880m
  - Hilly Areas : 1440m
- Minimum 'K' Value "Crest" based on Passing sight distance
  - Plain Areas : 39m
  - Hilly Areas : 11m
- Minimum 'K' Value "Sag" based on stopping sight distance
  - Plain areas : 38m
  - Hilly Areas : 18m
- Minimum Curve Length
  - Plain Areas : 54m
  - Hilly Areas : 36 m
- Maximum Gradient
  - Level topography : 2.55 to 2.0% (1300m to unlimited)
  - Rolling topography : 4.0% to 4.0% (580m to 1400m)
  - Mountainous Topography : 6.0% to 6.0% (3000m to 720m)
- Embankment side slopes : 2:1
- Design speed
  - Plain Areas : 90km/hr
  - Hilly Areas : 60km/hr

55. Road pavement design is based on latest traffic counts converted into Equivalent Standard Axle load (ESALs) projected for design period, results of soil investigation (CBR) taking into account local climatic condition.

### 3.4 Project Implementation Schedule

56. It has been assumed that the implementation of the Project shall take 30 months after start.

### 3.5 Sources of Construction Material

57. From Qila Saifullah to Loralai and Waigum Rud construction materials is available easily along the existing road as follows:

- Borrow material for construction of embankment is easily available all along the existing alignment;
- Material for sub-base, base and aggregates can be obtained from adjacent mountains, from river/nullah beds and can be used after screening and crushing as the case maybe. There are three crushers located along the roadway which can provide aggregate for base, concrete and asphalt;
- Fine aggregates are also available in river and nullah beds.

#### 3.1.1. Embankment Fill

58. Soils along the alignment of the existing road have been classified as A-1-a, A-1-b and A-4 as per AASHTO Classification. These soils may be used as embankment fill for embankment construction. These soils are available along the length of the Project Road.

### 3.6 Sub-base/Base

59. Sub-base, base material is available near the alignment of the Project Road. The sub-base material has to be carried from the borrow pits in the vicinity of the road. Base material is available in Loralai River (2.0km from Loralai towards Qila Saifullah) and Sehwan River (60km from Loralai towards Waigum Rud). The boulders from these rivers will have to be crushed to make aggregate base.

60. There are crushing plants along the road and good quality material for sub base, base and aggregates for concrete and asphalt is easily available. A crusher plant is located at Km 23+000; two crusher plants are located at km 75+000 immediately after the town of Loralai.

### 3.7 Aggregate for Concrete and Asphalt

61. Boulders carried from Loralai River and Sehwan River as detailed above will have to be crushed to make aggregate for concrete and asphalt.

### 3.8 Sand for Concrete

62. Sand is available in the Loralai River, Sehwan River and Zhob River. Distance of these rivers from Loralai is 2km, 60km and 9km respectively.

### 3.9 Traffic

63. Three day, 24 hr. traffic counts were conducted for the Project at three different locations. The traffic count was conducted for both directions. This 3-day both directional traffic count was averaged to arrive at the average daily traffic given in the following table:

***Table 3-1: Summarized average daily traffic volume***

| Station Name | ADT (vehicles per day) |
|---|---|
| At P.S.O. Petrol Pump | 1790 |
| At Check Post | 1720 |
| **At Shell Petrol Pump** | 2420 |

64. These ADT were then projected using variable growth rates as given in the following table:

***Table 3-2: Annual Growth Rates***

| *Vehicle Type* | *Year (2009-10)* | *Year (2011-15)* | *Year (2016-20)* | *Year (2021-25)* | *Year (2026-30)* |
|---|---|---|---|---|---|
| **Passenger Vehicle** | 7.8% | 6.15% | 5.14% | 4.40% | 3.78% |
| **Freight Vehicle** | 8.47% | 7.37% | 6.61% | 5.90% | 5.28% |

65. Following tables give the annual average daily traffic up to the year 2030:

***Table 3-3: Average Annual Traffic***

| Year | Cars/Motor Cycles (PCU) | Buses | Mini Buses | Total trucks | Total Traffic |
|---|---|---|---|---|---|
| **Shell Petrol Pump Station # 1** | | | | | |
| 2012 | **1219** | **27** | **196** | **884** | 4187 |
| 2020 | **1873** | **42** | **302** | **1508** | 3725 |
| 2025 | **2323** | **52** | **374** | **2008** | 4758 |
| 2030 | **2809** | **63** | **453** | **2597** | 5922 |
| **Levies Check Post Station # 2** | | | | | |
| 2012 | **1199** | **27** | **178** | **774** | 2108 |
| 2020 | **1842** | **44** | **290** | **1417** | 3594 |
| 2025 | **2285** | **55** | **359** | **1888** | 4587 |
| 2030 | **2762** | **66** | **435** | **2442** | 5705 |
| **Shell Petrol Pump station # 3** | | | | | |
| 2012 | **1499** | **33** | **262** | **1104** | 2898 |
| 2020 | **2304** | **50** | **402** | **1882** | 4639 |
| 2025 | **2857** | **62** | **499** | **2507** | 5926 |
| 2030 | 3455 | 75 | 603 | 3242 | 7376 |

## 3.10 Construction Camps and Work Force

66. Campsites will be selected keeping in view the availability of an adequate area for establishing campsites, including parking areas for machinery, stores and workshops, access to communication and local markets, and an appropriate distance from sensitive areas in the vicinity; final locations will be selected by the contractor. The Contractor shall comply with clause SS-5 'Contractors camps and depots' of the Tender Documents.

67. It is estimated that the Contractor shall supply following minimum work force for the Project:

- ⇨ Project Manager 1
- ⇨ Site Engineer 2
- ⇨ Assistant Engineer 2

| | |
|---|---|
| ⇨ Material Engineer | 2 |
| ⇨ Laboratory Technician | 6 |
| ⇨ Surveyors | 8 |
| ⇨ Quantity Surveyor | 2 |
| ⇨ Manager Administration | 2 |
| ⇨ Foreman | 4 |
| ⇨ Mechanic | 4 |
| ⇨ Clerk | 2 |
| ⇨ Operator/Drivers | 150 |
| ⇨ Masons | 8 |
| ⇨ Carpenter | 4 |
| ⇨ **Total Skilled Labor** | **197** |
| ⇨ Machine helpers | 452 |
| ⇨ Unskilled labor | As per requirement at site |

### 3.11 Machinery Requirement

68. The Project is located in remote, partly hilly, partly rolling and partly plain terrain. First 15km length is winding through high hills with hard rock, then upto Loralai passes through rolling terrain with mixed hard to medium rocky low hills. From Loralai the Road passes through partly rolling hills and partly plain areas with granular materials in river/nullah beds, and clayey/silty materials. The altitude along the alignment of the existing road varies from a maximum of 2,294 feet on Qila Saifullah side, 1,446 feet at Loralai and 1,880 feet above sea level at Waigum Rud. There are two main rivers/streams namely Loralai and Sehan River. The logistics for supply of spare parts, fuel and other lubricants are poor and the Contractor will have to make his own arrangements from Karachi. The working conditions have been rated as difficult, hard and this requires additional effort and inputs for running and maintenance of plant, equipment and machinery. Following is a summary of type of equipment and machinery required:

| | |
|---|---|
| Earth Moving Equipment of various types and capacity | 99 in Nos. |
| Jaw Crushers with Secondary Cone Crushers, Vibrating Deck Screen complete 250 tons/hr | 2 Nos. |
| Grizzlies for sub base, screenings over size materials | 2 Nos. |
| Asphalt mixes Equipment of various types | 19 Nos. |
| Concrete work machinery | 12 Nos. |
| Miscellaneous Equipment like Diesel generator, farm tractors Fork lifts, maintenance truck/ lubricating truck | 16 Nos. |

# 4. DESCRIPTION OF THE ENVIRONMENT

## 4.1 General

69. Physical, ecological, cultural and socio-economic environmental aspects have been studied around the proposed project.

70. As project (N-70) road already exists and traffic is plying through N-70, therefore human induced impacts such as traffic noise vehicular emission and other associated impacts already exists. The study of already existing impacts will allow establishing baseline conditions.

71. The impact as discussed above may not restrict only to road corridor, however, the direct corridor of impact (COI) due to construction of highway is restricted between ROW limits.

## 4.2 Methodology

72. To establish the baseline condition of project area, the information/data have been collected from different sources including, Government Departments/Agencies. The secondary data have been taken from other sources such as Statistical Bulletin, District Census reports of Districts Qila Saifullah and Loralai, information available on the internet etc.

73. Site visits were also carried out in order to obtain information about the social, environmental and economic conditions of the Project area.

74. To establish baseline ambient air, noise and water conditions a program of environmental monitoring has been prepared, and air and water samples have been collected from the selected locations. Noise levels have also been measured at site at selected locations. As the population along the project corridor is sparsely distributed, therefore locations selected for air and water sampling and noise tests were based on the proximity of local habitation. The location of sites selected for environmental tests are given as under:

| | |
|---|---|
| Site No –I: | Qila Saifullah (near Burhan Petroleum Service) |
| Latitude: | 30.68885 N |
| Longitude: | 68.37798 E |
| Site No –II: | Loralai by pass (near FC training centre) |
| Latitude: | 30.34658 N |
| Longitude: | 68.61204 E |
| Site No –III: | Near Community (Killi Chappali) |
| Latitude: | 30.38096 N |
| Longitude: | 68.65820 E |

75. The firm Environmental Management Consultants (EMC) was engaged to carry out sampling, lab and sites testing to establish baseline environmental conditions.


2

## 4.3 Physical Environment of Project Area

### 4.3.1 Climate and Meteorology

76. Generally the project area is classified as semi arid and warm, characterized by mild summers and cold winters. The summer season usually starts from end of April and lasts till the end of September. June and July are the hottest months. Due to scarcity of vegetation and surface water bodies, relative humidity of the area is low.

77. No meteorological station is established in District Loralai and Qila Saifullah. Zhob is the nearest meteorological station, with similar climatic condition therefore, meteorological data for Zhob is the only available data within the project area. Yearly mean minimum and maximum temperature for a ten year period (1998–2007) are obtained from the Statistical Year Book 2008, and is given in the following table:

***Table 4-1: Yearly Average Temperature***

| Year | * Yearly Average Temperature ($^0$C) | |
|---|---|---|
| | Mean Maximum | Mean Minimum |
| 1998 | 27.4 | 11.8 |
| 1999 | 30.1 | 13.7 |
| 2000 | 27.9 | 13.4 |
| 2001 | 28.1 | 13.0 |
| 2002 | 27.6 | 10.2 |
| 2003 | 26.8 | 15.4 |
| 2004 | 28.6 | 11.9 |
| 2005 | 26.0 | 10.8 |
| 2006 | 27.0 | 10.4 |
| 2007 | 24.3 | 8.0 |

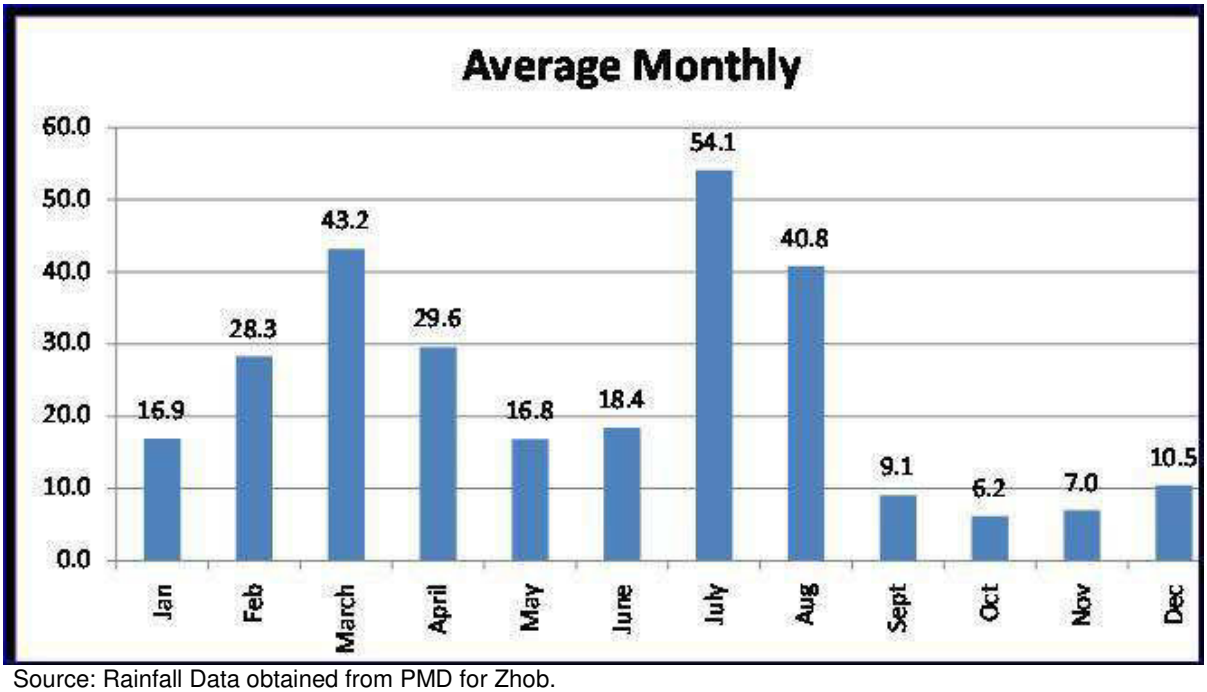
Source: * Pakistan Statistical Publications, year Book 2008.

78. Within the project area, winter rains are significant and range between 250 to 500 mm. The rainfall data of Zhob has been obtained from Pakistan Meteorological Department (PMD), Karachi. The rainfall data of 30 years (1978–2007) is obtained from PMD. Monthly average of rainfall record of 30 years is given in the table below and is also represented in the form of a bar chart.

***Table 4-2: Rainfall Data of Zhob***

| Month | Precipitation (mm) | Precipitation (inches) |
|---|---|---|
| January | 16.9 | 8 |
| February | 28.3 | 13 |
| March | 43.2 | 19 |
| April | 29.6 | 13 |
| May | 16.8 | 7 |
| June | 18.4 | 8 |
| July | 54.1 | 24 |
| August | 40.8 | 18 |
| September | 9.1 | 4 |
| October | 6.2 | 3 |
| November | 7.0 | 3 |
| December | 10.5 | 5 |

***Figure 5-1: Rainfall Data of Zhob***




Source: Rainfall Data obtained from PMD for Zhob.

79. The mean maximum rainfall occurred in July. However, winter rainfall is significant and takes place from January to April. The yearly average of rainfall (30 years) is 23.4 mm.

### 4.1.2 Air Quality

80. Both districts lack industrial activity and in absence of major industrial activity air pollution is mainly due to vehicle emissions along the road corridor. The main air quality issue is the suspended particulate matter. To a certain extent, the high level of particulate matter is a natural consequence of the dry atmosphere, lack of vegetation cover, and winds. Nevertheless, this condition is exacerbated by such human activities as vehicles driving on unpaved shoulders or poorly maintained roads. Moreover, many trucks, buses, and passenger vehicles are diesel fueled and poorly maintained. Some use a fuel that is a mixture of kerosene and diesel which results in both a cheaper fuel mix and in exhaust smoke that is high in PM10. The Ambient air monitoring methods employed are given in table below:

***Table 4-3: Ambient Air Monitoring Methods***

| Pollutants | Title of US EPA 40 CFR | Methods |
|---|---|---|
| NOx | Reference Method in Appendix F of 40 CFR Part 50 | Chemiluminescence's |
| $SO_2$ /H2S | Ambient Monitoring Reference & Equivalent Method of 40CFR Part 52 | Fluorescence Method |
| CO | Method in Appendix C of 40 CFR Part 50 | IR Gas Filter Correlation |
| $CO_2$ | Method in Appendix C of 40 CFR Part 50 | IR Gas Filter Correlation |
| TSP | Reference Method in Appendix B of 40 CFR Part 50 | Beta Gauge |
| PM10 | Reference Method in Appendix J of 40 CFR Part 50 | -do- |
| Noise level | Ambient Monitoring Reference & Equivalent Method 40CFR part 205 | Preamplifier detector with the help of microphone |
| VOC | | Gas Chromatograph Method |

81. The ambient air quality levels for each selected sites are as under:

***Qila Saifullah (near Burhan Petroleum Service)***

| | $SO_2$ (ppb) | $NO_X$ (ppb) | CO (ppm) | PM10 ($\mu g/m^3$) | w/s (m/s) |
|---|---|---|---|---|---|
| **Min** | 24.1 | 25.9 | 3.1 | 120.0 | 0.4 |
| **Max** | 32.5 | 36.5 | 5.4 | 169.0 | 2.3 |
| **Average** | 27.8 | 30.3 | 3.9 | 145.3 | 1.1 |

82. The average observed levels of Total Suspended Particulate PM10 was 145 $\mu g/m^3$. These concentrations were well within the prescribed limits for PM10 (150 $\mu g/m^3$) of USEPA. The measured mean concentrations of gaseous pollutants were, 3.9 ppm for CO, 27.8 ppb for $SO_2$ and 30.3 ppb for NOx. All these levels of gaseous pollutants were well also within limits of USEPA and the prescribed International Standards for ambient air quality like USEPA, WHO and World Bank.

***Loralai by pass (near FC training centre)***

| | $SO_2$ (ppb) | $NO_X$ (ppb) | CO (ppm) | PM10 ($\mu g/m^3$) | w/s (m/s) |
|---|---|---|---|---|---|
| **Min** | 10.2 | 12.3 | 1.9 | 120.0 | 0.1 |
| **Max** | 14.2 | 16.3 | 3.2 | 129.0 | 1.0 |
| **Average** | 12.0 | 14.2 | 2.5 | 124.1 | 0.3 |

83. The average observed levels of Total Suspended Particulate PM10 was 124.0 $\mu g/m^3$. These concentrations were well within the prescribed limits for PM10 (150 $\mu g/m^3$) of USEPA. The measured mean concentrations of gaseous pollutants were, 2.5 ppm for CO, 12.0 ppb for $SO_2$ and 14.2 ppb for NOx. All these levels of gaseous pollutants were well also within limits of USEPA and the prescribed limits of International Standards for ambient air quality like USEPA, WHO and World Bank.

***Near Community (Killi Chappali)***

| | $SO_2$ (ppb) | $NO_X$ (ppb) | CO (ppm) | PM10 ($ug/m^3$) | w/s (m/s) |
|---|---|---|---|---|---|
| **Min** | 8.1 | 12.6 | 1.2 | 103.0 | 0.1 |
| **Max** | 12.8 | 16.9 | 1.9 | 125.0 | 2.1 |
| **Average** | 10.2 | 15.3 | 1.4 | 115.0 | 0.9 |

84. The average observed levels of Total Suspended Particulate PM10 was 115 $\mu g/m^3$.These concentrations were well within the prescribed limits for PM10 (150 $\mu g/m^3$) of USEPA. The measured mean concentrations of gaseous pollutants were, 1.4 ppm for CO, 10.1 ppb for $SO_2$ 0.5 ppb and 15.3 ppb for NOx. All these levels of gaseous pollutants were also within limits of USEPA and the prescribed limits of International Standards for ambient air quality like USEPA, WHO and World Bank.

### 4.1.3 Noise

85. Low traffic volume is plying on N-70 owing to low population density, lack of industrial and significant mining activities, limited agro-based economic activities etc. Noise along the

existing N-70 highway particularly between Qila Saifullah and Loralai is not a serious issue. Road side noise levels have been measured at the selected locations at a distance of about 4 to 6 m from road edge.

86. The mean noise level along the corridor is 44.80 db(A) peak noise level observed at Qila Saifullah which is 59.0 db(A). Average values of noise level of project corridor are well within WHO limits of 55 db(A) and NEQS limits of 85 db(A). However average noise levels are close to (slightly higher) to WHO standard values.

87. During construction these values are likely to increase due to operations of earth moving equipment / machinery.

88. The noise level is directly proportional to traffic, therefore with the increase of traffic the noise level is also likely to increase.

89. Noise levels at different locations are given in table below:

**Noise Level at Qila Saifullah (near Burhan Petroleum Service)**

| | Noise (dB) | WHO Standards | NEQS Standards |
|---|---|---|---|
| Min | 43.0 | | |
| Max | 59.0 | | |
| Average | 48.1 | | |

**Noise Level at Near Community (Killi Chappali)**

| | Noise (dB) | WHO Standards | NEQS Standards |
|---|---|---|---|
| Min | 41.0 | | |
| Max | 49.0 | | |
| Average | 44.8 | | |

### 4.1.3 Water Sources and Quality

90. Nari River and its tributaries including Loralai River are the major water sources in Loralai District whereas Zhob River and its tributaries are the main sources of surface water for Qila Saifullah district. Since all these sources of surface water are ephemeral in nature therefore ground water is another source which is extracted with the help of wells and tube wells both electric and diesel operated.

91. In order to evaluate the water quality, water samples both from surface and ground water have been collected from the representative locations described as below:

1. Surface water sample at Qila Saifullah
2. Drinking water sample taken from pumps near Killi Chappali near Loralai
3. Surface water from Pathan kot Lake

92. The summary of the chemical tests of the water samples taken from the location as stated above are given in table below:

***Table 4-9: The summary of the Chemical tests of the water samples***

| S. No. | Parameters | Units | NSDWQ | Concentration | | | Method |
|---|---|---|---|---|---|---|---|
| | | | | Qila Saifullah | Killi Chappali | Pathankot Lake | |
| 1 | pH Value | | 6.5–8.5 | 7.14 | 7.62 | 7.62 | pH Meter |
| 2 | Total Dissolved Solids | mg/l | <1000 | 780 | 690 | 430 | Evaporation |
| 3 | Total Suspended Solids | mg/l | <5 | <5 | <5 | <5 | Hach Method 8006 |
| 4 | Chloride | mg/l | <250 | 51.12 | 124.96 | 22.7 | Hach Titration |
| 5 | Total Hardness | mg/l | <500 | 200 | 190 | 115 | Hach Titration (EDTA) |
| 6 | Nitrate | mg/l | <50 | 5.3 | 6.8 | 4.7 | Hach Method 8039 |
| 7 | Nitrite | mg/l | <3 | 0.009 | 0.020 | 0.016 | Hach Method 8507 |
| 8 | Fluoride | mg/l | <1.5 | 0.55 | 0.48 | 0.82 | Hach Method 8029 |
| 9 | Sulphate | mg/l | …….. | 240 | 164 | 47 | Hach Method 8051 |
| 10 | Residual Chloride | mg/l | 0.5 | BDL | BDL | BDL | Hach Method 8021 |
| 11 | Bicarbonate | mg/l | …….. | BDL | BDL | BDL | Hach Titration ($H_2SO_4$) |

NSDWQ = National Standards for Water Quality
BDL = Below Detection Limit

93. The summary of the microbiological tests of the water samples taken from the location as stated above are given in table below:

***Table 4-10: The summary of the Microbiological tests of the water samples***

| S. No. | Parameters | Recommended Value | Results | | |
|---|---|---|---|---|---|
| | | | Qila Saifullah | Killi Chappali | Pathankot Lake |
| 1 | Total Colony Count | <500 cfu/ml | $2x10^3$ cfu/ml | $3.6x10^4$ cfu / ml | $2.5 \times 10^3$ cfu/ml |
| 2 | Total Coliform | 0 cfu / 100 ml | 13/100 ml | 300 / 100 ml | 260/100 ml |
| 3 | Total Faecal Coliform | 0 cfu / 100 ml | 0 / 100 ml | 94 / 100 ml | 09 / 100 ml |
| 4 | Faecal Streptococci | 0 cfu / 100 ml | 0 / 100 ml | 0 / 100 ml | 0 / 100 ml |

* Recommended Values as per WHO / USEPA for Drinking Water.

94. In order to re-assess the groundwater potential of Pishin, Nari, Zhob, Porali, Hamun-e-Lora and Kachhi Plain basins, a study was sponsored by the Asian Development Bank and undertaken by Halcrow in 1996. It revealed that available groundwater in Pishin Lora, Nari and Zhob basins is limited and that groundwater mining is taking place from aquifer storage in Quetta, Mastung, Mangochar, Pishin, Loralai and Qila Saifullah sub-basins. Following table 3.2 shows the water balance in these sub-basins.

***Table 4-11: Groundwater balance in basins of Balochistan***

| Basin | Sub-basin | Recharge (cusecs) | Extractions (cusecs) | Drawn out of storage (cusecs) |
|---|---|---|---|---|
| Pishin Lora | Quetta–North | 38.4 | 67.2 | 28.8 |
| Pishin-Lora | Mastung | 21.8 | 31.7 | 9.8 |
| Pishin-Lora | Mangochar | 10.0 | 24.7 | 14.7 |
| Pishin-Lora | Pishin | 28.5 | 84.0 | 55.5 |
| Nari | Loralai | 63.2 | 74.8 | 11.6 |
| Zhob | Qilla Saifullah–West | 41.3 | 59.4 | 80.1 |

Source: ADB. Halcrow: *Baluchistan groundwater assessment* (1996).

95. A review of the above table shows that both districts are water deficient i.e. extraction of water is more than its recharge. The ground water quality is generally defined in table given below:[1]

[1] Source: Pakistan – Development of a Research programme in Irrigation and drainage.

**Water quality: various sources**

| Source | Salinity (ppm) | pH | Cations (me/l) | | | Total | Anions (me/l) | | | | Total | SAR | RSC* (me/l) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | $Ca^{++}$ + $Mg^{++}$ | $Na^{+}$ | $K^{+}$ | | $CO_3$ - | $HCO_3$ | Cl | $SO_4$ | | | |
| Karezes | 512 (385 - 662) | 7.8 | 7.1 | 2.14 | 0.07 | 9.31 | 0.17 | 4.62 | 1.46 | 3.04 | 9.29 | 1.14 | - |
| Springs | 491 | 8.2 | 14.7 | 2.15 | 0.07 | 16.92 | 0.80 | 3.70 | 1.25 | 11.17 | 16.92 | 0.79 | - |
| Shallow wells | 370 (415 – 2 771) | 7.7 | 9.63 | 4.60 | 0.075 | 14.31 | 0.16 | 4.64 | 2.36 | 7.16 | 14.32 | 1.92 | - |
| Deep wells (WAPDA wells) | 588 | - | 5.06 | 1.75 | - | 6.81 | - | 4.57 | 1.18 | 1.05 | 6.80 | 1.10 | - |
| Flood water | 116 (97 – 138) | 7.4 | 2.9 | 0.18 | 0.25 | 3.33 | - | 2.49 | 0.51 | 0.29 | 3.29 | 0.14 | - |

* Residual sodium carbonate
Source: Government of Baluchistan (1986).

### 4.1.4 Topography

96. Topography of the project area is predominantly mountainous. The distinct topographic features of the districts Loralai and Qila Saifullah (project area) are defined as under:

***Qila Saifullah District***

97. The greater part of the district Qila Saifullah is covered with hills and rocks, intersected on the south by the Zhob valley, which is a alluvial plain extending from Kan Mehterzai pass onward to the Gomal River in the form of a crescent. Qila Saifullah is at an elevation of 1,550 meter above mean sea level (masl). The hills of the district belong mainly to the Toba Kákar range. The Toba Kakar range is a semi-arid mountainous range with an average elevation of 2,400 meters (at an altitude of about 8,700 feet above mean sea level (masl).

98. The district consists mainly of rock outcrops and very patchy cover of heterogeneous soil material of the western mountainous regions. In some parts of Muslim Bagh tehsil of the district the soil is mainly loamy, part gravely valley-fill with some rock outcrops and some sand dunes (Camborthids and some Lithic Camborthids). Soil in all the remaining area of the district is made of rock outcrops and is loamy, very shallow steep high mountain soils of mainly arid and semi-arid zone (rock outcrops and Lithic Camborthids).

***Loralai District***

99. The district belongs to the north east Zhob – Loralai basin and is surrounded by mountains on all sides. It consists of mountainous areas and valleys running through various ranges. The valleys contain alluvial accumulations while the formation of various hill ranges consists of earth, sand and limestone. Some portions are rocky. The hill ranges consist of rugged mountains varying in elevation from 924 to 3100 m. The main range is the Sulaiman range which runs from the Gomal River in the north to the Indus in the south. It stretches through the district on the east in one continuous chain of mountain peaks. The other prominent ranges are Kerasar range in the west of the district, Murdarghar on the north of Sinjawi, Sialu which forms the south-west boundary of the Thal plain, Dubbai on the northwest corner of the same plain, Kru in the centre of the district and Gadabar which forms the boundary of the Bori valley. The Bori valley formed by the Damanghar and Kru ranges lie in the north of the district running east to west. The next important valley is the Thal Chotiali valley which is so low and flat that when viewed from the neighboring hills, it looks like an inland sea.

100. The valleys consist of alluvial soil, favorable for agriculture purposes.

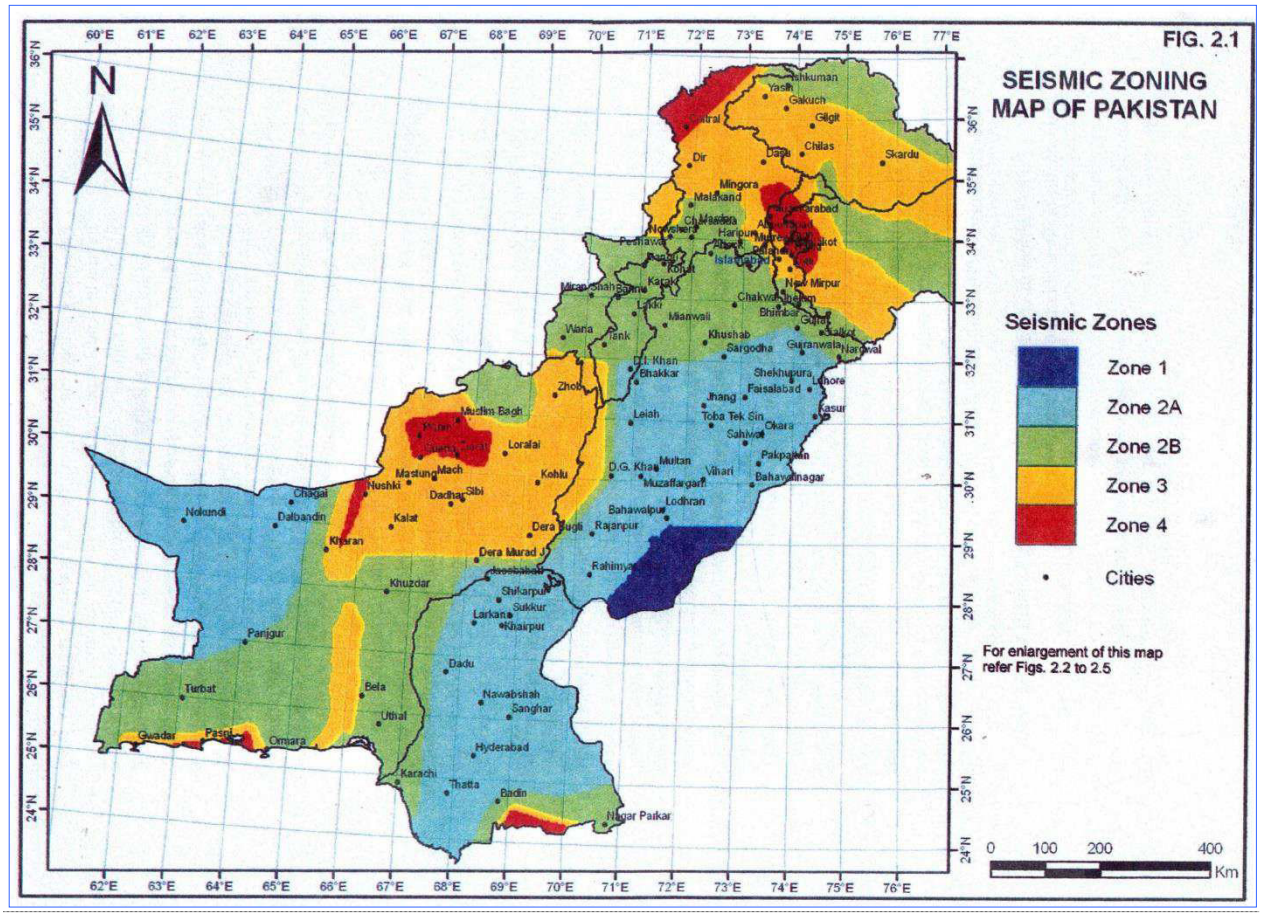
### 4.1.5 Geology and Seismology of the Project Area

101. Balochistan is the only province where three major tectonic plates, viz Indo-Pakistani, Afghan portion of Eurasian, and Ormarian plate meet together to produce the triple plate junction within the county. Ormarian plate is a newly discovered triangular piece broken off from the Arabian oceanic plate. The mountain ranges of Balochistan consist chiefly of Cretaceous and Tertiary beds, which are thrown into a series of folds running approximately parallel to the mountain ridges.

102. The Project area lies in the Chaman Fold which is a major left-lateral strike-slip fault that accommodates a significant amount of the slip across the plate boundary. The area comes under zone 3 and zone 4 of the seismic zone map of Pakistan as shown in the map below. The zone 3 and zone 4 are high risk zones with major tectonic faults.

103. The sedimentary and volcanic rocks of the Project Area belong to Mesozoic age and the ophiolites and mélange rocks or zones (found mainly in Qila Saifullah district) belong to late Mesozoic and tertiary age. Wulgai Formation in Muslim Bagh Qila Saifullah is made up of shale and limestone and belongs to early to late Triassic age. The Nisai Formation composed of limestone, shale and marl belongs to Eocene to Oligocene age. The Dungan formation in Loralai district is composed of limestone and marl conglomerate of Paleocene to Eocene age as shown by final evidence.

***Figure 4-1 Seismic Zone Map of Pakistan***



## 4.2 Ecological Resources

104. The project is located in Koh-e-Sulaiman Range area, which is rich in biodiversity due to wide variations in physical features and climate. Among the faunal species endemic to Koh-e-Sulaiman/Balochistan, the most dominant are Markhor, Chinkara, Black Bear, leopard and Afghan Urial, which are mostly found on the hill tops. But none of the said species has been encountered in the project's area of influence. The most prominent species of trees in the district are Acacia, Prosois, Olive and Tamarix. The flora and fauna of two districts of Loralai and Qila Saifullah of the project area are tabulated as below:

***Table 4-12: Description of Project Area Flora***

| Sr. No | Qila Saifullah | | Loralai | |
|---|---|---|---|---|
| | **Common Name** | **Scientific Name** | **Common Name** | **Scientific Name** |
| 1 | Showan | Olivea cusedata | Juniper | |
| | Shung | Wild ash | Pistachio | |
| | Ghaz | Tamarix galica | | Acacia Modesta |
| | Willow | Salix alba | Khinjak | |
| | Wild Pistachio | Pistacia khinjuk | | Glidetovbia Tricanthois |
| | Juniper | Junipers macropoda or excelsa | Alder | Ulnus Pennataramosa |
| | Wild Olives | Olea ferruginea | Phulai | Acacia Modesta |
| | Ash | Fraxinus xanthoxyloides | Tamarisk | Tamarix |
| | Tamarisk | Tamarix sp. | Chilghoza | Pinus gerardiana |
| | Babul | Acacia sp. | Kail | Pinus wallichiana |
| | Khar | Haloxylon sp. | | |
| | Small Rose | Rosa sp. | | |
| | Wild tulips | Liriodendron tulipifera | | |
| | Wild Rhubarb | *Rheum* sp., | | |
| | **Irrigated Plantation** | | | |
| | *Lachi* | Eucalyptus | | |
| | *Sufaida* | Poplar | | |
| | *Toot (*mulberry) | *Morus macroura* | | |
| | *Bakain* | Melia azedarach Linn | | |
| | *More pankhi* | *Thuja orientalis* | | |
| | Quetta pines | Pinus sylvestris | | |
| | **Bushes** | | | |
| | *Peesh* | Pheonix | Gangu | Orthonopsis Intermedia |
| | Kaka mush | Artemisia sp. | Gandenae | Nerium Ordorum |
| | | | Leghunae | Daphne Oleoides |
| | | | Tirkha | Artemisia |
| | | | Makhae | Caragana |
| | | | Oman | Ephedra |
| | | | Khabal | Cynodon Dactylom |
| | | | Dab | Desmostachya Bipinata |
| | | | Harnal, Spand | Peganum Barmala |
| | | | Lana | Haloxylon Griffithi |
| | | | Surai | Rosa Beggeriana |
| | | | Mazari | Nannborbops Ritehiana |

***Table 4-13: Description of Project Area Fauna***

| Sr. No | Qila Saifullah | | Loralai | |
|---|---|---|---|---|
| | **Common Name** | **Scientific Name** | **Common Name** | **Scientific Name** |
| | **MAMMALS** | | | |
| 1. | Suleiman Markhor | Capra falconeri | Wolf | Canis lupus |
| 2. | Afghan Urial | Ovis orientalis cycloceros | Jackal | Canis aureus |
| 3. | Asiatic black bear | Ursus thebetanus | Hyena | Hyaena hyaena |
| 4. | Wolf | Canis lupus | Fox | Vulpes vulpes and V. cana |
| 5. | Hyena | Hyaena hyaena | | |
| 6. | Fox | Vulpes vulpes and V. cana | Markhor | Capra falconeri |
| 7. | Pallas Cat | Felis manul | | |
| 8. | Steppe wild cat | F. sylvestris | | |
| 9. | Ornate and stone martin | Martes foina | | |
| 10. | Porcupines | Hystrix indica | | |
| 11. | Leopard | Panthera Pardus (now extinct) | | |
| 12. | Pika | Ochotona rufescens | | |
| 13. | Afghan mole vole | Ellobius fuscocapillus | | |
| 14. | Jackal | Canis aureus | | |
| | **Reptiles** | | | |
| 15. | Horned viper | | | |
| 16. | Leafnosed viper | | | |
| | **Birds (over 80 species of birds are found in Torghar conservation Area.)** | | | |
| 17. | Chikur | | Chikur | |
| 18. | See partridge | | Partridges | |
| 19. | Houbara Bustard | | See see | |
| 20. | Falcon | | Sand grouse | |
| 21. | Cranes | | Kharghat | |
| | | | Geese | |
| | | | Ducks | |
| | | | Eurasian cranes | |
| | | | Demoiselle cranes | |

### 4.2.1 Protected Areas

105. There are no state owned protected areas in Qila Saifullah and Loralai Districts but Torghar Conservation Area is a community owned conservation area located on the western side of Loralai city at a distance of about 75 km. This is a sanctuary to straight horned Markhor and Afghan Urial and other wildlife. This sanctuary is not situated within 500m of the Project area and hence will not be affected by construction activities.

### 4.2.2 Hydrology and Drainage

106. Although floods caused by the hill torrents are not very common in Loralai district, sometimes with heavy rains hill torrents take up formidable size, causing loss of cattle and property. Necessary cross drainage provision have been made in project during the design stage to ensure the drainage without effecting the safety and functional durability of the project road and to avoid flooding of the road adjoining areas up and down stream.

107. Sufficient embankment protection for erosion are considered and provided in design in order to meet the requirement of cross drainage without effecting road traffic.

### 4.2.3 Agriculture and Horticulture

108. The two districts under the influence of the Project are basically rural and agriculture and livestock breeding is the major occupation of the people of the districts. Following table gives the list of all agriculture and horticulture crops of the two districts of area of influence of the Project:

***Table 4-14: List of agricultural and horticultural crops of two districts***

| Sr. No. | Season | crops | |
|---|---|---|---|
| | | **Qila Saifullah District** | **Loralai District** |
| 1 | Rabi Season | Wheat, barley, cumin | Wheat, barley, vegetables and fodder. |
| 2 | Kharif Season | Potato, onions, tobacco, maize, onions, melons, chilies, jowar and pulses. | Fruits, chilies, onions, fodder, maize, jowar. Potato and other vegetables. |
| 3. | Cash Crops | Tomatoes, almonds, cherries, grapes, apricots, pomegranate, pulses and sunflower. | Apples, Apricots, almonds, pomegranate, peach and grapes. |

109. A lot of land in both districts is range land; this facilitates livestock breeding and development. In livestock farming areas about 80 percent of the households make a living out of raising small ruminants. These livestock farmers own tiny plots of irrigated land. Children and men are livestock grazers. However, women are involved in a variety of livestock activities. They feed the animals and care for them by traditional methods. They keep their areas clean and prepare dung cakes which are used as fuel.

110. Spate irrigation is major source of water for irrigation purposes and includes both flood irrigation system (*Sailaba spate irrigation*) and rain-fed irrigation (*Khuskaba spate irrigation*). Total area under the two types of irrigation in both districts is given in the following table:

***Table 4-15: Land Irrigated by Spate Irrigation***

| Sr. No. | District | Sailaba Irrigation | Khuskaba irrigation |
|---|---|---|---|
| 1 | Qila Saifullah | 7,047.1HA | 9,265HA |
| 2 | Loralai | 13,250HA | 39,503HA |

### 4.2.4 Sociocultural Environment

111. The Project road connects two districts of Balochistan province—the Qila Saifullah and Loralai district. Both districts are basically rural with only 13.1% of population of Qila Saifullah and 11.8% of population of Loralai district being urban. Qila Saifullah district has four tehsils—Baddini, Qilla Saifullah, Loiband and Muslim Bagh. There are a total of 15 union councils in Qila Saifullah district. Loralai district is divided into 3 tehsils—Duki, and Bori and 20 union councils. Following table gives the socio-economic indicators of the both districts:

***Table 4-16: Socioeconomic Indicators***

| Sr. No | Indicator | Qila Saifullah District | Loralai District |
|---|---|---|---|
| 1 | Area | 10,609 sq km | 9,933 sq km |
| 2 | Population | 193,553 (as per 1998 census) | 295,555 (as per 1998 census) |
| 3 | Total black topped road | 220 km | 330km, (138 km Provincial highways, 142 km National Highways, 50 km farm to Market roads. |
| 4 | Shingle roads | 186km | 209 km |
| 5 | Household size | 7.0 persons | 7.4 persons |
| 6 | Houses with piped water | 13.5% | 54.2% |
| 7 | Houses with electricity | 41.2% | 60.6% |
| 8 | No. of industrial units | none | None |
| 9 | Major tribes | Pashtoon belonging to Kakar Tribe, Kakars, Jogezai | Jogezai, Naser, Tareen, Buzdar, Dumar and Kakars |

112. The Project Road will provide better communication facilities for people living in the districts of Qila Saifullah and Loralai and all the small villages and human settlements along the Road alignment will be benefited the most. The Project Road will help in socio-economic development.

### 4.2.5 Ethnicity and Tribes

113. The Pushtuns constitute an overwhelming proportion of the population in the **Qila Saifullah District** while the remaining include Punjabis, Balochs, Brahvis, Sindhis, Hindko, Saraiki and others. Pushto is spoken in 98.9 percent of the households in the district. Most of the Pushtun population belongs to the Kakar tribe. Kakars living in Qila Saifullah district are divided into two major sub-tribes: Sanzarkhels and Santia. The major branches of Sanzarkhel Kakars in the district include Jogizai, Rahatzai, Sargarhi, Mehterzai, Jalalzai, Musazai, Malaizai, Mardanzai, Akhtarzai, Faqirzai and Allozai while the major branches of Santia Kakars include Mehterzai, Sultanzai, Mullazai and Bakalzai.

114. Muslims constitute the majority of the population in **Qila Saifullah District** while the remaining population includes Christians, Ahmadis, Hindus, Parsis, Sikhs, Buddhists and others. In Qila Saifullah, sectarian violence is minimal as most of the people belong to the *Sunni* sect of Islam and believe in the *Hanfi* interpretation of the *Shariah*. Generally, the people have a religious attitude and practice Islam according to its fundamental principles. Inheritance is divided according to the Islamic principles and daughters are given their property rights accordingly.

115. The population of **Loralai District** consists of heterogeneous tribes, but their language, customs and tradition are more or less the same. The major tribes are, Kakar, Luni, Tareen, Nasir, and Nasar, the other tribes are Shadozai, Dumer, Humzazai, Utmankhail, Sarghah, Zakhpal, Jogazai, Jalazai, Vanchi, and Peechi.

116. 90% of the population is Pashtu speaking, 5% speak Balochi and the remaining 5% are other languages including Urdu.

117. The majority of the people are Muslim, with the exception of a few Christians and Hindus. Wrestling, egg striking, target shooting, folk dances, are arranged to celebrate festivals such as Eid.

### 4.2.6 Occupations

118. Agriculture and its allied livestock farming is major occupation of the population of both districts. In **Qila Saifullah** district, mineral mining is also an important economic activity. Major minerals found in the district include Chromite, magnesite, asbestos, granite, marble and gabro. Some semi precious gemstones have also been discovered in the district. There are indications of presence of coal, salt, saltpeter, soapstone, limestone and calcite deposits in the district.

119. Nearly 75% of population of **Loralai** district is engaged in agriculture and livestock farming. Mineral mining plays a major role in the economy of Loralai district. Major minerals being mined in the district are coal, gypsum, calcite and marble, whereas oil is being explored in the district.

### 4.2.7 Health Care Facilities

120. The district administration of health services is headed by a District Health Officer. In its supervising capacity, the DHO Office can play an important role in the effective and efficient functioning of hospitals and dispensaries. Following table gives the number of health facilities available in the district:

***Table 4-17: Health Care Facilities***

| Health Facilities | Qila Saifullah | Loralai |
|---|---|---|
| | Number | Number |
| Hospitals | 02 | 02 |
| Dispensary | 16 | 03 |
| RHC | 01 | 03 |
| BHU | 09 | 27 |
| MCH Centre | 01 | 05 |
| TB Clinic | 0 | - |
| Family Welfare centers | 03 | 07 |
| Sub Health centers | 03 | 0 |

### 4.2.8 Educational Facilities

121. Formal schooling in Pakistan has three stages: primary, middle and secondary or high school, and runs for a total period of 10 years. Following table gives the number of schools in the district (1995 figures)

***Table 4-18: Educational Facilities***

| Educational facilities (1995) | Qila Saifullah for boys/girls | Loralai for boys/girls |
|---|---|---|
| Mosque | 71 | Data not available |
| Primary | 222/54 | 416/73 |
| Middle | 16/4 | 38 |
| High | 8/3 | 11 |
| College | 1 | 1/1 |
| Vocational Institutes | 0 | 0 |

### 4.2.9 Archeological Sites

122. Qila Saifullah is a fort built by the founder of Qila Saifullah District (Saifullah Khan), it is an important archaeological remain of the area. The district has some archaeological sites mainly attributed to the Mughals. The ruins of an old fort called Mughalo Qila or “the fort of the Mughals” were found to the west of the Karezgai village, about 3.25 km from Muslim Bagh, below which there is a spring of water which was reopened about 125 years ago. Fragments of ancient pottery were found in these ruins and it is said that old silver and copper coins were also found. The ruins of a fort called Khanki lie near Shina Khura about 25 kilometres east of Muslim Bagh. Local tradition asserts that the fort was held by Miro, a Mughal governor, who was miraculously overthrown by Sanzar Nika, the progenitor of the Sanzarkhel Kakars. There are also ruins of an old fort called the Mughalo Brunj in Murgha Faqirzai. Similar ruins occur near Toiwar, Sharan, Ismailzai and on the Zhar hill near Akhtarzai. There also exist ancient karezes, said to have been made in Mughal times, which may be considered as relics of archaeological interest. These include Karez Akhtarzai, Karez Soghai and Mustafa Karez in Qila Saifullah sub-division and 2 karezes in Sra Khulla, about 6.5 km from Muslim Bagh.

123. Khan Mehtarzai Railway station the highest railway station in the world is another local attraction.

124. Rana Ghundai is located 16 km north of Loralai Town on the road to D. G. Khan. Discovered and excavated in 1927 is a cultural heritage site. Sur Jungal is located 8 km northeast of Sinjawi Town in Baghave Valley on the road to Duki. Discovered and excavated in 1927. Dabar Kot located 18 km northeast of Duki Town at the plain, on the right side of the road to Kohlu. Chinjan located 68 km southwest of Loralai are all prehistoric caves of the district.

125. Mughal Qila, Tordheri site, Tordheri, Loralai, high cound Dabarkot, Loralai and prehistoric mound Harian Haider Zai Loralai are protected cultural heritage sites of the Loralai district.

# 5. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

## 5.1 Introduction

126. This chapter deals with the anticipated environmental impacts of the Project Road and their mitigation measures to prevent or alleviate the environmental impacts to maximum possible level during design, construction and operational phases of the Project.

## 5.2 Project Corridor

127. The proposed Project corridor is defined on the basis of Corridor of Impact i.e. the width of the corridor that will be impacted, directly or indirectly by the proposed Project during construction and operational phases.

## 5.3 Project Right of Way

128. The Proposed Project will have a Right of Way (ROW) of 55ft exist from Km 0+00 Qilla Saifullah to Km 24+200 and 110 ft ROW is available from Km 24+200 to Km 67+300. It has been proposed that the ROW may be restricted where the alignment passes through built up areas. This has been done to minimize land acquisition and resettlement problems.

## 5.4 Corridor of Impact

129. Corridor of Impact (CoI) was delineated as the extent, which has direct or indirect impact of Project. Direct impacts of the Project, caused by relocation, are envisioned within the ROW and construction limits. Indirect impacts caused by noise, dust emissions, location of camp sites, and source of construction material construction material storage areas etc.

## 5.5 Potential Impacts and Mitigation Measures during Design Phase

### 5.5.1 Topography

130. The topography along the Project Area will change to some extent because of construction of Project related structures such as embankments, culverts etc. Visual changes to the topography will be of permanent and minor in nature and do not require any mitigation measures, except that the Project design should consider aesthetic concerns.

### 5.5.2 Formation Width in Built-up Areas

**Impact**

131. The formation width in built-up areas may result in creating hindrance to market opportunities, loading and vending activities for the locals. This impact is temporary and minor negative in nature. The severe impact of formation width on built-up area with respect to effects as discussed above may be in the area where the alignment is passing through Loralai city which is the main hub of economic activities of the area.

**Mitigation Measures**

132. Mitigation measures will include:

- Flexibility in design is adopted in built-up area to avoid resettlement and to avoid hindrance in local market activities.
- The separate cross sections have been prepared and adopted for the section of the road passing through built-up area.

### 5.5.3 Land Acquisition and Resettlement for ROW

**Impact**

133. As the proposed project's alignment follows the alignment of the existing road with adequate ROW available, hence no land acquisition is envisaged. The Project Road alignment terrain in Qila Saifullah is mountainous with average altitude ranging between 2294 to 1146 m above mean sea level. In Loralai District it is plain with scattered agricultural activity (crop cultivation and orchards), where the adjoining landowners have encroached upon the existing ROW limits. Similarly, near settlements the ROW has been encroached upon for residential/commercial structures. Clearance of ROW in encroached sections will have resettlement impacts for encroachers that need to be mitigated for the smooth implementation of the project.

**Mitigation Measures**

134. All losses will be compensated in accordance with the involuntary resettlement safeguard requirements of ADB's SPS (2009).

### 5.5.4 Change in Hydrologic Regime

**Impact**

135. The proposed road runs in east west direction and the natural fall of the area is also towards Indus River in east. Therefore the direction of the natural follow of the area is along the road. Due to variation in ground elevation and natural direction of fall, chances of flooding around the road embankment are minimum. However, necessary embankment protections are required to avoid the erosion of road embankment and washout of road surface.

**Mitigation Measures**

136. At the detailed design stage the safety of proposed road against the damage due to hydraulic regime has been considered and ensured that the design has been checked for maximum probable flood and there damaging effects due to higher velocity etc. Necessary erosion protection and cross drainage structure including culvers and bridges have been incorporated in design.

### 5.5.5 Seismicity

**Impact**

137. As stated earlier, the Project Road falls under zone 3 and zone four of the seismic zone map of Pakistan. This means that the Road will suffer heavy damage if it is designed without consideration of seismic activity. This would be permanent and major negative impact.

**Mitigation Measures**

138. At the detailed design stage, the safety of the proposed Road against the damages due to seismic activity has been ensured. The design has been checked against expected seismic factors in view of the seismic and geological record of the area. However Zone 3 and zone 4 parameters were adopted for the design of all structures and road.

### 5.5.6 Flora and Fauna

**Impact**

139. The Road alignment mostly passes through barren mountainous lands without too many trees and no tree will be cut. The alignment of the existing road passes very near to some fruit orchards, cultivated areas and green fields. The road does not pass through or near to any wild life habitats and hence will have no impact on the fauna.

**Mitigation Measures**

140. A sum of Rs. 15 million for tree plantation near human settlements has been earmarked.

### 5.5.7 Road Safety

**Impact**

141. The increased vehicular traffic and speed on the rehabilitated road may result in road safety issues like traffic accidents. The accidents may also be due to tiredness of the drivers. This impact will be major and negative in nature.

**Mitigation Measures**

142. These impacts will be mitigated by providing traffic signs to facilitate road users about speed limits for light and heavy vehicles. All lanes and sharp bends will be reflectorized to facilitate travelers at night. Phone numbers to be contacted in an emergency shall be displayed at intervals. Necessary highway safety features have been incorporated in design to address safety issues. Provisions have been made for rest areas to be provided every 60 to 70 km; a total of three rest areas shall be provided. In addition bus stops shall also be provided to cater for the needs of the buses and their passengers.

### 5.5.8 Historical/ Archeological Sites

143. Although there are a few historical and archeological sites located in Loralai District (as discussed in section 4.2.9), however no such sites are located within 200 m of the proposed construction activity.

## 5.6 Potential Impact and their Mitigation during Construction

### 5.6.1 Clearing of Right of Way

**Impact**

144. Clearing of ground for ROW, cutting and filling and rehabilitation of existing pavements will be a major construction activity. The topography along the Project road will change to some extent because of filling and cutting of hills, filling and construction of project related structures.

145. In the hilly terrain of the project area, the widening of the carriageway will necessitate cutting of hillsides, which will destabilize the slopes. If not managed properly, the unstable slopes will be a continuous hazard (landslides, rockfalls) for road users. Visual changes to the landscape will have no mitigation measures, but the project design should consider aesthetic concerns. In plain areas of the project area, the construction limit/ROW clearing near roadside settlements and agricultural farms will have adverse impacts on the privately owned properties established by encroaching upon the ROW.

**Mitigation Measures**
146. In the hilly terrain of the project area, in order to avoid landslides, land stabilization in form of retaining walls has been included in the project design. In order to ensure slope stabilization, hill cutting will be done in steps (bench cutting).

147. In plain areas, all losses to private property (if any) will be compensated in accordance with SPS (2009).

### 5.6.2 Public Utilities

**Impact**
148. NIL.

### 5.6.3 Location of Construction Camps and Other Facilities

**Impact**
149. It is anticipated that construction will require a minimum period of 30 months or more. The location of construction camps and other facilities such as workshops, equipment washing yards, asphalt plants, batching plants and construction material storage areas and the workers and their associated impacts and changes can have significant impacts on the local communities and social infrastructure if established nearby or adjoining existing settlements. This may also include social disruption due to the presence of outside workers in the contractos staff. Water supply and discharges, solid waste generated, and storage of plant and materials for the construction camps may interfere with local residents and their ecosystems.

**Mitigation Measures**
150. FIDIC based contract documentation include provisions for the safe provision of construction camps, restoration of natural conditions upon completion of the Project, secondary water treatment facilities, proper disposal of solid waste, minimum interactions with local communities, deep well boring to provide water for their own use and at the end handing those wells over to the local residents, and other matters. Wherever possible, local communities must be involved and/or hired by the contractors for identifying camp locations and sharing resources with construction workers. In addition, it is suggested to have meetings with local elders for smooth working throughout the construction activities. In this way, a sense of ownership will be developed in local residents to encourage their protecting the highway assets and looking after their interests and related resources.

151. Non local workers may not be aware of local customs, traditions, and history. Awareness about the local culture and observances (particularly with regard to women, religious concepts and sectoral background, political affiliations, and the cultural system) is required to avoid incidents. Sites of social, religious, or historical significance should be marked and information disseminated to the staff to avoid damage or desecration. Graveyards in the area must be identified to ensure due care and diligence to ensure they are given consideration and respect.

152. All dangerous materials (fuel, chemicals, and welding materials) used and stored on site should be placed in secured and safe premises. Loading and transferring of fuels, solvents, and lubricants should be carried out in a way to control all possible potential spills. Storage areas shall be equipped with warning signs displaying potential impacts, such as fire and other hazards.

### 5.6.4 Soil erosion and Contamination

**Impact**
153. Since the terrain of the Project is mountainous and consists mostly of hard rock hence soil erosion and contamination will be a very minor consideration.

**Mitigation Measures**
154. Good engineering design will ensure erosion protection of the embankment. Effective mitigation measures and sound environmental management practices will be specified in the contracts to ensure minimum soil erosion and degradation if and where required.

### 5.6.5 Borrow Areas and Open Pits

**Impact**
155. Construction material for the Road is easily available along entire length of road. Material for sub-base, base and aggregates can be obtained from adjacent mountains, from river/nullah beds and can be used after screening and crushing as the case maybe. There are three crushers located along the roadway which can provide aggregate for base, concrete and asphalt. Fine aggregates are also available in river and nullah beds.

156. Borrow/ open pits and its excavation activities may result in land disputes, soil erosion, loss of potential cropland, loss of vegetation, landscape degradation, and damage to road embankments. Borrow/ open pits may also become potential sources of mosquito breeding and may prove hazardous to human beings, livestock and wildlife. This will also degrade hygienic condition of the Project Area. This impact is permanent and moderately adverse in nature.

**Mitigation Measures**
157. The material obtained from cutting of rock and other excavations should be used in construction as much as possible. Only approved, licensed quarries to be used and the site for borrow areas should be selected on the basis of type of soil strata, depth of water table, ground topography, prevalent vegetation state etc.

### 5.6.6 Top Soil Conservation

**Impact**
158. For constructing roads on new alignments and/or for new borrow pits or quarries, it is a normal practice to strip off the fertile surface layers of soil, if present, and to store this material until construction is complete. This "top fertile layer" is then used to help restore borrow pit areas. This practice of stripping and storing this fertile material will be done in areas where the highway is built and/or expanded on fertile lands. The requirement to store this material for reuse can result in agricultural land being used unnecessarily. If the material dries up, it will be blown away as dust and thereby damage crops.

**Mitigation Measures**
159. The storage areas will be carefully selected to minimize crop damage and precautions (i.e., constant watering of this layer) will be taken to avoid the material's drying out and being blown away.

### 5.6.7 Obstruction of Drainage System in Project Corridor

**Impact**

160. Following impacts will need mitigation measures:

- The natural streams and irrigation channels may become sited by borrow material (earth) in the runoff from construction areas, workshops and equipment washing yards.
- Highway embankments tend to restrict cross-country drainage, causing the land on either side of the embankment to flood in case of heavy rains.
- Surface run-off from impervious surface of carriageway can further aggravate the flooding of embankment sides.

**Mitigation Measures**

161.
- Cross drainage structures should be adequately maintained otherwise, culverts and water channels tend to choke with debris and corroded soil, adversely affecting agricultural lands.
- New cross drainage have been provided at appropriate locations at highway embankments, intersecting rivers, natural streams and canals to protect nearby agricultural lands and settlements from flooding.
- Embankment slops have been protected through either stone pitching or vegetation.
- Median drains with outlets leading into either natural streambeds or open areas when no natural stream beds are available nearby.

### 5.6.8 Air Quality

**Impact**

162. Air quality in the Project site and the surrounding area could be affected by dust generated during excavation, by movement of vehicles, or by gaseous emissions of vehicles and construction equipment.

163. Impact of air emission may be carried over long distances depending upon the wind speed, direction, the temperature of the surrounding air and atmospheric stability.

164. Emissions from crushers and quarry sites can cause health impacts, i.e. coughing, flu, difficulty in inhaling, irritation in eyes and reduction in visibility. This impact is temporary and minor negative in nature.

**Mitigation Measures**

165. Effective mitigation measures and sound environmental management practices will be specified in the contracts to ensure minimum air pollution. There are very few human settlements near the Project alignment and these too are sparsely populated. The residual impacts on these communities would be very little.

166. Spraying with water and covering the stockpiles are efficient means of controlling dust. Water is eventually to be added to fill material during construction of the road base. Watering of road surface under construction and compaction of other soil surfaces, and particularly in the vicinity of villages and haul roads, shall be undertaken regularly.

167. Other precautions to reduce impacts on air quality include to (i) properly cover trucks carrying spoil or construction materials to prevent spills and materials being blown away; (ii) fit

stone crushers, asphalt mix plants, and diesel generators with dust suppression equipment or emission control devices; (iii) locate stone crushers, asphalt mix plants, and diesel generators away from residential areas; and (iv) limit construction works that create noise only to daytimes.

168. The existing air quality of the Project Road alignment will only be disturbed during construction phase; once construction is complete the air quality will revert to its original condition. Due to construction of a bypass the air quality of Loralai City will not be disturbed at all.

### 5.6.9 Noise and Vibration

**Impact**

169. Noise producing activities include compaction using vibratory rollers, formation of sub-base, road base surfacing and associated drainage works, operation of concrete batching plants, asphalt plants, quarry areas, generators etc. Vibration may be caused by tire-road interaction of heavy vehicles. Traffic vibration is an issue where accessibility routes are in close proximity to sensitive buildings such as hospitals and schools. Vibration can also result in damage to buildings and to well being of neighboring population. Since the Project area is mostly barren with few human settlements and wildlife habitats noise and vibration will have very little negative impact. Tables showing the noise levels and their effect on human life and general noise levels of various types of machinery and different construction equipment are given below:

***Table 5-1: Maximum Limits of Noise Levels***

| Sr. No | Noise Level db(A) | Situation |
|---|---|---|
| 1 | 194 | Lung damage |
| 2 | 180 | Ear drum rupture |
| 3 | 150 | Absolute limit with ears protected |
| 4 | 150 | Maximum of instantaneous noise |
| 5 | 135 | Absolute maximum with ears unprotected |
| 6 | 100 | Prolonged noise causing permanent damage |
| 7 | 90 | Factory work for an 8-hour day, 5 days a week |
| 8 | *85 | Ear protection should be worn |
| 9 | 80 | Noise on building or construction sites |
| 10 | 70 | Normal road traffic near residential areas |

Source: *"Environmental Degradation"* by Engr. Col. Mumtaz Hussain.
*Above 85 dB(A) ear protection devices should be worn.

***Table 5-2: General noise levels of machinery***

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

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

***Table 5-3: Construction Equipment Noise Levels***

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

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

**Mitigation Measures**

170. The Contractor shall use plant and equipment conforming to the international standards and directives on noise and vibration. Noise will be kept to a minimum by avoiding construction during night time and by minimizing the use of noisy equipment. As most of the human settlements are more than 500m away from the existing road alignment, the residual noise impacts on the community will not be significant.

### 5.6.10 Water Quality

**Impact**

171. Loralai stream flows very near to the Project Road from Darazanda village from where the Project alignment starts going away from the River. The average distance of the River from the Project road is nearly 11m with 30m being the longest and 3m the shortest distance from the road. The stream/river is not perennial and is deficient in groundwater. Any stream flowing along the River bed run near the foot of the hills which is more than 300m from Road. Hence there will be no negative impact on the surface water. There are several sources which have the potential to contaminate local soil and water. These includes waste oil, run-off from vehicles/equipment, maintenance yards containing fuel and lubricants, accidental spills of fuel/lubricants/chemicals, and run-off from material stock piles that contain particulate matter.

**Mitigation Measures**

172. The fuel and chemical storage areas shall be located on an impervious base within an embanked area and secured by fencing. The area shall be big enough to house all lubricants and other liquid chemicals and the walls of the enclosure shall be impermeable.

173. Wastewater/effluent from contractor's workshop and equipment washing yards would be passed through gravel/ sand beds to remove oil/ grease contaminants before discharging it into natural streams

174. The solid waste will be disposed off in designated landfill sites to sustain the water quality for domestic requirements. Water quality shall be regularly monitored according to determined sampling schedule.

175. Following additional measures are proposed:

- The contractor should ensure that construction debris do not find their way into the drainage or irrigation canals which may get clogged;
- To maintain the surface water flow/drainage, proper mitigation measures will be taken along the road, like drainage structures in urban areas;
- Prohibit washing of machinery and vehicles in surface waters, provide sealed washing basins and collect wastewater in sedimentation/retention pond;
- Construction work close to the streams or other water bodies will be avoided, especially during monsoon period;
- Construct temporary or permanent devices to prevent water pollution due to increased siltation; and
- Wastes must be collected, stored and taken to approve disposal site.

### 5.6.11 Solid and Liquid Wastes

**Impact**

176. There will be several sources from which solid and liquid waste will be generated, namely; (a) worker camps, (b) construction site and (c) vehicle/equipment serving and maintenance yards. In the absence of proper waste management on site the impact of disposal of untreated waste to the environment will be significant.

**Mitigation Measures**

***Solid waste***

177. The contractor shall prepare a comprehensive solid waste management plan to collect, treat and properly dispose of the solid and liquid wastes generated from different construction activities

178. The Contractor shall collect and dispose off all solid waste in officially approved dumping sites and waste water from construction camps shall not be thrown in fields but shall be collected and disposed off in an environmental-friendly manner.

179. Aggregate waste material of existing road will be reused in up-gradation of road.

***Liquid Waste***

180. Sanitary wastes generating from staff and labor camps must be disposed off in environment friendly manner, i.e. provision of septic tank etc. for toilet wastes.

181. Different kinds of lubricants are used for oiling greasing and fueling of machinery and equipment. The most appropriate way to dispose of used lubricants is to send them back to suppliers. Apart from this the spillages from fuel and chemical storages also pollute the land. All

fuel and chemical storages shall be located on an impervious base within an earmarked area and secured by fencing.

### 5.6.12 Traffic Management

**Impact**

182. Traffic management will be an issue during construction due to increased traffic volume caused by movement of vehicles carrying construction materials. It will also increase the traffic load on the existing highway, thus deteriorating the existing condition of the highway. Since, during construction, existing highway will be operational for the traffic movement, therefore the traffic management will not be a major problem. This impact is temporary and minor negative in nature.

**Mitigation Measures**

183. Proper alternate traffic management plan should be prepared during rehabilitation of existing road which should be upgraded in phases. Proper traffic management with marking should be done on the existing road.

## 5.7 Potential Impact and their Mitigation during Operation

### 5.7.1 Air Quality and Noise

**Impact**

184. Improvement in road condition will help reduce traffic related emissions in the short term by allowing a smoother traffic flow. However, in the longer run, increased traffic levels may lead to higher values of emissions. This impact is permanent and two-fold. It is positive, in case of improvement of road conditions; and minor negative, when traffic volume increases also due to increase in traffic volume noise is expected to increase. This impact is permanent and minor negative.

**Mitigation Measures**

185. Air quality should be monitored along the Project Area in accordance with acceptable International standards. This can be done by monitoring emissions of vehicles as per NEQS and helping the owners and occupants of the affected premises to identify and implement special measures such as hedges and vegetation to reduce air pollution. Noise pollution shall not be an issue since the project Road mostly passes through barren uninhabited areas. The following table shows the NEQS for Motor vehicle exhaust and noise:

***Table 5-4: National Environmental Quality Standards for Motor Vehicle Exhaust and Noise***

| Sr. No | Parameter | Standard (Maximum permissible limit | Measuring Method |
|---|---|---|---|
| 1 | Smoke | 40% or 2 on the Ringelmann scale during engine acceleration mode | To be compared with Ringelmann Chart at distance of 6 meters or more |
| 2 | Carbon Mono-oxide | Emission Standard<br>New vehicles: 4.6%<br>Used vehicles: 6% | Under idling conditions:<br>Non dispersive in infrared detection through gas analyzer |
| 3 | Noise | 85dB(A) | Sound meter at 7.5 meter from the source |

Source: National Environmental Quality Standards (SRO 742(1), 29th August 1993.

### 5.7.2 Safety and Security

**Impact**
186. Improved carriageway will improve safety conditions and will reduce accidents and loss of lives due to better traffic movements. This impact is permanent and major positive in nature. In addition construction of rest houses and bus stops along the length of Road shall be an additional safety measure.

### 5.7.3 Deterioration of Vehicles

**Impact**
187. Improved road condition will result in less wear and tear to vehicles; it will also result in less fuel consumption. This impact is permanent and major positive in nature.

### 5.7.4 Community Development/ Commercial Activities

**Impact**
188. Improved road condition will promote better business opportunities such as new petrol pumps and hotels. In addition, such an activity will also increase the land value that will benefit the local residents. This impact is permanent and major positive in nature.

### 5.7.5 Time Saving

**Impact**
189. Due to increase in speed and undisturbed flow of traffic, traveling time will be reduced to go from one place to another. Trade will improve due to better transport opportunities. This impact is permanent and major positive in nature.

### 5.7.6 Avenue Plantation

190. Trees shall be planted as per NHA policy along the road alignment passing near human settlements or wherever the topography and terrain permit. Any tree that need be cut shall be replaced by planting two trees in its place. The Choice of trees and plantation patterns shall be according to NHA policy. Planting of trees shall be a major positive impact.

191. Following trees and shrubs can be planted to conserve water sheds:

**Trees**

Usmani (Ailanthus Alticima)
Singit (Elaeagnus angustifolia)
Mulberry (Murus Alba)
Shina (pistacia Khinjak)
Bakain (Melia azadirachta)
Farash (Tamarix Gallia)
Mesquite (Prosopis Juli flora)
Iranian Kikar (ceasal pinnae)

**Shrubs**

Quel salt bush (Atriplex lentiformis)
Four wing salt bush (Atrplex cana scens)

## 5.8 Potential Impacts on Socioeconomic Condition

### 5.8.1 Social and Cultural Problems

**Impact**

192. People will face minor exit/entry problems during the construction activities. This impact is temporary and minor negative in nature.

**Mitigation Measures**

193. Timely completion of the construction work and provision of alternate routes during the construction will effectively offset this impact.

### 5.8.2 Changes in nearby Land Values

194. Like every roads project the proposed project is likely to increase the land value due to improvement works of the road. The opportunity for land owner for higher prices of land in a result of project is very much there. The new road improves the accessibility of the area and attracts even the local development authorities to take the advantage of improved accessibility with the provision of the road. This scenario will result in increased economic activity, increase land value, etc.

**Impact**

195. The proposed Project is expected to increase the land values, especially in areas near the human settlements. Landowners will have an opportunity to utilize their land to its full potential or sell their land on increased prices and start a new business. This impact will be positive in nature.

### 5.8.3 Lifestyle and Culture

196. Change in local lifestyle and culture may occur when the local and migrant workers will come in contact during the construction works. With improvement in driving conditions and increase in land values, the local community will have the opportunity to travel to the more developed areas in Punjab and other parts of the country. Furthermore, improved connectivity will also promote the influx of immigrants to the project area from other parts of the province and country. Both these factors will bring new cultural values and economic opportunity to the Project area. This impact is permanent and minor positive.

### 5.8.4 Induced Ribbon Development

**Impact**

197. The areas near human settlements will be especially vulnerable to ribbon development, which causes road safety and infrastructure servicing problems and is usually associated with visual degradation. New industry tends to locate where land is available and infrastructure exists; highway corridors are natural choices. Road side commercial development takes place in response to speculation that improved access and greater visibility will bring more customers. Being, totally unplanned induced development proceeds without comprehensive consideration of impacts. Other infrastructure, especially that needed for waste management may not exist, social services may become overloaded, individual induced developments generates traffic, possibly overloading the very roads and highways which led to their existence in the first place. This impact is major negative in nature.

**Mitigation Measures**

198. Laws regarding ribbon development e.g. Highways Safety Ordinance 2000, this ordinance includes provisions for the licensing and registration of vehicles and construction equipment; maintenance of road vehicles; traffic control, offences, penalties and procedures; and the establishment of a police force for motorways and national highways charged with regulating and controlling traffic on the national highways, and keeping the highways clear of encroachments. This impact can also be mitigated by reducing templates near human settlements and vigilant monitoring to stop growth of any such development.

199. Detailed Environmental Management Plan is attached at Annexure IV of this Report.

# 6. ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

## 6.1 General

200. The Environmental Management Plan (EMP) is developed to eliminate and / or mitigate the impacts envisaged at the design, construction and the operation stages and provide specific guidelines for long-term monitoring by identifying the roles and responsibilities of the Proponent, Supervision Consultant, and Contractor(s).

201. Detailed Environmental Management Plan (EMP) attached as Annexure IV which ensures that the Project has no detrimental effect on the surrounding environment. The Plan shall act as a guideline for incorporating environmental measures to be carried out by NHA and contractors, as well as for other parties concerned for mitigating possible impacts associated with the Project and will form part of the Contract documents to be considered alongside the specifications. This Plan shall act as the Environmental Monitoring Plan during construction and operational phase of the Project, and will allow for prompt implementation of effective corrective measures.

## 6.2 Environmental Management Plan (EMP)

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

- Delivery of the prescribed environmental outcomes during all phases of the Project;
- Formulating a system for compliance with applicable legislative and non-legislative
- requirements and obligations and commitments for the Project including;

    - Relevant Legislative Requirements;
    - Licenses and Approvals;
    - Obligations and commitments from the IEE process (IEE and Submissions Report);

- Ensure that project design process incorporate best practice environmental design and sustainability principles to minimize potential impacts of construction and operation on the environment and community.
- Ensure that the construction work procedures minimize potential impacts on the environment and community.
- Develop, implement and monitor measures that minimize pollution and optimize resource use.

## 6.3 Objectives of the EMP

203. The EMP provides a delivery mechanism to address potential impacts of the project activities, to enhance project benefits and to outline standardized good practice to be adopted for all project works. The EMP has been prepared with the objectives of:

- Defining roles and responsibilities of the project proponents for the implementation of EMP and identifying areas where these roles and responsibilities can be shared with other parties involved in the execution and monitoring of the project;
- Outlining mitigation measures required for avoiding or minimizing potential negative impacts assessed by the environmental study;

- Developing a monitoring mechanism and identifying requisite monitoring parameters to confirm effectiveness of the mitigation measures recommended in the study;
- Defining the requirements for communication, documentation, training and monitoring, and management and implementation of the mitigation measures.

## 6.4 Monitoring Parameters

204. Following environmental parameters will be monitored at locations to be identified during the construction phase (e.g. location of asphalt plants, construction camps etc.):

- Ambient Air Quality mainly $PM_{10}$;
- Asphalt Plant emissions (smoke, dust etc.);
- Ambient noise levels;
- Water quality;
- Avenue plantation

205. A monitoring plan for the Project indicating environmental parameters, frequency, locations and applicable standards is attached with this report. Standards set under the NEQS and WHO for various categories of receptors to be used as reference points is attached at **Annexure VI.**

***Table 6-1: Environmental Monitoring Plan***

| Project Stage | Parameters | Details | Standards to be applied | location | Frequency | Duration |
|---|---|---|---|---|---|---|
| **Air Quality** | | | | | | |
| Pre-Construction | $PM_{10}$, $NO_X$, CO | 15m from the edge of pavement downwind | EPA Ambient Air Quality Standards NEQS | Four selected locations | baseline once prior to construction | Continuous 24hrs |
| Construction | $PM_{10}$ | 40m from hot mix plant downwind direction | EPA Ambient Air Quality Standards NEQS | Where ever Contractor decides to locate hot mix plant | once every four months during construction | Over one full working day |
| | $PM_{10}$ | 15m from the edge of pavement downwind | EPA Ambient Air Quality Standards NEQS | Stretch of Road where construction is in progress | once every four months during construction | over one full working day |
| Operation | SPM, RPM, $NO_X$,CO | 15m from the edge of pavement downwind<br>Background concentration near a residential area<br>At a sensitive location e.g. hospital or school | EPA Ambient Air Quality Standards NEQS | Four selected locations | 3 samples in a week once a year for three years | Continuous 24hrs |
| **Water Quality** | | | | | | |
| Construction | pH, Nail, BOD, COD, TDS, Dissolved $O_2$, Coliforms hydrocarbons | Community ground water sources near edge of ROW | WHO and NEQS | Two selected locations | once in the middle and once at end of construction | |

| Project Stage | Parameters | Details | Standards to be applied | location | Frequency | Duration |
|---|---|---|---|---|---|---|
| Operation | Ph, NaCl, BOD, COD, TDS, coliforms Dissolved $O_2$, | Community ground water sources near edge of ROW | WHO and NEQS | Two selected locations | Once a year in summer, just before monsoon season | |
| **Noise Level** | | | | | | |
| Pre-Construction | Noise levels on dB(A) scale | four locations: 15m from edge of pavement, background noise a sensitive location residential / commercial area | EPA Ambient Noise Standards. | four selected locations as specified | once, one or two weeks before start of work | 24 hr reading taken at 15sec intervals over 15min every hr. and then averaged |
| Construction | Noise levels on dB(A) scale | 7m from equipment whose noise level is to be determined | PEPA NEQS (noise) 1993 | At equipment yard and road construction site | As and when necessary or as instructed by NHA | readings taken at 15sec intervals over 15min every hr. and then averaged |
| Operation | Noise levels on dB(A) scale | four locations: 15m from edge of pavement, background noise sensitive location residential/commercial area | PEPA NEQS (noise) 1993 | Four selected locations | Once a year | 24 hr reading taken at 15sec intervals over 15min every hr. and then averaged |
| **SOIL** | | | | | | |
| Construction | Heavy metal Contamination | At reported sites with spillage and contamination | NEQS | Five selected locations in Contractors equipment yard | As per occurrence of spill | |
| Operation | oil, metals and chemicals | Parameters to be analyzed according to nature of spill | NEQS | Spill locations involving vehicles carrying fuel and hazardous material. | As per occurrence of spill | |
| **VEGETATION COVER** | | | | | | |
| Pre-construction | Number of trees felled | only marked trees to be felled | as per detailed design | All along Project Corridor | | |
| Operation | Survival rates of trees and re-vegetation | On each visit number of surviving trees to be compared to the number of saplings planted | Survival rate to be 75% or above, below which re-plantation will be done | plantation sites | every year for three years | |

## 6.5 Institutional Requirements

206. The proposed project environmental management plan will need involvement of the following organization for its implementation:

- The Project Management Unit (PMU), which will be established at NHA, this PMU will be the project proponent and owners of the EMP;
- Project Contractors as the executors of the EMP; and
- Project Environment Officer (PEO) as environmental monitor of the execution of the EMP.

### 6.5.1 Role of NHA

207. Being the proponent of the Project, NHA will be responsible for implementation of the EMP. The NHA will be responsible for ensuring the implementation of the EMP and for overall environmental performance during construction operations, also for ensuring implementation of the EMP by the project contractors.

### 6.5.2 Role of GM (EALS) (Environment/Afforestation/Land/Social)

- The key responsibility of the GM (land/Environment/Afforestation) will be to liaise closely with environmental agencies (PEPA, SEPA), all concerned Government Departments e.g. Forest and Wildlife Department, Department of Archaeology and Museums, NGOs, CCBOs and research institutions;
- He will be responsible for approval of the EIA;
- Overall responsibility of ensuring that EMP is properly implemented;
- Responsible for all environmental coordination and reporting;
- Provide technical support for compliance and monitoring of EMP;
- Responsible for resettlement plan;
- Provide guidance to Manager Lands for land acquisition;
- The Deputy Director for Environment, with the assistance of the supervision consultant, will be responsible for directly supervising the contractor in implementing the EMP;

### 6.5.3 Role of Project Contractor

- The contractors will be responsible for implementation of, or adherence to, all provisions of the EIA and the EMP.
- Overall responsibility for the contractor's environmental performance will rest with the person holding the highest management position within the contractor's organization. Reporting to their management the contractor's site managers' will be responsible for the effective implementation of the EMP.

### 6.5.4 Institutional Arrangement

**General**

208. This sub-section describes institutional framework and defines roles and responsibilities of different role players in the implementation of the proposed mitigation measures during the design, constructional and operational phases.

209. The executing agency of the proposed Project will be NHA. General Manager (Environment, Aforestation, Land and Social) of NHA will be the overall in-charge of the Project. He will delegate the supervisory responsibilities of the Project to the Project Director.

210. The General Manager (EALS) will have team of qualified environmentalists and Environmental Monitoring Specialists/Consultants. Figure below shows the institutional arrangement of NHA.

211. Environmental Protection Agency (EPA), Balochistan will act as the overall regulatory body. The specific roles of key functionaries are described hereunder.

### 6.5.5 National Highway Authority (NHA)

#### a) Project Director

212. The Project Director will be responsible for successful implementation of the proposed Project. He will be assisted by the Supervision Consultant.

#### b) Director (Environment & Afforestation)

213. The Director (E&A) will be the overall in-charge for handling the NHA's obligations with respect to the EMP. The Director (Environment) will be responsible for ensuring that the provisions of the EMP are effectively implemented. They will also coordinate with the EPA, Balochistan, provincial Agricultural, NGOs/CBOs and other public/private sector organizations. He will be assisted by the Deputy and Assistant Directors (Environment) for the execution of the EMP.

**Design Consultant**

214. The Design Consultant will ensure that all the mitigation measures proposed for the design phase are incorporated in the final design and included in the contract documents.

**Supervision Consultant**

215. The Supervision Consultant appointed by NHA will be headed by a "Project Manager", who will be a qualified engineer. He, along with his team, will supervise the proposed Project Contractor(s) to ensure quality of work and fulfilment of contractual obligations. He will recruit one Environmental Specialist / Monitoring Consultant (MC) who will:

- Ensure that all the environmental provisions comply with the applicable standards;
- Ensure that day-to-day construction activities are carried out in environment friendly manner;
- Organize periodic environmental training programmes and workshops for the Contractors' staff and NHA site staff in consultation with the NHA; and
- Develop "good practices" construction guidelines to assist Contractors and NHA staff in implementing the EMP.

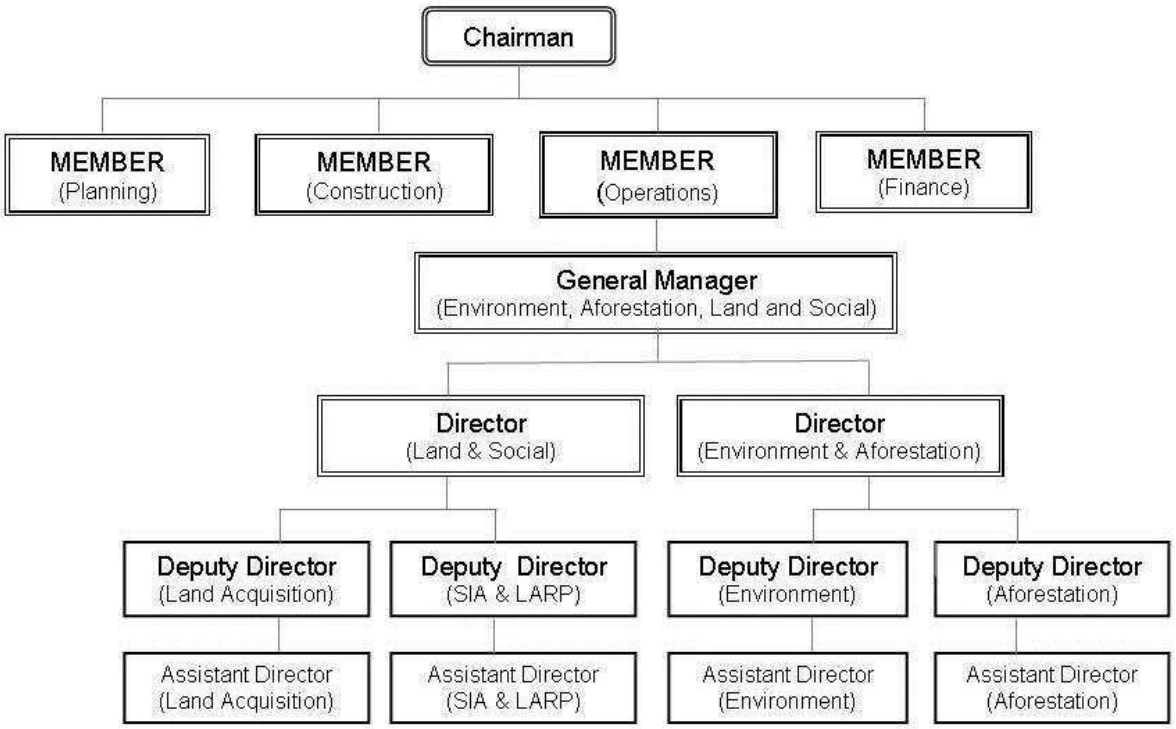



**Figure 6.1 Organogram of NHA to present the institutional arrangement for implementation of EMP of proposed project**

**Construction Contractor**

216. The EMP will be made a part of the contract agreement and the Contractor(s) will ensure that all the proposed Project activities are in compliance with the EMP and NEQS.

**Specific Implementation Responsibilities**

217. This section describes the implementation and supervision responsibilities of the personnel involved at different phases of the proposed Project.

**Design Phase/Pre-Construction Phase**

218. The Director (Environment, Social and Land) and his staff with the assistance of EIA Consultant will be responsible for ensuring that the proposed Project design and specifications adequately reflect the EMP. He will ensure the Project's compliance with environmental regulations and ADB requirements; and ensure stakeholders participation in the Project design.

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

- To coordinate with regulatory agencies including EPAs, EIA Consultant, local NGOs, that could assist NHA in independent reviews of environmental compliance;
- To supervise environmental assessment reports, and provide substantial inputs and guidance to EIA Consultant;
- To get approval of EIA from the EPA (Balochistan); and

- To ensure that the Design Consultant has incorporated all the mitigation measures proposed for the design phase in the design and included in the contract documents.

**Construction Phase**

220. NHA will appoint Supervision Consultant, who along with the Environment Specialists and Director (Environment) will oversee the working of the Contractor in accordance with the EMP.

- Supervision Consultant will liaise with the Project staff and staff of the Director Environment of NHA to monitor environmental compliance during construction;
- He will supervise the construction activities and get technical support, where necessary, from Director Environment of NHA to ensure compliance with the EMP;
- He will monitor the progress of work and adherence of the Contractor to the EMP; and report to Directorate of Environment.
- He will direct the Contractor to work in such a manner that all the proposed Project activities are in compliance with the EMP.
- Director Environment will over all look after the assignments of supervision consultant.

**Operation Phase**

221. The Environment Specialist with the help of Director (Environment) and Assistant Directors will be responsible for the following:

- Coordinating with the operational staff working under the Regional General Manager (Operations) to monitor environmental compliance during the proposed Expressway operation;
- Assessing the long-term environmental impacts of proposed Expressway operation;
- Sustaining a working partnership among NHA, EPA (Baloshistan), Agricultural, Forest and Wildlife Departments, NGOs and other related public-private sector organizations;
- Reporting to the General Manager (Land and Environment) about progress of the work; and
- Reporting on environmental performance monitoring and compliance to the Baloshistan EPD and District Environment Offices in the area.

## 6.6 Environmental Training

**Capacity Building and Training**

222. Capacity building and training programs are necessary for NHA staff in order to control negative impacts of road construction, maintenance and operation. They also need training for monitoring and inspecting road projects for environmental impacts and for implementation of mitigation measures.

223. The details of this capacity building and training program are presented in the Table below:

***Table 6-2: Capacity Development and Training Programme***

| Provided By | Organized By | Contents | No of Events/Trainees | Duration | Cost (Rs.) |
|---|---|---|---|---|---|
| **Pre-Construction Phase** Monitoring consultants/Organizations offering specialized services in environmental management and monitoring | Director (Environment) | Short seminars and courses on: Environmental Management Plan and Environmental Monitoring Plan | Three seminars for NHA project staff | 3 days | 150,000/ |
| **Construction Phase** Monitoring consultants/organizations offering specialized services in social management and monitoring | Director (Environment) | Short seminars and courses on: Environmental Risks associated with construction phase Development of Environmental Performance Indicators Occupational Health and Safety (OHS) issues | Three seminars for NHA Project staff dealing in social/land matters | 3 days | 150,000/ |
| **Operational Phase** Monitoring consultants/organizations offering specialized services in Occupational Health and Safety (OHS) issues | Director (Environment) | Short lectures relating to Road Safety (Policy measures/implementation) Development of Green Belt and Environment Up gradation | Two seminars for Contractor's staff | 2 days | 100,000/ |
| **TOTAL** | | | **400,000 (Rs. 0.4 million)** | | |

224. Director (Environment) will have at least two visits beside the training schedule at each stage of the project. Supervision consultant will be bound to submit the Monthly Environmental Reports or the Quarterly Environmental Reports to the office of Director (Environment) for further verification and submission to ADB.

### 6.7 Environmental Performance Indicators

225. Environmental performance indicators will be chosen to quantify that whether the targets of environmental policy safeguard are met as desired in the environmental management plan within specified time period. The quantitative data against following attributes as performance indicator will be collected and reported in the quarterly Environmental Monitoring Reports.

- **Land Use**

226. Indicators of land use should measure the quality of land resources, changes in the capability of land to produce desired goods and services, and the existence of negative external impacts due to project implementation.

- **Water quality and related issues**

227. Indicator of water quality must quantify water contamination or pollution and any changes in the water composition and chemistry whether surface or ground water in terms of water quality parameters and there pattern of existence.

- **Air & Noise Pollution**

228. Magnitude of air and noise quality changes due to project activities.

- **Flora & Fauna**

229. Any quantifiable changes in the population of fauna and flora and in their habitats pattern will be recorded.

- **Traffic and Transportation**

230. Dislocation of traffic during construction and adequate planning for the operation

- **Socio-Economic**

231. Impact on the local/regional economy
Changes in cultural pattern
Dislocation of population

- **Health &Safety**

232. New disease pathway
Number of injuries or casualties

## 6.8 Environmental Management Costs

233. Following Table gives cost estimates for monitoring air quality, water quality and noise monitoring:

***Table 6-3: Cost Estimates for Environmental Monitoring***

| Sr. No | MONITORING COMPONENT | PARAMETERS | QUANTITY | AMOUNT Rs. | DETAILS |
|---|---|---|---|---|---|
| 1 | **AIR QUALITY** | | | | |
| | Ambient Air Quality | $PM_{10}$ | 12 | 300,000 | 12 samples @ Rs. 25,000/sample |
| | Asphalt Plant stack emissions | $SO_2$, $NO_X$, CO, HC, $O_3$ | 40 | 400,000 | 40 samples @ Rs. 10,000/sample |
| 2 | **Water quality** | | | | |
| | Surface Water | Common ions, TDS, TSS, etc | 25 | 575,000 | Fortnightly testing of water samples drawn from streams and water courses during construction along their banks @ Rs. 23,000/ per sample |
| | Drinking Water | Common ions, TDS, BOD, Coliforms, etc | 6 | 48,000.00 | 6 samples @ Rs. 8,000/ sample |
| 3 | **Noise Levels** | dB(A) | 24 | 96,000 | 24 readings @ Rs. 4,000/per reading |
| 4 | Contingencies | | | 70,950 | 5% of monitoring cost |
| | **SUB TOTAL** | | | **1,489,950** | |
| | Equipment required | | | | Provision for a camera, lap top, GPS, noise meter and a computer has already been made in the EMP Budget |
| | **TOTAL COST OF MONITORING** | | | **1,439,550** | |

# 7. PUBLIC PARTICIPATION AND CONSULTATION

## 7.1 Introduction

234. General public, elected representatives, local councilors and informal community leaders including members of non-government organizations (NGOs) were asked to state their current perceptions of priorities for improvements to the urban environmental infrastructure in their areas and about the likely impacts of the Project during construction and operation phases. Due to social constraints women's groups could not be contacted. The main objectives of the public information campaign and public consultation were as follows:

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

## 7.2 Identification of Main Stakeholders

235. Stakeholders identified include local representatives, government officials, NGOs and general public. All these stakeholders have different types of stakes according to their interests and professions.

## 7.3 Approach for Public Consultation

236. The approach adopted towards public participation was to disseminate information, soliciting inputs and getting consensus on issues and propose mitigation measures. This approach was put into practice through consultation with NHA and public meetings, meetings with influential people of the districts, workshops and roadside consultations with pedestrians, vehicle drivers, roadside vendors etc were held. The first consultation process was held in 2008-2009 during the preparation of this environmental assessment report. Subsequently, further consultations were held in September 2013 during the updation of this report.

## 7.4 Meetings with Stakeholders

237. During the first round of consultations meetings were held with the local communities and Engineers of Communication and Works (C&W) Department, Balochistan and the district Coordination Officer Loralai in March 2008. During discussions with residents and site visits, it has been revealed that local people are generally aware of the Project and are in favor of its construction. In February 2009 a meeting was also held with the General Manager, ADB Projects in Quetta.

238. In the second round of consultation held in 2013, meetings were held with the Director General BEPA, Deputy Director (Technical) BEPA, Deputy Commissioner, Loralai, Executive Engineer (Buildings and Revenue), Loralai, Deputy Director (Agriculture) Loralai, and Deputy Director (Maintenance) Loralai. NHA staff with whom consultations were held included General Manager Balochistan, Director Maintenance Quetta, Deputy Director Maintenance Loralai, and Deputy Director Land/ Legal Quetta.

239. Consultations were also held with community members of villages along the road alignment. Since the Project road alignment generally follows the existing alignment and only widening/improvement in the road geometry is being done, the Project is generally accepted and people want this Project to be taken up.

### 7.5 Stake Holders Concern

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

a. Highway Design
   - The design of road should be least disturbing the local agriculture and economic activity. For example the provision of bypass at north of the city may severely interfere with the agriculture of the area and hence locally unaccepted.
   - Sufficient cross drainage structures should be provided to avoid flooding of the area.
   - The Highway alignment should minimum effect the local settings and to avoid the severance of the area while passing through the populated area.
   - The respectful local customs should be taken in account in a design and should be maintained during construction.

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

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

241. These concerns will be addressed through the proper implementation of the EMP. The list of consulted persons during both rounds of consultations (2008-09 and 2013) is attached as Annexure V.

### 7.6 Socioeconomic survey

242. A socio-economic survey form was designed and distributed amongst the participants of various meetings held with the locals for dissemination of information and to gauge their reaction towards the implementation of the Project. The filled forms were received and analyzed. The analysis showed that most of the respondents were engaged in agriculture as their main occupation, followed by small private business (shop keeping) and services. The respondents needed adequate compensation if their land or business were required by the Project.

243. The trees planted along the road consist of eucalyptus, pine trees and Sanober (another type of pine tree). In addition there are cherry, apricot, mulberry and apple orchards along the existing road.

# 8. GRIEVANCE REDRESS MECHANISM

## 8.1 General

244. In order to receive and facilitate the resolution of affected peoples' (AP) concerns, complaints and grievances about the Project's environmental performance, a Grievance Redress Mechanism (GRM) will be established at the Project. The GRM will address the APs' concerns and complaints proactively and promptly, using an understandable and transparent process that is gender responsive, culturally appropriate, and readily accessible to all segments of the APs at no costs and without retribution. The mechanism will not impede access to the country's judicial or administrative remedies.

## 8.2 Grievance Redress Committee, Focal Points, Complaints Reporting, Recording and Monitoring

245. NHA will facilitate the establishment of the Grievance Redress Committee (GRC) at the project location prior to the Contractor's mobilization to site. The GRC will be headed by the Project Director, and members will include Deputy/ Assistant Director Env of NHA's Environment, Afforestation, Land and Social (EALS) Unit., Asst. Director Land, the Environment Specialist of the Supervision Consultant and the contractor's Environment, Health and Safety (EHS) officer. The role of the GRC is to address the Project related grievances of the affected parties that are not resolved satisfactorily through the initial stages of the GRM.

246. NHA will assist the project affected communities/villages identify local representatives to act as Grievance Focal Persons (GFPs). The GFPs will be responsible for i) acting as community representatives in formal meetings between the project team and the local community he/she represents; ii) communicating the community members' grievances and concerns to the contractor during project implementation.

247. A pre-mobilization public consultation meeting will be convened by NHA's EALS Unit and attended by the GFPs, Supervision Consultant, contractor, Project representative and other interested parties (e.g. district level representatives, NGOs). The objectives of the meeting will be as follows:

(i) Introduction of key personnel of each stakeholder including roles and responsibilities;
(ii) 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;
(iii) Establishment and clarification of the GRM to be implemented during project implementation including proactive public relations activities proposed by the project team, Supervision Consultant and contractor to ensure that communities are continually advised of project progress and associated constraints throughout project implementation period;
(iv) Elicit and address the immediate concerns of the community based on information provided above

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

(i) Individuals will lodge their environmental complaint/grievance with their respective community's nominated GFP.
(ii) The GFP will bring the individual's complaint to the attention of the contractor.
(iii) The contractor will record the complaint in the onsite Environmental Complaints Register (ECR) in the presence of the GFP.
(iv) The GFP will discuss the complaint with the contractor and have it resolved.
(v) If the contractor does not resolve the complaint within one week, then the GFP will bring the complaint to the attention of the Supervision Consultant's Environmental Specialist. The SC's Environment Specialist will then be responsible for coordinating with the contractor in solving the issue.
(vi) If the complaint is not resolved within two weeks the GFP will present the complaint to the Grievance Redress Committee (GRC).
(vii) The GRC will have to resolve the complaint within a period of two 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.
(viii) Should the complaint not be resolved through the GRC, the issue will be adjudicated through local legal processes.
(ix) In parallel to the ECR placed with the contractor, each GFP will maintain a record of the complaints received and will follow up on their rapid resolution.
(x) NHA's project office will also keep track of the status of all complaints through the Monthly Environmental Monitoring Report submitted by the contractor to the SC and will ensure that they are resolved in a timely manner.

## 9. CONCLUSIONS AND RECOMMENDATIONS

249. The proposed Project has been conceived to help in socio-economic development of Balochistan and to provide better access between Punjab and Balochistan. The National Highway N-70 connects the districts of Qila Saifullah-Loralai-Musa Khel and Barkhan before joining Bewata in Dera Dhazi Khan District of Punjab. In Punjab Province the N-70 passes through D.G.Khan District, Muzaffagarh District and passing through Multan District ends at N-5. This is a very important highway as it provides the most direct route between southern Punjab, northern Balochistan, southern Afghanistan and Iran. It will also serve as a sub-regional route between India, Afghanistan, and Iran in the future. N-70 passes through several important intermediate cities and towns, including Muzaffargarh, D.G. Khan, Bewata, and Loralai.

250. National Highway N-70 takes a role in the shipment of mining products, such as coal, and agricultural products. The section of N-70 targeted by this project goes through mountainous areas with narrow, steep and sharp curves, hindering traffic of large vehicles such as trailers, tankers and large-scale buses and forcing them to detour to other routes. Furthermore, traffic blockage caused by accidents involving trucks rolling over and landslide disasters often make it hard for even cars and other ordinary passenger vehicles to pass through.

251. The National Highway Authority (NHA) plans to strengthen the transportation capacity of N-70, especially by improving the section that runs through the mountainous areas, and through urban localities like Loralai City, in order for N-70 to serve as the shortest and highly safe east-west crossway.

252. Primary and secondary data was used to assess the environmental impacts of the Project. This report highlights all potential environmental impacts associated with the Project and recommends mitigation measures. All environmental impacts associated with the Project need to be properly mitigated, through the existing institutional arrangements highlighted in this report.

253. Most of the environmental impacts will be felt during construction phase. Implementation of mitigation measures during this period will be the responsibility of the Contractors, who has to be made aware of the perception and understanding of environmental problems. Hence, the required environmental mitigation measures will have to be clearly defined in the Contract Documents, and an Environmental Consultant must supervise the implementation process. PEC Tender Documents which are founded on FIDIC based Tender Documents sufficiently cover this aspect of the construction contract.

254. The Project area is generally mountainous, rolling and plain. Some areas near human settlements are agriculture lands with many fruit orchards. Implementation of proposed mitigation measures will not only reduce negative impacts, but improve the road environment. The institutional development and building a better environmental perception and understanding through training, NHA and other related agencies will be better equipped for future environmental management and monitoring. The Contractor shall include the cost of all mitigation measures in his Bid and shall be responsible for their implementation.

255. The EIA reveals that no major negative environmental impacts are likely to occur due to construction and normal operations of the proposed Project, provided mitigation measures are implemented and the proposed monitoring program is adequately carried out. The EMP includes measures to minimize project impacts due to soil erosion, air and noise pollution, waste

generation, and vegetation clearing. Cumulative impacts of this Project should be viewed with a "corridor" and regional perspective, and mitigation or response programs formulated at the policy, cross-sectoral level. The project is recommended for implementation, with adequate consideration of the EMP and cumulative impacts.

256. This report has thoroughly assessed all the potential environmental impacts associated with the Project. The environmental impacts identified by the study are manageable, which will be mitigated at various stages, as suggested in the report.

257. **The Project has therefore, been assigned "Category B" in accordance with the 'ADB *Environmental Guidelines, 2003 read in conjunction with 'Safeguard Policy Statement 2009',* and Schedule II as per PEPA, *IEE and EIA Gazette Notification, 2000'. Environmental Impact Assessment (EIA) is therefore to be carried out for the project.***

## ANNEXURE – I

## RAPID ENVIRONEMNTAL ASSESSMENT CHECKLIST

## RAPID ENVIRONMENTAL ASSESSMENT (REA) CHECKLIST

**Instructions:**

 This checklist is to be prepared to support the environmental classification of a project. It is to be attached to the environmental categorization form that is to be prepared and submitted to the Chief Compliance Officer of the Regional and Sustainable Development Department.
 This checklist is to be completed with the assistance of an Environment Specialist in a Regional Department.
 This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB checklists and handbooks on (i) involuntary resettlement, (ii) indigenous peoples planning, (iii) poverty reduction, (iv) participation, and (v) gender and development.
 Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

| | |
|---|---|
| **Country/Project Title:** | Improvement & Widening of Qila Saifullah-Loralai-Waighum Rud Section of National Highway N-70 |

**Sector Division:**

| SCREENING QUESTIONS | Yes | No | REMARKS |
|---|---|---|---|
| **A. Project Siting**<br>Is the Project area adjacent to or within any of the following environmentally sensitive areas? | | | |
| Cultural heritage site | | | |
| Protected Area | | | |
| Wetland | | | |
| Mangrove | | | |
| Estuarine | | | |
| Buffer zone of protected area | | | |
| Special area for protecting biodiversity | | | |
| **B. Potential Environmental Impacts**<br>Will the Project cause… | | | |
| encroachment on historical/cultural areas; disfiguration of landscape by road embankments, cuts, fills, and quarries? | | | |
| **ROADS AND HIGHWAYS** | | | |

| | | | |
|---|---|---|---|
| □ encroachment on precious ecology (e.g. sensitive or protected areas)? | | | |
| □ alteration of surface water hydrology of waterways crossed by roads, resulting in increased sediment in streams affected by increased soil erosion at construction site? | | | |
| □ deterioration of surface water quality due to silt runoff and sanitary wastes from worker-based camps and chemicals used in construction? | | | |
| □ increased local air pollution due to rock crushing, cutting and filling works, and chemicals from asphalt processing? | | | |
| □ noise and vibration due to blasting and other civil works? | | | |
| □ dislocation or involuntary resettlement of people | | | |
| □ other social concerns relating to inconveniences in living conditions in the project areas that may trigger cases of upper respiratory problems and stress? | | | |
| □ hazardous driving conditions where construction interferes with pre-existing roads? | | | |
| □ poor sanitation and solid waste disposal in construction camps and work sites, and possible transmission of communicable diseases from workers to local populations? | | | |
| □ creation of temporary breeding habitats for mosquito vectors of disease? | | | |
| □ dislocation and compulsory resettlement of people living in right-of-way? | | | |
| □ accident risks associated with increased vehicular traffic, leading to accidental spills of toxic materials and loss of life? | | | |
| □ increased noise and air pollution resulting from traffic volume? | | | |
| □ increased risk of water pollution from oil, grease and fuel spills, and other materials from vehicles using the road? | | | |

**ANNEXURE – II**

**BIOTIC INFORMATION PROFILE**

## Improvement and Widening of Qila Saifullah-Loralai-Waigum-Rud of N-70

### Environmental Survey Results Km 0–15 (Starting at N-50 Qila Saifullah)

| BIOTIC INFORMATION PROFILE | |
|---|---|
| **Topography** | Mountainous |
| **Soil type / Land use** | Mostly barren lands |
| **Drainage & Watercourses** | 10 water courses cross the Road over which culverts have been provided |
| **Flora & Fauna** | None |
| **Road side trees** | None |
| **Existing traffic category** | All types and category of vehicles use this facility |

| Attributes | Environmental Impacts | | | | |
|---|---|---|---|---|---|
| | Nil | Low | Med | High | Unknown |
| **Land Use** | | | | | |
| Increase population | | ✓ | | | |
| Adverse use of natural resources | | ✓ | | | |
| Encourage strip development | | ✓ | | | |
| Induced impact on natural resources | | ✓ | | | |
| Affect existing beneficial use | | | ✓ | | |
| Construction camps | | | ✓ | | |
| Land clearing | | ✓ | | | |
| Alter local drainage | | ✓ | | | |
| Change soil character | | ✓ | | | |
| Borrow pit sitting | | ✓ | | | |
| **Water Quality and related issues** | | | | | |
| Contamination from accidental spills | | ✓ | | | |
| Alter Physical / chemical / biological state of water | | ✓ | | | |
| Ecological balance | | ✓ | | | |
| **Air & Noise Pollution** | | | | | |
| Air Pollution / Dust | | | ✓ | | |
| Noise pollution | | | ✓ | | |
| **Flora & Fauna** | | | | | |
| Adverse impact on wildlife | | ✓ | | | |
| **Traffic and Transportation** | | | | | |
| Dislocation of traffic during construction | | | ✓ | | |
| Adequate planning for safe operation | | | ✓ | | |
| **Socio-Economic** | | | | | |
| Impacts on the local/regional economy | | | | ✓ | |
| Changes in cultural patterns | | | ✓ | | |
| Dislocation of population | | ✓ | | | |
| **Health** | | | | | |
| New disease pathway e.g., Malaria | | ✓ | | | |
| Changing natural environmental | | ✓ | | | |
| **General** | | | | | |
| Adverse effect on culture | | ✓ | | | |
| Controversial impacts | | ✓ | | | |
| Amenity impacts | | ✓ | | | |

View of Qilla Saifullah-Loralai road Left side from Intersection point at start of project .

View of Loralai road towards Loralai at Ch: 1+000

View of Bridge at Garang Nala towards down stream Ch: 2+500

## Improvement and Widening of Qila Saifullah-Loralai-Waigum-Rud of N-70

### Environmental Survey Results Km 15–30 km

| BIOTIC INFORMATION PROFILE | |
|---|---|
| **Topography** | The alignment passes through barren mountainous land |
| **Soil type / Land use** | Strongly calcareous, gravely and stony loams. |
| **Drainage & Watercourses** | 61 small water courses cross the Road over which culverts have been provided there are two nullahs over which bridges have been provided |
| **Flora & Fauna** | No road side plantation |
| **Road side trees** | none |
| **Existing traffic category** | All types of traffic use the road. |

| Attributes | Environmental Impacts | | | | |
|---|---|---|---|---|---|
| | Nil | Low | Med | High | Unknown |
| **Land Use** | | | | | |
| Increase population | | | ✓ | | |
| Adverse use of natural resources | | ✓ | | | |
| Encourage strip development | | ✓ | | | |
| Induced impact on natural resources | | ✓ | | | |
| Affect existing beneficial use | | | ✓ | | |
| Construction camps | | ✓ | | | |
| Land clearing | | ✓ | | | |
| Alter local drainage | ✓ | | | | |
| Change soil character | ✓ | | | | |
| Borrow pit sitting | | ✓ | | | |
| **Water Quality and related issues** | | | | | |
| Contamination from accidental spills | | ✓ | | | |
| Alter Physical / chemical / biological state of water | ✓ | | | | |
| Ecological balance | ✓ | | | | |
| **Air & Noise Pollution** | | | | | |
| Air Pollution / Dust | | ✓ | | | |
| Noise pollution | | ✓ | | | |
| **Flora & Fauna** | | | | | |
| Adverse impact on wildlife | ✓ | | | | |
| **Traffic and Transportation** | | | | | |
| Dislocation of traffic during construction | | ✓ | | | |
| Adequate planning for safe operation | | ✓ | | | |
| **Socio-Economic** | | | | | |
| Impacts on the local/regional economy | | | | ✓ | |
| Changes in cultural patterns | | ✓ | | | |
| Dislocation of population | | | ✓ | | |
| **Health** | | | | | |
| New disease pathway e.g., Malaria | ✓ | | | | |
| Changing natural environmental | | | | | |
| **General** | | | | | |
| Adverse effect on culture | ✓ | | | | |
| Controversial impacts | ✓ | | | | |
| Amenity impacts | ✓ | | | | |

View of Loralai road with Culvert towards Loralai at Ch: 15+000

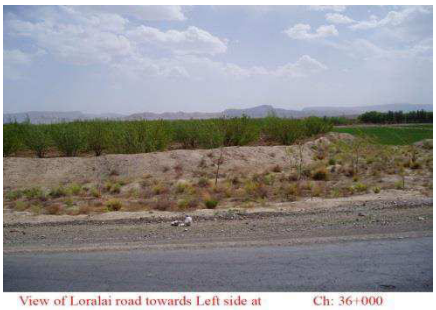
View of Loralai road and bridge on Nala at Ch: 13+500

## Improvement and Widening of Qila Saifullah-Loralai-Waigum-Rud of N-70

### Environmental Survey Results Km 30–45

| BIOTIC INFORMATION PROFILE | |
|---|---|
| **Topography** | The road passes through mountainous terrain goes through Drazanda village with agricultural lands |
| **Soil type / Land use** | Strongly calcareous, gravely and stony loams. |
| **Drainage & Watercourses** | A number of water courses cross the road over which culverts have been provided. One bridge is being constructed over a nullah |
| **Flora & Fauna** | Some agricultural lands and fruit orchards very little road side plantation can be seen, wildlife nearly non existent. |
| **Road side trees** | Eucalyptus |
| **Existing traffic category** | All types of vehicles use the road |

| **Attributes** | **Environmental Impacts** | | | | |
|---|---|---|---|---|---|
| | **Nil** | **Low** | **Med** | **High** | **Unknown** |
| **Land Use** | | | | | |
| Increase population | | | ✓ | | |
| Adverse use of natural resources | | ✓ | | | |
| Encourage strip development | | ✓ | | | |
| Induced impact on natural resources | | ✓ | | | |
| Affect existing beneficial use | | | ✓ | | |
| Construction camps | | ✓ | | | |
| Land clearing | | ✓ | | | |
| Alter local drainage | ✓ | | | | |
| Change soil character | ✓ | | | | |
| Borrow pit siting | | ✓ | | | |
| **Water Quality and related issues** | | | | | |
| Contamination from accidental spills | | ✓ | | | |
| Alter Physical / chemical / biological state of water | ✓ | | | | |
| Ecological balance | ✓ | | | | |
| **Air & Noise Pollution** | | | | | |
| Air Pollution / Dust | ✓ | | | | |
| Noise pollution | ✓ | | | | |
| **Flora & Fauna** | | | | | |
| Adverse impact on wildlife | ✓ | | | | |
| **Traffic and Transportation** | | | | | |
| Dislocation of traffic during construction | | ✓ | | | |
| Adequate planning for safe operation | | ✓ | | | |
| **Socio-Economic** | | | | | |
| Impacts on the local/regional economy | | | ✓ | | |
| Changes in cultural patterns | | ✓ | | | |
| Dislocation of population | | | ✓ | | |
| **Health** | | | | | |
| New disease pathway e.g., Malaria | ✓ | | | | |
| Changing natural environmental | ✓ | | | | |
| **General** | | | | | |
| Adverse effect on culture | ✓ | | | | |
| Controversial impacts | ✓ | | | | |
| Amenity impacts | ✓ | | | | |



View of Loralai road towards Left side at Ch: 36+000

View of Loralai road towards Left side at Ch: 32+000

View of Loralai road towards Right side at Ch:39+500

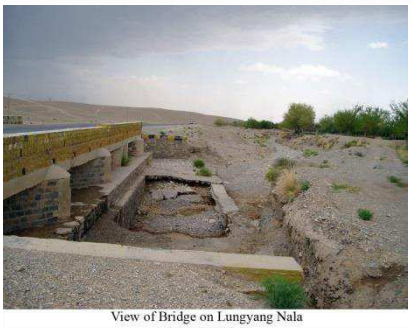
## Improvement and Widening of Qila Saifullah-Loralai-Waigum-Rud of N-70

### Environmental Survey Results Km 45–60

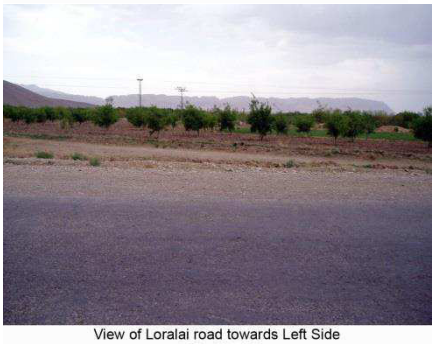
| BIOTIC INFORMATION PROFILE | |
|---|---|
| **Topography** | The alignment passes rolling terrain and human settlement with orchards and agricultural lands on both side of road |
| **Soil type / Land use** | Strongly calcareous, gravely and stony loams |
| **Drainage & Watercourses** | A large number of water courses over which culverts have been provided. Lon Yang Nullah crosses the road at two locations bridges have been provided over these crossing points. |
| **Flora & Fauna** | Lush green cultivated fields on both sides of the road. Very little wildlife. |
| **Road side trees** | Eucalyptus trees on both sides of the road |
| **Existing traffic category** | All types of vehicles use the road. |

| Attributes | Environmental Impacts | | | | |
|---|---|---|---|---|---|
| | Nil | Low | Med | High | Unknown |
| **Land Use** | | | | | |
| Increase population | | | ✓ | | |
| Adverse use of natural resources | | ✓ | | | |
| Encourage strip development | | ✓ | | | |
| Induced impact on natural resources | | ✓ | | | |
| Affect existing beneficial use | | | ✓ | | |
| Construction camps | | ✓ | | | |
| Land clearing | | ✓ | | | |
| Alter local drainage | ✓ | | | | |
| Change soil character | ✓ | | | | |
| Borrow pit sitting | | ✓ | | | |
| **Water Quality and related issues** | | | | | |
| Contamination from accidental spills | | ✓ | | | |
| Alter Physical / chemical / biological state of water | ✓ | | | | |
| Ecological balance | ✓ | | | | |
| **Air & Noise Pollution** | | | | | |
| Air Pollution / Dust | ✓ | | | | |
| Noise pollution | ✓ | | | | |
| **Flora & Fauna** | | | | | |
| Adverse impact on wildlife | ✓ | | | | |
| **Traffic and Transportation** | | | | | |
| Dislocation of traffic during construction | | ✓ | | | |
| Adequate planning for safe operation | | ✓ | | | |
| **Socio-Economic** | | | | | |
| Impacts on the local/regional economy | | | | ✓ | |
| Changes in cultural patterns | | ✓ | | | |
| Dislocation of population | | | ✓ | | |
| **Health** | | | | | |
| New disease pathway e.g., Malaria | ✓ | | | | |
| Changing natural environmental | ✓ | | | | |
| **General** | | | | | |
| Adverse effect on culture | ✓ | | | | |
| Controversial impacts | ✓ | | | | |
| Amenity impacts | ✓ | | | | |

View of Loralai road towards Qilla Saifullah at Ch: 50+000



View of Bridge on Lungyang Nala at Ch: 50+000



View of Loralai road towards Left Side at Ch: 51+000

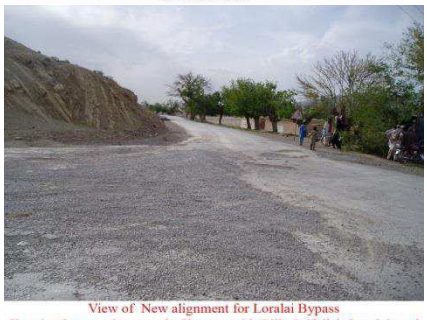
## Improvement and Widening of Qila Saifullah-Loralai-Waigum-Rud of N-70

### Environmental Survey Results Km 60–75

| BIOTIC INFORMATION PROFILE | |
|---|---|
| **Topography** | The alignment passes rolling terrain and Loralai city with orchards and agricultural lands on both side of road |
| **Soil type / Land use** | Strongly calcareous, gravely and stony loams |
| **Drainage & Watercourses** | A large number of water courses over which culverts have been provided. Lon Yang Nullah crosses the road at two locations bridges have been provided over these crossing points. |
| **Flora & Fauna** | Lush green cultivated fields on both sides of the road. Very little wildlife. |
| **Road side trees** | Eucalyptus trees on both sides of the road |
| **Existing traffic category** | All types of vehicles use the road. |

| Attributes | Environmental Impacts | | | | |
|---|---|---|---|---|---|
| | Nil | Low | Med | High | Unknown |
| **Land Use** | | | | | |
| Increase population | | | ✓ | | |
| Adverse use of natural resources | | ✓ | | | |
| Encourage strip development | | ✓ | | | |
| Induced impact on natural resources | | ✓ | | | |
| Affect existing beneficial use | | | ✓ | | |
| Construction camps | | ✓ | | | |
| Land clearing | | ✓ | | | |
| Alter local drainage | ✓ | | | | |
| Change soil character | ✓ | | | | |
| Borrow pit sitting | | ✓ | | | |
| **Water Quality and related issues** | | | | | |
| Contamination from accidental spills | | ✓ | | | |
| Alter Physical / chemical / biological state of water | ✓ | | | | |
| Ecological balance | ✓ | | | | |
| **Air & Noise Pollution** | | | | | |
| Air Pollution / Dust | ✓ | | | | |
| Noise pollution | ✓ | | | | |
| **Flora & Fauna** | | | | | |
| Adverse impact on wildlife | ✓ | | | | |
| **Traffic and Transportation** | | | | | |
| Dislocation of traffic during construction | | ✓ | | | |
| Adequate planning for safe operation | | ✓ | | | |
| **Socio-Economic** | | | | | |
| Impacts on the local/regional economy | | | | ✓ | |
| Changes in cultural patterns | | ✓ | | | |
| Dislocation of population | | | ✓ | | |
| **Health** | | | | | |
| New disease pathway e.g., Malaria | ✓ | | | | |
| Changing natural environmental | ✓ | | | | |
| **General** | | | | | |
| Adverse effect on culture | ✓ | | | | |
| Controversial impacts | ✓ | | | | |
| Amenity impacts | ✓ | | | | |

View of Loralai road towards Right Side at Ch: 60+500



View of New alignment for Loralai Bypass Showing Intersection at end of bypass with Qilla Saifullah-Loralai road

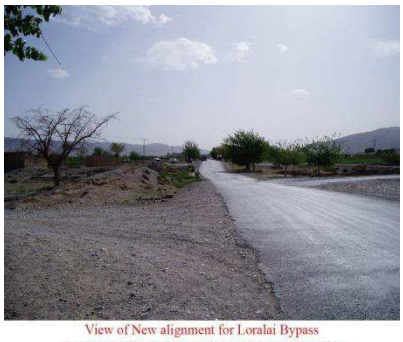
View of New alignment for Loralai Bypass Showing End point of bypass towards Watagam Rud side at Qilla Saifullah-Loralai road

## Improvement and Widening of Qila Saifullah-Loralai-Waigum-Rud of N-70

### Environmental Survey Results Km 75–90

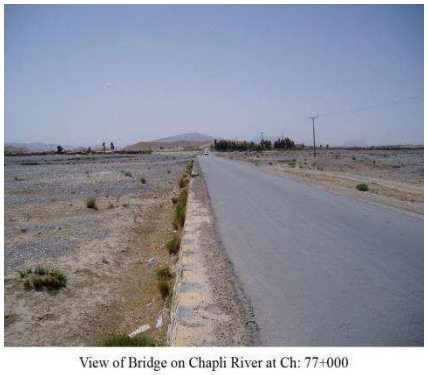
| BIOTIC INFORMATION PROFILE | |
|---|---|
| **Topography** | The alignment passes rolling terrain and human settlement Shakarez village) with orchards and agricultural lands on both side of road, water ponds etc on both sides of the road |
| **Soil type / Land use** | Strongly calcareous, gravely and stony loams |
| **Drainage & Watercourses** | A large number of water courses over which culverts have been provided. Durgai Nullah crosses the Road over which a bridge has been provided. |
| **Flora & Fauna** | Lush green cultivated fields on both sides of the road. Very little wildlife. |
| **Road side trees** | Eucalyptus trees on both sides of the road |
| **Existing traffic category** | All types of vehicles use the road. |

| Attributes | Environmental Impacts | | | | |
|---|---|---|---|---|---|
| | Nil | Low | Med | High | Unknown |
| **Land Use** | | | | | |
| Increase population | | | ✓ | | |
| Adverse use of natural resources | | ✓ | | | |
| Encourage strip development | | ✓ | | | |
| Induced impact on natural resources | | ✓ | | | |
| Affect existing beneficial use | | | ✓ | | |
| Construction camps | | ✓ | | | |
| Land clearing | | ✓ | | | |
| Alter local drainage | ✓ | | | | |
| Change soil character | ✓ | | | | |
| Borrow pit sitting | | ✓ | | | |
| **Water Quality and related issues** | | | | | |
| Contamination from accidental spills | | ✓ | | | |
| Alter Physical / chemical / biological state of water | ✓ | | | | |
| Ecological balance | ✓ | | | | |
| **Air & Noise Pollution** | | | | | |
| Air Pollution / Dust | ✓ | | | | |
| Noise pollution | ✓ | | | | |
| **Flora & Fauna** | | | | | |
| Adverse impact on wildlife | ✓ | | | | |
| **Traffic and Transportation** | | | | | |
| Dislocation of traffic during construction | | ✓ | | | |
| Adequate planning for safe operation | | ✓ | | | |
| **Socio-Economic** | | | | | |
| Impacts on the local/regional economy | | | | ✓ | |
| Changes in cultural patterns | | ✓ | | | |
| Dislocation of population | | | ✓ | | |
| **Health** | | | | | |
| New disease pathway e.g., Malaria | ✓ | | | | |
| Changing natural environmental | ✓ | | | | |
| **General** | | | | | |
| Adverse effect on culture | ✓ | | | | |
| Controversial impacts | ✓ | | | | |
| Amenity impacts | ✓ | | | | |



View of New alignment for Loralai Bypass
Showing towards Sanjawi from Sanjawi road befor 100m from River

Loralai city viewing towards Qilla Saifullah



View of Bridge on Chapli River at Ch: 77+000

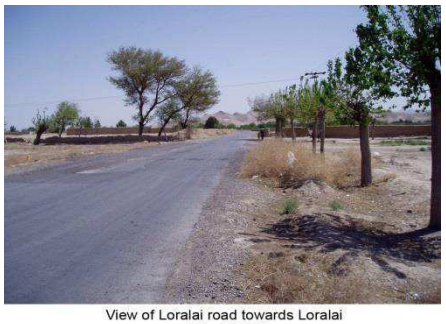
## Improvement and Widening of Qila Saifullah-Loralai-Waigum-Rud of N-70

### Environmental Survey Results Km 90–105

| BIOTIC INFORMATION PROFILE | |
|---|---|
| **Topography** | The alignment passes rolling terrain and human settlement with orchards and agricultural lands on both side of road |
| **Soil type / Land use** | Strongly calcareous, gravely and stony loams |
| **Drainage & Watercourses** | A large number of water courses over which culverts have been provided. Lon Yang Nullah crosses the road at two locations bridges have been provided over these crossing points. |
| **Flora & Fauna** | Lush green cultivated fields on both sides of the road. Very little wildlife. |
| **Road side trees** | Eucalyptus trees on both sides of the road |
| **Existing traffic category** | All types of vehicles use the road. |

| Attributes | Environmental Impacts | | | | |
|---|---|---|---|---|---|
| | Nil | Low | Med | High | Unknown |
| **Land Use** | | | | | |
| Increase population | | | ✓ | | |
| Adverse use of natural resources | | ✓ | | | |
| Encourage strip development | | ✓ | | | |
| Induced impact on natural resources | | ✓ | | | |
| Affect existing beneficial use | | | ✓ | | |
| Construction camps | | ✓ | | | |
| Land clearing | | ✓ | | | |
| Alter local drainage | ✓ | | | | |
| Change soil character | ✓ | | | | |
| Borrow pit sitting | | ✓ | | | |
| **Water Quality and related issues** | | | | | |
| Contamination from accidental spills | | ✓ | | | |
| Alter Physical / chemical / biological state of water | ✓ | | | | |
| Ecological balance | ✓ | | | | |
| **Air & Noise Pollution** | | | | | |
| Air Pollution / Dust | ✓ | | | | |
| Noise pollution | ✓ | | | | |
| **Flora & Fauna** | | | | | |
| Adverse impact on wildlife | ✓ | | | | |
| **Traffic and Transportation** | | | | | |
| Dislocation of traffic during construction | | ✓ | | | |
| Adequate planning for safe operation | | ✓ | | | |
| **Socio-Economic** | | | | | |
| Impacts on the local/regional economy | | | | ✓ | |
| Changes in cultural patterns | | ✓ | | | |
| Dislocation of population | | | ✓ | | |
| **Health** | | | | | |
| New diseases e.g., Malaria | ✓ | | | | |
| Changing natural environmental | ✓ | | | | |
| **General** | | | | | |
| Adverse effect on culture | ✓ | | | | |
| Controversial impacts | ✓ | | | | |
| Amenity impacts | ✓ | | | | |

View of Loralai road towards Qilla Saifullah at Ch: 82+000



View of Loralai road towards Loralai at Ch: 92+500

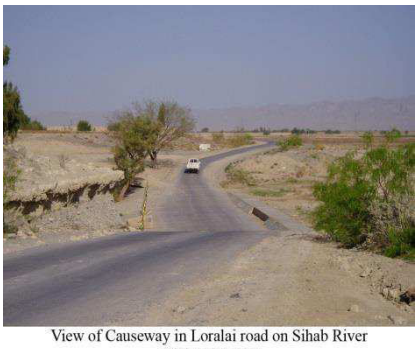
View of Loralai road towards Right Side at Ch: 104+000

## Improvement and Widening of Qila Saifullah-Loralai-Waigum-Rud of N-70

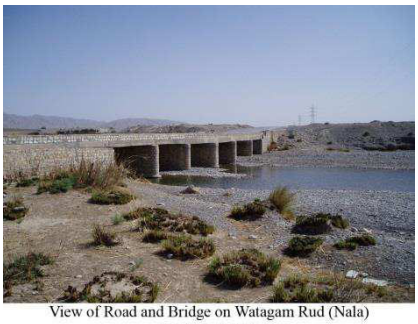
### Environmental Survey Results Km 105–end of Project

| BIOTIC INFORMATION PROFILE | |
|---|---|
| **Topography** | The alignment passes rolling terrain and human settlement with orchards and agricultural lands on both side of road |
| **Soil type / Land use** | Strongly calcareous, gravely and stony loams |
| **Drainage & Watercourses** | A large number of water courses over which culverts have been provided. One Nullah cross the road over which a bridge has been Provided. Mara river cross the road at RD 113 near Samzop village. |
| **Flora & Fauna** | Lush green cultivated fields near human settlements. Very little wildlife. |
| **Road side trees** | Only near human settlements. |
| **Existing traffic category** | All types of vehicles use the road. |

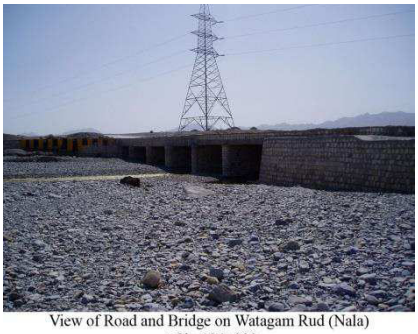
| Attributes | Environmental Impacts | | | | |
|---|---|---|---|---|---|
| | Nil | Low | Med | High | Unknown |
| **Land Use** | | | | | |
| Increase population | | | ✓ | | |
| Adverse use of natural resources | | ✓ | | | |
| Encourage strip development | | ✓ | | | |
| Induced impact on natural resources | | ✓ | | | |
| Affect existing beneficial use | | | ✓ | | |
| Construction camps | | ✓ | | | |
| Land clearing | | ✓ | | | |
| Alter local drainage | ✓ | | | | |
| Change soil character | ✓ | | | | |
| Borrow pit sitting | | ✓ | | | |
| **Water Quality and related issues** | | | | | |
| Contamination from accidental spills | | ✓ | | | |
| Alter Physical / chemical / biological state of water | ✓ | | | | |
| Ecological balance | ✓ | | | | |
| **Air & Noise Pollution** | | | | | |
| Air Pollution / Dust | ✓ | | | | |
| Noise pollution | ✓ | | | | |
| **Flora & Fauna** | | | | | |
| Adverse impact on wildlife | ✓ | | | | |
| **Traffic and Transportation** | | | | | |
| Dislocation of traffic during construction | | ✓ | | | |
| Adequate planning for safe operation | | ✓ | | | |
| **Socio-Economic** | | | | | |
| Impacts on the local/regional economy | | | | ✓ | |
| Changes in cultural patterns | | ✓ | | | |
| Dislocation of population | | | ✓ | | |
| **Health** | | | | | |
| New disease pathway e.g., Malaria | ✓ | | | | |
| Changing natural environmental | ✓ | | | | |
| **General** | | | | | |
| Adverse effect on culture | ✓ | | | | |
| Controversial impacts | ✓ | | | | |
| Amenity impacts | ✓ | | | | |



View of Causeway in Loralai road on Sihab River at Ch: 106+000



View of Road and Bridge on Watagam Rud (Nala) at Ch: 124+000



View of Road and Bridge on Watagam Rud (Nala) at Ch: 124+000

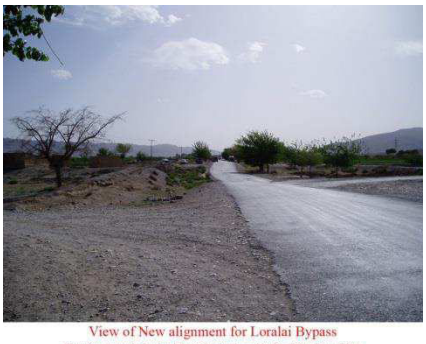
## Improvement and Widening of Qila Saifullah-Loralai-Waigum-Rud of N-70 Including Loralai Bypass

### Environmental Survey Results Loralai bypass

| BIOTIC INFORMATION PROFILE | |
|---|---|
| **Topography** | The alignment passes rolling terrain and |
| **Soil type / Land use** | Strongly calcareous, gravely and stony loams |
| **Drainage & Watercourses** | A large number of water courses over which culverts have been provided. |
| **Flora & Fauna** | Lush green cultivated fields on both sides of the road. Very little wildlife. |
| **Road side trees** | Eucalyptus trees on both sides of the road |
| **Existing traffic category** | All types of vehicles use the road. |

| Attributes | Environmental Impacts | | | | |
|---|---|---|---|---|---|
| | Nil | Low | Med | High | Unknown |
| **Land Use** | | | | | |
| Increase population | | | ✓ | | |
| Adverse use of natural resources | | ✓ | | | |
| Encourage strip development | | ✓ | | | |
| Induced impact on natural resources | | ✓ | | | |
| Affect existing beneficial use | | | ✓ | | |
| Construction camps | | ✓ | | | |
| Land clearing | | ✓ | | | |
| Alter local drainage | ✓ | | | | |
| Change soil character | ✓ | | | | |
| Borrow pit sitting | | ✓ | | | |
| **Water Quality and related issues** | | | | | |
| Contamination from accidental spills | | ✓ | | | |
| Alter Physical / chemical / biological state of water | ✓ | | | | |
| Ecological balance | ✓ | | | | |
| **Air & Noise Pollution** | | | | | |
| Air Pollution / Dust | ✓ | | | | |
| Noise pollution | ✓ | | | | |
| **Flora & Fauna** | | | | | |
| Adverse impact on wildlife | ✓ | | | | |
| **Traffic and Transportation** | | | | | |
| Dislocation of traffic during construction | | ✓ | | | |
| Adequate planning for safe operation | | ✓ | | | |
| **Socio-Economic** | | | | | |
| Impacts on the local/regional economy | | | | ✓ | |
| Changes in cultural patterns | | ✓ | | | |
| Dislocation of population | | | ✓ | | |
| **Health** | | | | | |
| New disease pathway e.g., Malaria | ✓ | | | | |
| Changing natural environmental | ✓ | | | | |
| **General** | | | | | |
| Adverse effect on culture | ✓ | | | | |
| Controversial impacts | ✓ | | | | |
| Amenity impacts | ✓ | | | | |

View of New alignment for Loralai Bypass
Showing towards Loralai River



View of New alignment for Loralai Bypass
Showing towards Sanjawi from Sanjawi road befor 100m from River


View of New alignment for Loralai Bypass
Showing towards Loralai river from Sanjawi road befor 100m from River

## ANNEXURE – III

## NEQS GUIDELINES AND WHO STANDARDS

**National Environmental Quality Standards for Gaseous Emission**

| Parameter | Source of Emission | Existing Standards | Revised Standards |
|---|---|---|---|
| Smoke | Smoke Opacity not to exceed | 40% or 2 on Ringlemann scale | 40% or 2 on Ringlemann scale or equivalent number |
| Particulate matter | a) Boilers and furnaces<br>Oil fired<br>Coal fired<br>Cement Kilns<br>b) Grinding crushing, clinker, coolers and related processes, metallurgical processes, converter, blast furnaces and cupolas | <br>300<br>500<br>200<br>500 | <br>300<br>500<br>300<br>500 |
| Hydrogen Chloride | Any | 400 | 400 |
| Chlorine | Any | 150 | 150 |
| Hydrogen Flouride | Any | 150 | 150 |
| Hydrogen Sulphide | Any | 10 | 10 |
| Sulphur oxides | Sulfuric acids/sulfuric acid plants<br>Other plants | 400<br>400 | 5000<br>1700 |
| Lead | Any | 50 | 50 |
| Mercury | Any | 10 | 10 |
| Cadmium | Any | 20 | 20 |
| Arsenic | Any | 20 | 20 |
| Copper | Any | 50 | 50 |
| Antimony | 20 | 20 | 20 |
| Zinc | Any | 200 | 200 |
| Oxides of Nitrogen | Nitric Acid Manufacturing Unit<br>Gas Fired<br>Oil Fired<br>Coal Fired | 400<br>400 | 400<br>400<br>600<br>1200 |

**WHO Guideline Values for Community Noise in Specific Environment**

| Specific Environment | LA eq (dB) | LAmax Fast (db) |
|---|---|---|
| Out door living area | 55 | |
| School class rooms and pre-schools (indoor) | 35 | |
| School Playground (outdoors) | 35 | |
| Hospitals Ward rooms (indoor | 30<br>30 | 40 |
| Hospital Treatment rooms (indoors) | #1 | |
| Industrial, commercial, shopping and traffic areas (indoors and out doors) | 70 | 110 |

#1= as low as Possible

**WHO Drinking Water Quality Standards**

| Sr. No. | Constituent, mg/L | Recommended limit (1961 European) |
|---|---|---|
| 1 | Ammonia | 0.5 |
| 2 | Chlorides | 350 |
| 3 | Copper | 0.05[a] |
| 4 | Flourides | 1.5 |
| 5 | Iron | 0.1 |
| 6 | Magnesium [b] | 125[b] |
| 7 | Nitrates | 50 |
| 8 | Oxygen | 5.0 |
| 9 | Phenols | 0.001 |
| 10 | Sulphates | 250 |
| 11 | Zinc | 5.0 |

*a Maybe higher for new piping*
*b if 250mg/L $SO_4$ is present, Mg not to exceed 30mg/L*

**ANNEXURE – IV**

**ENVIRONMENTAL MANAGEMENT PLAN**

**ENVIRONMENTAL MANAGEMENT PLAN**

**IMPROVEMENT AND WIDENING OF QILA SAIFULLAH-LORALAI-WIGUM RUD SECTION OF N-70 INCLUDING LORALAI BYPASS**

| Environmental Issues / Component | Remedial Measure | Reference to Contract Document | Approximate Location | Timeframe | Mitigation Cost | Institutional Responsibility | |
|---|---|---|---|---|---|---|---|
| | | | | | | Implementation | Supervision |
| **Location Issues** | | | | | | | |
| Structural Excavation | Maximum usage in embankments & fill areas<br>Safe disposal at pre-selected sites by covered haulage trucks in waste lands, Site to be selected with approval of local residents.<br>No spoil to be disposed near residential areas, lands, forests, streams and other water bodies | To be added in the relevant parts of contract documents<br>(Clause 8.1 and 8.2 of FIDIC document 1992 edition) | Alignment of road | During Construction | To be included in project cost | Design Consultants and NHA | NHA |
| Borrow materials | Only licensed and pre approved quarries to be used<br>Borrow areas away from habitats and not visible from road.<br>Refilling of excavated areas. Areas that cannot be refilled should be cordoned off with barbed wire fence with warning signs. | To form part of general specifications | Alignment of road | During Construction | To be included in project cost | Design Consultants and NHA | NHA |
| Ribbon developments | Enforcement of Laws<br>Reduced template widths in built-up areas.<br>Vigilant monitoring and timely action to prevent any such development. | To be added in the relevant parts of<br>To form part of general specification policy of NHA | Alignment of road | During design, contract and Bidding stage | To be included in project cost | Design Consultants NHA | NHA |
| Flora and Fauna | Detailed tree/vegetation plantation plan.<br>No Tree to be removed without prior approval of FD.<br>Safe storage & re-application of any scarified top earth<br>Enforcement of wildlife protection laws.<br>General public and road users to be educated through graphic signboards.<br>Warning signs for presence and crossing areas of wildlife. | NHA Plantation Pattern guide to be followed. | Road alignment | During design, contract and Bidding stage | To be included in project cost | Design Consultants NHA | NHA |

| Environmental Issues / Component | Remedial Measure | Reference to Contract Document | Approximate Location | Timeframe | Mitigation Cost | Institutional Responsibility | |
|---|---|---|---|---|---|---|---|
| | | | | | | Implementation | Supervision |
| **Design / pre-construction Stage** | | | | | | | |
| **1. Alignment** | | | | | | | |
| Land and Property Losses | All land and property to be acquired for the Project should be equitably and amicably acquired with proper compensation as per the Land Acquisition Act 1894 including later amendments. | Clause 19.1 FIDIC 1992 edition | Road alignment | During design, contract & tendering stage | Included as part of Project Cost under sub head Land acquisition. | Design Consultants NHA | NHA |
| | Adopting suitable cross-sections and adjustment of median width near human settlements and agricultural lands | Land Acquisition Act 1894 including later amendments. | Reduced median width within populated area | | | | |
| | Any existing utilities to be properly relocated | | Retaining walls will be provided where required. | | | | |
| **2. Land** | | | | | | | |
| Embankment Slopes | All critical slopes along the roadsides to be provided with, turf in order to protect the slopes as per the recommended practice for treatment of embankment slopes for erosion control. | This remedial measure to form part of general specifications. | Road alignment | During design, contract & Bidding stage | Included in project cost | Design Consultants and NHA | NHA |
| Road Inundation | Proper drainage, erosion and training structures to be provided, also suitable structures such as culverts to be provided where necessary | General specifications | Road alignment | During design, contract and Bidding | To be included in project cost | Design consultants and NHA | NHA |
| Quarries and Borrow Areas | Existing licensed quarries have been recommended. | General Specifications | All selected borrow pits and quarries | During design, contract and Bidding | To be included in project cost | Design Consultants and NHA | NHA |
| | Non-productive barren lands, raised lands, riverbeds, and wastelands have been recommended to be used as borrow areas for earth materials; no fertile land to be used for this purpose. | | | | | | |
| | Low lying areas and wastelands that can be developed into fish ponds are recommended to be used for borrow areas. | | | | | | |
| | Any land that the landlord wishes to be cut for any purpose | | | | | | |

| Environmental Issues / Component | Remedial Measure | Reference to Contract Document | Approximate Location | Timeframe | Mitigation Cost | Institutional Responsibility | |
|---|---|---|---|---|---|---|---|
| | | | | | | Implementation | Supervision |
| **3. Water** | | | | | | | |
| Water Sources | Balochistan is an arid province and depends upon ground water for its agricultural and other uses. The two districts depend mostly on rainfall. River Zhob provides drainage to Qila Saifullah, whereas Nari River and its tributaries | General Specification | All water resources of the area will be affected. | During design and Bid stage | To be included in project cost | Design Consultants and NHA | NHA |
| | Water ponds, fish ponds in construction sphere to be relocated. | | | | | | |
| | Proper training works to be provided and maintained. No major change is foreseen in the existing water resources of the area. | | Very little adverse impact foreseen. | | | | |
| | **Ground Water** | | Road alignment | During Design and Bid stage | To be included in the Project cost | Design Consultant and NHA | NHA |
| | All construction plants and machinery should be kept well maintained and all fuel, lubricants and other chemicals should be stored in | | | | | | |
| Drainage | Natural drains will be modified to avoid obstructions | | Road alignment | During design and Contract | To be included in project cost | Design Consultants NHA | NHA |
| | Provision of adequate size and number of cross drainage structures. | | | | | | |
| | Sections of the road that are flooded during rains shall be raised and cross drainage structures and adequate side drains shall be provided. | | | | | | |
| **4. Flora & Fauna** | | | | | | | |
| Roadside Plantations | Trees to be removed only after approval of FD. | | Along road within Right of way. | During design, Contract, | To be included in project cost | Design Consultants NHA | NHA |
| | Compensatory forestation will be adopted. Two trees will be planted for each tree cut as per NHA policy. | | | | | | |
| | Trees to be planted in linear plantation along the approach roads. | | | | | | |

| Environmental Issues / Component | Remedial Measure | Reference to Contract Document | Approximate Location | Timeframe | Mitigation Cost | Institutional Responsibility | |
|---|---|---|---|---|---|---|---|
| | | | | | | Implementatio | Supervision |
| **5. NEQ's** | | | | | | | |
| Air Quality | Improving road geometry, curves, slopes, etc and widening of road to smoothen traffic flow.<br>Trees will be planted on both sides of the road and in the median verges shrubs of suitable species will be planted this will reduce air pollutant concentrations and reduce noise. | Major Pakistan Environmental Legislations to be followed | Along road, especially at sensitive locations | During designs, contract. | To be included in project preparation cost. | Design Consultants NHA | EPA, NHA, FD |
| Solid Waste | Solid waste disposal sites will be properly designed and must be at least 250 m away from the right-of way of all roads | Same as above | Near construction sites | During design and construction | To be included in project cost | Design consultants and NHA | NHA |
| Noise levels | Removal of slumps & bottlenecks in built-up areas.<br>Proper design of all junctions & intersections.<br>Segregation of slow and fast moving traffic<br>Roadside plantations of different species of trees, shrubs etc will act as sound barrier and absorbers.<br>Places that are highly sensitive, such as schools and hospitals, shall be protected as follows:<br>Shrubs to be planted 3m from the edge of the pavement.<br>More noise barriers will be provided at 4m. | Same as above | Near construction sites | During design and construction. | To be included in project cost | Design consultants and NHA | NHA |
| **6. Utilities** | | | | | | | |
| Public Utilities | All public utilities such as gas/water pipes, power/phone lines etc likely to be affected, must be relocated, after consulting the responsible agency. | General Specifications | Near Human settlements and along Road alignment | During design, contract | To be included in project cost | Design consultants and NHA | NHA |

| Environmental Issues / Component | Remedial Measure | Reference to Contract Document | Approximate Location | Timeframe | Mitigation Cost | Institutional Responsibility | |
|---|---|---|---|---|---|---|---|
| | | | | | | Implementation | Supervision |
| **7. Cultural heritage** | | | | | | | |
| Cultural Properties | There is no cultural heritage site within 500m of the Project Road. There are a few mosques and one shrine in the ROW of the Project Road these will be relocated as per the desire of the local communities affected. | Land Acquisition Act 1894 and later amendments will be followed. | At various locations all along the project corridor | During design, contract | To be included in project cost | Design Consultants and NHA | NHA |
| **Construction Stage** | | | | | | | |
| **1. Soil** | | | | | | | |
| Soil Erosion | Steep embankments will be protected with one or more of the following:<br>- Drains and chutes to minimize soil erosion<br>- Stone pitching<br>- Masonry retaining structures<br>- Vegetative turfs at embankments, i.e. planting of grass and shrubs etc.<br>- Borrow pit depths will be such that no side is steeper than 25%<br>- Formation of sediment basins and slope drains<br>- Bench terracing for high cut areas. | General Specifications | Borrow areas | During design contract | To be included in his cost by the contractor. | Contractor's Environment Engineer | EPA, NHA, Supervising Consultant. |
| Loss of Top Soil | Agricultural areas will not be used for borrowing of materials, unless requested by the landowner for making ponds or for lowering the land for making it irrigable | General specifications | Borrow areas | During design contract. | To be included in Bid Cost by the Contractor | Contractor's Environment Engineer | EPA, NHA and Supervising Consultant. |
| Borrow Soils | No earth will be borrowed from within the Right of way of roads.<br>Non-productive lands, barren lands, raised lands, riverbeds and waste lands may be used for borrowing earth.<br>If new borrow areas are to be selected, then measures will be taken so that there will be no loss of productive soil, and all environmental<br>Unpaved surfaces used for the haulage of borrow materials will be maintained properly.<br>Precautionary measures such as covering vehicles will be taken to avoid spilling of borrow materials.<br>To avoid any embankment slippage, borrow areas will not be dug continuously.<br>In borrow areas; two trees will be replaced for one tree cut. | General specifications | In all proposed borrow areas | During design, contract | To be included in Bid Cost by the Contractor | Contractor's Environment Engineer | EPA, NHA Supervising Consultant. |

| Environmental Issues / Component | Remedial Measure | Reference to Contract Document | Approximate Location | Timeframe | Mitigation Cost | Institutional Responsibility | |
|---|---|---|---|---|---|---|---|
| | | | | | | Implementatio | Supervision |
| Quarry Areas | The quarry material will be obtained from licensed sites with proper environmental clearances.<br>New quarries will only be opened with prior permission from Local authorities. | | All proposed quarry sites | During construction | To be included in Bid Cost by the Contractor | Contractor's Environment Engineer | EPA, NHA and Supervising Consultant |
| Contamination of Soils | Construction equipment will be maintained & refuelled ensuring no spillage contaminates the soil<br>All spoils and waste material will be disposed of in wastelands, with approval of local communities<br>Scarified bituminous wastes will be disposed of at approved sites with impervious linings. | | Throughout project corridor, all borrow areas and construction sites | During Construction | To be included in Bid Cost by the Contractor/ | Contractor's Environment Engineer | EPA, NHA and Supervising Consultant. |
| **2. Water** | | | | | | | |
| Water Bodies and other Water Sources | Immediate rehabilitation & compensation of damaged or adversely affected water sources.<br>Advance measures to be taken to prevent any damage to water bodies.<br>Any community water source, such as well etc., damaged accidentally will be replaced with alternate sources. | | At water bodies or cross drainage | During Construction | To be included in Bid Cost by the Contractor | Contractor's Environment Engineer | EPA, NHA and Supervising Consultant. |
| Drainage & Runoff | At cross drainage structures, the earth, stone or any other construction material will be properly disposed off, so as to avoid blocking the flow of water | | Throughout proje ct corridor | During construction | To be included in Bid cost by the Contractor | Contractor's Environment Engineer | EPA, NHA, SC. |
| Water Contamination | All necessary precautions will be taken to construct temporary or permanent devices to prevent water pollution due to increased siltation and turbidity.<br>All necessary measures will be taken to prevent earthworks and stone works from impeding rivers, streams, water canals, or drainage system.<br>Wastes must be collected, stored, and taken to approve disposal site.<br>To avoid contamination from fuel and lubricants, the vehicles and equipment will be properly maintained and refuelled. Oil and grease traps will be provided at fuelling locations. The slopes of embankments leading to water bodies will be modified and screened so that contaminants do not enter water body.<br>Side drains provided in the settlement areas will discharge through primary settling tank Waste petroleum products will be collected, stored, and disposed of at the approved sites.<br>Water quality will be monitored. | | Throughout proje ct corridor | During Construction | To be included in bid cost by the Contractor | Contractor's Environment Engineer | EPA, NHA and SC. |

| Environmental Issues / Component | Remedial Measure | Reference to Contract Document | Approximate Location | Timeframe | Mitigation Cost | Institutional Responsibility | |
|---|---|---|---|---|---|---|---|
| | | | | | | Implementation | Supervision |
| Sanitation and Waste disposal in construction camps | The Construction camps will be located away from the habitation. The sewage system for such camps will be properly designed and built so that no water pollution takes place, If necessary, temporary effluent treatment plants will be installed in the construction camps.<br>The workplace will have proper medical facilities. | | Various construction camps throughout project corridor. | During Construction | To be included in Bid Cost by the Contractor | Contractor's Environment Engineer | EPA, NHA and Supervising Consultant. |
| Water used during Construction | The contractor will arrange for water for construction such that nearby communities remain unaffected.<br>Water will not be wasted during construction. | | All project roads | During construction | To be included in Bid Cost by the Contractor | Contractor's Environment Engineer. | EPA, NHA and SC |
| **3. Air** | | | | | | | |
| Emission from Construction Vehicles & Equipments | All machinery and plant storage yards will be constructed downwind of human settlements.<br>The pollution emission levels of all vehicles, equipment and machinery used for construction will conform to the NEQs.<br>Air pollutant parameters will be monitored regularly during construction, as envisaged in the EMP.<br>The Asphalt plants, crushers and the batching plants will be at least 1 km in the downwind of the nearest human settlement. | | All construction sites | During construction | To be included ion bid cost by the contractor | Contractor's Environment Engineer | |
| Dust and its treatment | All precautions will be taken to reduce the level of dust emissions from hot mix plants, crushers and batching plants<br>The hot-mix plants, crushers and batching plants will be at least 1 km downwind from the nearest habitation. The hot mix plant will be fitted with dust extraction units. Water will be sprayed in the lime, cement, and earth mixing sites asphalt mixing site and temporary service and access roads.<br>After compaction of Works, water will be sprayed regularly on the earthwork to prevent dust.<br>Delivery vehicles will be covered. Mixing equipment will be well sealed and equipped as per existing standards | | All construction sites throughout project corridor | During construction | To be included in bid cost by the contractor | Contractor's Environment Engineer | EPA, NHA and SC |

| Environmental Issues / Component | Remedial Measure | Reference to Contract Document | Approximate Location | Timeframe | Mitigation Cost | Institutional Responsibility | |
|---|---|---|---|---|---|---|---|
| | | | | | | Implementation | Supervision |
| **4. Noise Levels** | | | | | | | |
| Noise from Vehicles, Asphalt Plant & Equipment | The Plants and equipment used for construction will strictly conform to NEQs noise standards.<br>Vehicles and equipment used will be fitted with silencer and maintained accordingly.<br>Noise standards for industrial enterprises will be strictly enforced to protect construction workers from severe noise impacts.<br>Workers will be provided with appropriate ear muffs/plugs.<br>The noise level will be monitored during the construction, as per the EMP.<br>Noise barriers/trees will be placed in urban locations. | | All construction sites throughout the project corridor | During construction | To be included in Bid Cost by the Contractor | Contractor's Environment Engineer | EPA, NHA and SC. |
| Noise Barriers | Vegetation and high walls with insulation against sound will be installed at locations with high noise levels exceeding NEQs. | | Sensitive locations such as near educational institutions, hospitals etc. | During Construction | To be included in bid cost by the Contractor | Contractor's Environment Engineer | EPA, NHA and SC. |
| **5. Flora** | | | | | | | |
| Loss or damage to vegetation | Areas from where trees are removed will be marked and all trees will be replaced according to "Roadside Plantation Program".<br>Trees requiring removal will be paint-marked | | Throughout project corridor. | Just before start of construction work | To be included in Bid Cost by the Contractor | Contractor's Environment Engineer | EPA, NHA and SC. |
| Vegetation and soil Compaction | All construction machinery & equipment will be parked in designated areas to prevent vegetation compaction outside right of way.<br>Any incidental damages like, soil trampling & damage to herbs, shrubs & grasses will be kept to the minimum | | | | | | |

| Environmental Issues / Component | Remedial Measure | Reference to Contract Document | Approximate Location | Timeframe | Mitigation Cost | Institutional Responsibility | |
|---|---|---|---|---|---|---|---|
| | | | | | | n | Supervision |
| **6. Fauna** | | | | | | | |
| Loss, damage or disruption to fauna | Providing education to construction workers to avoid disruption or damage to wildlife.<br>Wildlife Protection laws to be strictly followed.<br>All construction vehicles will use specified routes to avoid accidents with cattle or wildlife. | | Throughout project corridor | During Construction | To be included in Bid Cost by the Contractor. | Contractor's Environment Engineer | EPA, NHA, SC, Wildlife Department |
| **7. Safety & Accident Risks** | | | | | | | |
| Construction Activities & Accident Risks | Safety signals will be installed on all temporary routes during construction.<br>Strict enforcement of traffic rules & regulations.<br>Workers will be provided helmets, masks & safety goggles etc.<br>A readily available first aid unit, dressing materials, ambulance & nursing staff will be ensured at critical locations.<br>Road safety education will be imparted to drivers of construction vehicles.<br>Traffic management will be ensured during construction periods.<br>Information dissemination through newspaper, audio/TV & banners etc about project time frame, activities causing disruption & temporary arrangements for public relief<br>must be ensured. | | Throughout project corridor | During Construction | To be included in bid cost by the Contractor | Contractor's Environment Engineer | Police, NHA and SC. |

| Environmental Issues / Component | Remedial Measure | Reference to Contract Document | Approximate Location | Timeframe | Mitigation Cost | Institutional Responsibility | |
|---|---|---|---|---|---|---|---|
| | | | | | | Implementatio | Supervision |
| Traffic bottlenecks and diversions | Temporary access roads will be provided at all interchanges, bridges and culverts, especially in high population areas. Such diversions shall have proper drainage facilities. | | Along settlements and at major intersections | During construction | To be included in Bid Cost by the Contractor. | Contractor's Environment Engineer | EPA, NHA, SC, Wildlife Department |
| Health issues | Drainage, sanitation, & waste disposal facilities will be provided at work places.<br>Drainage will be maintained and water will not be allowed to stagnate to avoid breeding mosquitoes & spread of other diseases.<br>Suitable sanitation & waste disposal facilities will be provided at camps by construction of septic tanks & soak pit etc.<br>Sufficient water supply will be maintained at camps to secure workers hygiene.<br>Health education & preventive medical care will be provided to workers.<br>Routine medical check up of workers to avoid spread of communicable disease. | | Throughout project corridor | During Construction | To be included in bid cost by the Contractor | Contractor's Environment Engineer | Police, NHA and SC. |
| Cultural Properties | | | | | | | |
| Care of Archaeological, Religious, & Cultural properties | If any valuable articles such as fabric, coins, artefacts, structures, or other archaeological relics are discovered, the excavation will be stopped & the archaeology departments will be informed.<br>Construction camps, blasting sites, and all allied construction activities will be well away from cultural property. | | Along project corridor | During Construction | To be included in Bid Cost by the Contractor | Contractor's Environment Engineer | NHA, SC, Archaeology Department |
| Traffic bottlenecks and diversions | Temporary access roads will be provided at all interchanges, bridges and culverts, especially in high population areas. Such diversions shall have proper drainage facilities. | | Along settlements and at major intersections | During construction | To be included in Bid Cost by the Contractor. | Contractor's Environment Engineer | EPA, NHA, SC, Wildlife Department |

| Environmental Issues / Component | Remedial Measure | Reference to Contract Document | Approximate Location | Timeframe | Mitigation Cost | Institutional Responsibility | |
|---|---|---|---|---|---|---|---|
| | | | | | | Implementation | Supervision |
| Health issues | Drainage, sanitation, & waste disposal facilities will be provided at work places.<br>Drainage will be maintained and water will not be allowed to stagnate to avoid breeding mosquitoes & spread of other diseases.<br>Suitable sanitation & waste disposal facilities will be provided at camps by construction of septic tanks & soak pit etc.<br>Sufficient water supply will be maintained at camps to secure workers hygiene.<br>Health education & preventive medical care will be provided to workers.<br>Routine medical check up of workers to avoid spread of communicable disease. | | Throughout project corridor | During Construction | To be included in bid cost by the Contractor | Contractor's Environment Engineer | Police, NHA and SC. |
| **8 Cultural Properties** | | | | | | | |
| Care of Archaeological, Religious, & Cultural properties | If any valuable articles such as fabric, coins, artefacts, structures, or other archaeological relics are discovered, the excavation will be stopped & the archaeology departments will be informed.<br>Construction camps, blasting sites, and all allied construction activities will be well away from cultural property. | | Along project corridor | During Construction | To be included in Bid Cost by the Contractor | Contractor's Environment Engineer | NHA, SC, Archaeology Department |
| **9 Environmental Enhancement** | | | | | | | |
| Roadside Landscape Development | Avenue plantation of mixed species of aesthetically pleasing trees, shrubs & aromatic plants will be carried out. | | Throughout project corridor | During Construction | To be included in Bid Cost by the | Contractor's Environment Engineer | NHA, SC |
| Roadside Amenities | Provision of bus shelters, bus bays, petrol pump, restaurants, recovery areas & truck stops as per detailed design will be carried out.<br>Road furniture including footpaths, railings, traffic signs, speed zone signs, wildlife warning boards etc will be erected at suitable places | | Throughout project corridor | During Construction | To be included in Bid Cost by the Contractor | Contractor's Environment Engineer | NHA, SC. |
| Cultural Properties | All cultural properties will be protected and access roads will be provided, wherever required. | | Various construction sites throughout project corridor | During Construction | To be included in Bid Cost by the Contractor | Contractor's Environment Engineer | NHA, SC |

| Environmental Issues / Component | Remedial Measure | Reference to Contract Document | Approximate Location | Timeframe | Mitigation Cost | Institutional Responsibility | |
|---|---|---|---|---|---|---|---|
| | | | | | | Implementation | Supervision |
| **Operational stage** | | | | | | | |
| Contamination from oil and other spills | Any site of accidental oil or any other spill shall be cleared immediately.<br>Soiled earth will be scraped and deposited in small lined confined pits nearby, within the ROW | | Throughout project corridor | During road operations | To be included in engineering cost | NHA and Local Administration | EPA, NHA |
| Dust Generation | Roadside tree plantations will be maintained.<br>Forestation will be taken up at new sites near the road | | Throughout project corridor | During road operations | To be included in engineering cost | NHA, Local Administration | EPA, NHA |
| Air Pollution | Vehicular emissions of critical pollutant parameters (SPM, RSPM, CO, SO2, NO2 and Pb) will monitored as per the NEQs.<br>Roadside tree plantation will be maintained.<br>Vehicular air pollution will be managed and monitored.<br>The road will be regularly maintained to ensure good surface conditions. | | Along Project road alignment | During Road operations | To be included in Engineering costs | NHA, Local Administration | NHA, Traffic Police |
| Noise Pollution | Noise will be monitored.<br>According to monitoring results, use of sound barriers/trees will be considered where necessary.<br>Road signs for sensitive zones (hospitals, educational institutions etc.) will be put up to stop blowing of horns and to regulate traffic speed.<br>Public awareness program will be launched. | | Throughout project corridor | During road operations | Added in the EMP | NHA, Local Administration | EPA, NHA |

| Environmental Issues / Component | Remedial Measure | Reference to Contract Document | Approximate Location | Timeframe | Mitigation Cost | Institutional Responsibility | |
|---|---|---|---|---|---|---|---|
| | | | | | | Implementation | Supervision |
| Water | The drainages system will be cleaned periodically.<br>Water quality will be monitored as per the monitoring plan. | | Throughout project corridor | During road operations | Added in the EMP | NHA, local Administrations | EPA, NHA |
| Flora & Fauna | Roadside tree plantation will be strictly monitored & maintained<br>Efforts will be made to educate villagers on the use of specified areas for cattle grazing. | | Throughout project corridor. | During Road operations | Rs. 15 million | NHA local Administrations | EPA, NHA, FD & Wildlife Department |
| Soils | Soil quality for lead, chromium, cadmium to be monitored regularly. | | Throughout project corridor | During Road operations | Added in the EMP | NHA Local Administrations | EPA, NHA |
| Accidents | New roads tempt people to drive at high speeds and thus become more prone to accidents, this must be controlled through;<br>- Enforcement of traffic laws<br>- Speed restrictions<br>- Safety measures at critical spots<br>- Under/over-passes & zebra crossings<br>- Contingency plans for accident recovery | | Throughout project corridor | During Road operations | To be included in engineering costs | NHA, local Administrations | NHA, Traffic Police. |
| Transportation of Explosives and other dangerous Materials | Delivery of any dangerous substances must be done with prior approval of concerned<br>Such vehicles must be marked with appropriate signs in capital letters in red paint and should run during lean traffic hours.<br>Any spill will be reported to concerned agency, which will be responsible for the contingency measures of cleaning the spill within shortest | | Throughout project corridor | During Road operations | To be included in engineering costs | NHA, Local Administrations | NHA, Traffic Police |
| Safety Measures | Development of coordinated traffic management plan especially along highly populated and critical locations.<br>Traffic Control measures, including speed limits, will be enforced strictly.<br>Further growth of encroachments, ribbon developments and squatting settlements within right of way will be discouraged.<br>No schools, hospital, mosques, grave yards or houses will be allowed within 200m of the roads. | | Throughout project corridor | During Road operations | To be included in engineering costs | NHA, local Administrations | NHA, Traffic Police |

Note: FD = Forest Department, EIA – Environmental Impact Assessment, EMP = Environmental Management Plan, EPA = Environmental Protection agency, NHA= National Highways Authority
Km = Kilometres, m = meters, SC = Supervision Consultants, SPM = Suspended Particulate Matter, HC = Hydrocarbon, RPM – Respirable Particulate Matter

## ANNEXURE – V

## LIST OF PARTICIPANTS OF CONSULTATIONS

## I. Public Consultations held in 2008–2009

**Executive Chief Engineer C&W Department, Loralai** (Mr. Qazi Amanullah Khan)
He was of the view that the project will bring a number of direct and indirect benefits of development and job opportunities for communities living in the area. He shared that Government of Balochistan will allocate alternative sites for all mosques, shrine and graveyards, although illegally built on the RoW of the project.

**DCO Loralai** (Mr. Mohammad Ikhtiar)
The DCO Loralai provided great help in finalizing the alignment of Loralai bypass towards south of the Loralai city.

**Taraqee Foundation** (Mr. Amjad Rashid, Chief Executive)
Taraqee Foundation is a National level NGO working for poverty alleviation since the last 14 years. Currently it is serving in 13 districts of Balochistan and NWFP through its 35 offices with the support of 625 staff members. Its core program includes environment and infra-structure.

Mr. Amjad Rashid was also found to be in favor of the Project due to its strategic importance and also since the implementation of the Project will help in poverty alleviation.

## II. Public Consultations held in 2013

| Meetings with Public Office Holders | | |
|---|---|---|
| **Name** | **Designation** | **Department** |
| **Quetta** | | |
| Nasir Khan Kashani | Director General | Balochistan Environment Protection Agency Quetta |
| Muhammad Khan | Dy. Director Technical | Balochistan Environment Protection Agency Quetta |
| Daood Khan | Assistant | Balochistan Environment Protection Agency Quetta |
| Mr. Noor-ul-Hassan | GM Balochistan | National Highway Authority, Quetta, Balochistan |
| Mr. Anayat Ullah | Director Maintenance | National Highway Authority, Quetta, Balochistan |
| Mr. Abdul Manan | Dy. Director Land/Legal | National Highway Authority, Quetta, Balochistan |
| Mr. Shah Muhammad | Dy. Director Maintenance | National Highaway Authority, Loralai. Balochistan |
| **Loralai** | | |
| Abdul Wahid Kakar, | Deputy Commissionar | Deputy Commissionar Offcie Loralai |
| Abdul Razzaq, | Executive Engineer (B&R) | Buildings Departmemt Loralai |
| Latif Raza Changezi, | DD (Agri), | Agricultural Department Loralai |

## Consultation Meetings with Community along the project

Qila Saifullah - Loralai - Wagum Rud (N - 70) Project

| S# | | Mouza/ Venue | Name of Participants | Concerns Raised (if any) |
|---|---|---|---|---|
| 1 | 19/9/2013 | Drazinda | Abdul Matin | Increase in road Accidents |
| 2 | | | Juma Khan | No |
| 3 | | | Nasib Khan | No |
| 4 | | | Salim | Loss of Structures |
| 5 | | | M. Khan | No |
| 6 | | Zar Karez | Abdul Baqi | No |
| 7 | | | Zafarullah | Loss of Assets |
| 8 | | | Hameedullah | Loss of Business |
| 9 | 20/09/2013 | Shah Karez | Shahbaz | Loss of Trees |
| 10 | | | Abdul Rehman | No |
| 11 | | | Gul Dad | No |
| 12 | | | Mulla Abdullah | No |
| 13 | | | Nazar Khan | Loss of Land |
| 14 | | | Hassan | No |
| 15 | | | Raz. M | No |
| 16 | | | H. Umar | No |
| 17 | | | Mehrab Khan | |
| 18 | | | Rafiulah | |
| 19 | | | Waheed Ullah | |
| 20 | | Lasti + AsgharLon | Khudaidad | Increase in road Accidents |
| 21 | | | Haji Juma | Loss of Property |
| 22 | | Orad Shabozai | H. Zarghoon | Loss of Land |
| 23 | | | Asmatullah | No |
| 24 | | | Abdul Zahir | Loss of Property |
| 25 | | | Master Mian Khan | |
| 26 | 21/09/2013 | Martat Kalan + Lahore + Dargai Kadezai | Khan Bedaar | No |
| 27 | | | Hashim | No |
| 28 | | | M. Nawaz | Loss of Trees |
| 29 | | | Malik Yameen | No |
| 30 | | | Abdul Bari | No |
| 31 | | | M . Jan | Loss of Structures |
| 32 | | | Laloon | No |
| 33 | | | Noor. M Shah | No |
| 34 | | | Molvi Khaliq Dad | Loss of Business |
| 35 | | | Sahibjan | No |
| 36 | | | Abdul Razaq | No |
| 37 | | | Yaqoob | Loss of Structures |
| 38 | | | Bismillah | No |
| 39 | | Dalezai Shabozai | Haji Kala Khan | Increase in road Accidents |
| 40 | | | Dusmaal | No |
| 41 | | | H. Katai | No |
| 42 | | | Musa Gul | Loss of Business |
| 43 | | | Nasrullah | Loss of Land |
| 44 | | | Wajib | No |
| 45 | | | Pashuk | No |
| 46 | | | Rahim Jan | Loss of Land |
| 47 | | Bori Viyala + Saghrai | Ayaz Khan | No |
| 48 | | | Jalal Khan | No |
| 49 | | | Abdul Hakim | No |
| 50 | | | Abdul Aleem | Loss of Property |
| 51 | | Nawab Karez | Abdul Khaliq | No |
| 52 | | | Zia ul Haq | No |
| 53 | | Vehar Kala | Sher Khan | Loss of Assets |
| 54 | | | Ahsanullah | No |

**Total No of APs Consulted = 54**