



GOVERNMENT OF PAKISTAN
NATIONAL HIGHWAY AUTHORITY
ISLAMABAD

**CONSULTANCY SERVICES FOR
FEASIBILITY STUDY AND DETAILED DESIGN FOR
DUALIZATION OF ROAD FROM
CHISHTIAN TO CHAK NO. 46/3R VIA DAHRANWALA
(44.50 KM. APPROX.)**



**ENVIRONMENTAL IMPACT ASSESSMENT
(EIA) REPORT**

APRIL, 2023



ASSOCIATED CONSULTANCY CENTRE (PVT.) LTD., ISLAMABAD

in Joint Venture with



ASSOCIATED CONSULTING ENGINEERS ACE LIMITED, LAHORE

and



ZK ENTERPRISES, RAWALPINDI



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EXECUTIVE SUMMARY

This Environment Impact Assessment (EIA) has been prepared for National Highway Authority (NHA) by the Design Consultants to address the environmental impacts of the proposed Project. This study covers only the impacts from the Feasibility Study and Detailed Design for Dualization of Road from Chishtian to Chak No. 46/3 R via Dahranwala (44.5 km approx.). This report has been prepared to meet compliance with environmental regulations and requirements under Punjab Environmental Protection Act, 2012.

Name of the Proponent

National Highway Authority (NHA)

Name of Organizations preparing the Report

M/s. Associated Consultancy Centre (Pvt.) Ltd. in JV with M/s. Associated Consulting Engineer – (ACE) Limited and M/s. ZK Enterprises.

Need of Project

The proposed alignment starts from Dahranwala Morr, Chishtian and terminates at Chak 46 / 3R via Dahranwala. The length from Chishtian to Chak 46/3R is 41.250 Km. The project road further lead towards Haroonabad.

The proposed alignment will be 4–Lane, Dual Carriageway (2–lanes on Each Side) with achievable speed up to 80 – 100 Kph. The travel time will be reduced to about 35 – 40 minutes. Most importantly, as there will be dedicated lanes for each side of traffic, accident ratio will be greatly reduced. Better road facility will also contribute in savings for Vehicle Operating Cost (VOC) and Vehicle Travel Time (VTT).

Project Description

Project is located in District Bahawalnagar of Punjab Province. The project will provide a better access to the local producers to the one of the major industrial hub of Punjab which will help to improve the financial profile of the area. The project provides the following additional benefits :

- ❖ Improvement of existing track as per feasibility and detailed design, smooth traffic flow will be possible & traffic accidents ratio will be reduced to a greater extent.
- ❖ Project reflected Government of Pakistan policy for development of deprived areas.
- ❖ Vehicle operating cost will be reduced & traveling time will be saved.
- ❖ Job opportunities will be created for the locals

Legal and Administrative Framework

Pakistan has basic policy and legislative framework for the protection of the environment; and overall biodiversity in the country is now in place. However, detailed rules, regulations and guidelines required for the implementation of the policies and enforcement of legislation are still in various stages of formulation and discussion. The following paragraphs briefly describe legislative framework covering environmental framework relevant to this project.

Punjab Environmental Protection Act 2012 and National Environmental Policy (NEP) provide a framework for addressing the environmental issues. Their goal is “to protect, conserve and restore Pakistan’s environment in order to improve the quality of life of the citizens through sustainable development”. Section 5 of the NEP commits for integration of environment into development planning as instrument for achieving the objectives of National Environmental Policy. It also provides broad guidelines to the Federal Government, Provincial Governments, Federally Administered Territories and Local Governments to address their environmental concerns and to ensure effective management of their environmental resources.

The Biodiversity Action Plan (BAP), which has been designed to complement the NCS and the proposed provincial conservation strategies, identifies the causes of biodiversity loss in Pakistan and suggests a series of proposals for action to conserve biodiversity in the country. The BAP recognizes that an Environmental Impact Assessment (EIA) / Initial Environmental Evaluation (IEE) is used as a tool at a project level to identify environmental effects of a proposed project and to plan for reducing adverse effects. The BAP further stipulates that an EIA/IEE needs to be initiated at an early stage of project development and that public participation in the review of potential effects is important.

Pakistan Environmental Protection Act, 1997 (PEPA) is the 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. Its main sections are : Section 11 which prohibits discharge of emissions; Section 12 requires preparation of IEE and EIA prior to commencement of work; section 14 restricts use and handling of hazardous substances; and section 17 deals with the penalties.

The Review of IEE and EIA Regulations, 2000, provide the necessary details on the preparation, submission, and review of IEE and EIA. The Regulation classifies projects based on 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.

The Punjab Environmental Quality Standards (PEQS) promulgated under the PEPA (Amended 2012) specify standards for industrial and municipal effluents, gaseous emissions, vehicular emissions, and noise levels. The PEPA 2012 empowers the EPA to impose pollution charges in case of non-compliance to the PEQS. It also defines standards for drinking water as well as ambient air and noise. The Pakistan Penal Code (1860) 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.

The Land Acquisition Act (LAA) of 1894 amended from time to time has been the policy governing land acquisition, resettlement and compensation in the country. The LAA is the most commonly used law for acquisition of land and other properties for development projects.

The constitution of Pakistan contains a range of provisions related to labour rights found in Part II : Fundamental Rights and Principles of Policy. Article 11 of the constitution prohibits all forms of slavery, forced labour, and child labour. Article 17 provides for a fundamental right to

exercise the freedom of association and the right to form unions. Article 18 prescribes the right of its citizens to enter upon any lawful profession or occupation and to conduct any lawful trade or business. Article 25 lays down the right to equality before the law and prohibition of discrimination on the grounds of sex alone. Article 37(e) makes provision for securing just and humane conditions of work, ensuring that children and women are not employed in vocations unsuited to their age or sex, and for maternity benefits for women in employment.

Project Alternatives

For this EIA, following alternatives were considered :

- ❖ No Project Option;
- ❖ Alternate Route Option; and
- ❖ Project as Proposed

No Project Option

The existing road width varies from 6.5 m to 7.0 m with earthen shoulders. The carriageway is TST with few Asphalt Wearing Course Sections.

The road condition is poor, have potholes and fatigue cracking over a significant length. The major reason of poor segments is due to poor drainage system specifically in the built-up areas where road surface level is lower than the nearby buildings and commercial areas. The pavement lane markings need rehabilitation. The road safety furniture in the built-up areas is in average condition. Poor structural condition of the road pavement structure around the shoulders and the potholes causes interruption in the flow by traffic manoeuvring in opposite direction. Therefore, the said track cannot be used for the transportation purposes.

Alternate Route Option

The existing road runs within the ROW of Communication & Works (C&W) Department of Punjab therefore no / less additional land acquisition from private owners will be required. The alternatives route option in this case will be highly expensive due to relocation of utilities and purchase of land. The surrounding areas are very rich in agriculture and populative; hence, the alternative route may also cause a serious environmental impact.

Project as Proposed

The project addresses the urgent needs of the communities and is designed to be implemented in the most appropriate way entailing fulfilment of technical, financial, environmental requirements. With the provision of improved top surface, construction of small culverts, provision of drainage at required points and stronger road foundation will result safe route for movement. Provision of efficient roads section through improvement of this road section will provide uninterrupted traffic flow, this will increase the vehicle operating speed thereby reducing the vehicle operating time and cost. The result will be the stimulation of economic uplift of areas along the route by providing better farm-to-market access on one hand and savings in fuel due to less vehicle operating costs. The primary objective will be to ensure safety at higher speeds on modern road. In the long run, the project is expected to be financially viable, socially acceptable, environmentally manageable, gender-neutral and pro-poverty alleviation.

Conclusion

Based on the above information, the opportunity to construct the road as proposed is recommended and will prove to be very beneficial for the recipient communities. The negative environmental impacts are not highly significant because the existing route is already under operation. The short-term environmental damages may be controlled through mitigation measures.

Environmental Baseline

The existing environmental conditions around the proposed project have been considered with respect to physical, biological and socio-economic aspects. The methodology used for the EIA preparation included collection and review of relevant documents and first-hand data including policy and previous study documents, use of satellite imagery and Google Earth, onsite environmental, ecological and social investigation, consultation with public and stakeholders and undertaking the social impact assessment and analysis. Mitigation measures were then put in place to address negative impacts and compensatory plans are designed and recommended.

The Consultant has employed a participatory bottom-up transparent and consultative approach in the preparation of the Environmental Impact Assessment (EIA) Report. Various qualitative and quantitative data collection tools were used to develop an environmental baseline for the proposed area.

In order to assess baseline conditions, ambient air, noise, water and soil quality was monitored along the existing route through available data by the concern Departments.

Ambient Baseline

Overall Air monitoring indicates that average 24 hours concentrations of CO, NO, NO₂, NO_x and SO₂ were found below the permissible limits regulated by PEQS, 2016 for ambient air. Other parameters like ozone, lead, particulates matters (PM_{2.5}), particulates matters (PM₁₀) and suspended particulate matters are also within the permissible range according to PEQS. In general, there is no continuous major source of noise pollution along the proposed route alignment. Analysis results of drinking water samples show that the drinking water available along the existing route is not containing any serious contaminations. The drinking water parameters like pH, odour, taste, colour, turbidity, total hardness, total dissolved solids, ammonia, chloride, cyanide, fluoride, nitrite, nitrate, phenolic compounds, residual chlorine, aluminium, cadmium, copper, chromium, mercury, antimony, nickel, zinc, arsenic, barium, manganese, iron, boron, lead and selenium are within the permissible range according to PEQS. The wastewater parameters like pH, temperature, total dissolved solids, total suspended solids, biological oxygen demand (BOD), chemical oxygen demand (COD), oil and grease, phenolic compounds, chloride, fluoride, cyanide, detergent, sulphate, sulphite, ammonia, zinc, manages, pesticides, silver, chlorine, iron, cadmium, chromium, copper, lead, mercury, nickel, arsenic, barium, boron, selenium and total toxic metals were tested and found within the permissible range according to PEQS.

Physical Environment

The said Project area forms a part of the vast Indus plain, which is a part of the IndoGangetic depression. This depression is of a synclinal nature. Synclitorium depression is a fore deep

downward of the Himalayan foreland of variable depth, converted into flat plains by the simple process of alluviation. The alluvial deposits are underlain by rocks of Precambrian age. The soil of the level area is generally medium to coarse texture. Bar and levees have medium to coarse material. In sub-recent flood plain the soils of the bar and levees are relatively coarser while those of channels / basin are predominantly clayey.

The project area has a very hot and dry climate in summer. The maximum temperature touches 52 Centigrade. The climate in winter is very dry and cold. Wind and storms are quite common during the summer. The average annual rainfall in the project area is 119 mm. The project area may be divided into three parts according to the soil condition, i.e., the riverain area, the canal irrigated plain and the desert area. The riverain area of the district lies close to the Sutlej River which flows in the North-West along its border with Okara, Pakpattan, Sahiwal and Vehari districts. The land in this area is irrigated by non-perennial canals. During the summer monsoons, the area is generally inundated by river water. The canal irrigated area is the plain area which has been brought under cultivation by the canals. The desert area of the district is called the Cholistan. The surface of this desert consists of a succession of sand dunes, rising in places to a height of 150 meters.

Biological Environment

The variety of genes, species and ecosystems which encompass populations, communities and habitats constitute biological diversity. It forms the foundation upon which human civilization depends. Biological resources are essential for maintaining the basic processes on which life depends and a key to sustainable development. Bio-resources provide food, medicine and products of commercial and non-commercial use and also maintain life by providing environmental services like, air and water quality, soil fertility, pest and disease control, waste disposal etc. Increasing human population, industrialization, intensive agricultural and animal husbandry practices and over-exploitation of natural resources is, however, leading to loss of biological resources.

There are local trees and shrubs are available in the project area. Kikar (*Acacia Niloica*), Sufaida (*Eucalyptus*), Aak (*Calotropis*), Sheesam (*Dilbergia Sisso*) and Jandh (*Prosopis cineraria*) were seen on the project land. There are no floral or faunal species inhibiting in the project area that is included in RED Data Book of IUCN.

Fauna commonly found in the project area is not under conservation threat. The common local animals like cow, buffalo, dog, cat, horse, donkey etc. are available in the study area.

Wildlife species of the area included neel gai (blue bull), Chankara deer, Hog deer, wolves, wild cat, hyenas and leopards. Due to the development of irrigation system during 1920s and development of cities, the habitats of some of these animals were disturbed and they become extinct in this area. Vigorous hunting and killing has also eradicated some of the above species from this part of the world. The local birds like crow, sparrow, pigeon, hen, etc inhabit in the study area.

Socio-Economic Environment

The Punjab Province is Pakistan's most populous province, with an estimated population of 110,012,442 as of 2017. It shares borders with the Indian states of Punjab, Rajasthan and

Jammu and Kashmir. It has been inhabited since ancient times. It is the country's most industrialized province with the industrial sector making up 24% of the provinces.

In 2017 census the population of the Project area is 5,405,633 of which 54% are urban. Urdu is the language spoken and understood by all. Majority of the people speak Punjabi.

The main industries of the Arms & Ammunition, Security Printing Currency & Mint, High Explosives, Radio Active Substances, Alcoholic Beverages or Liquors, Cotton Ginning Industry, Flour Mills and transport.

Physical Cultural Resources (PCRs)

There are no well-known PCRs in the project area. Some local masjids are available in the study area. Due to well defined alignment of existing route, there is no physical cultural resource conflict.

Impacts Assessment

During the field surveys, significant efforts were made to identify the main social, cultural and environmental issues related to the construction of the project Road. Data from Various government departments and agencies were also contacted for obtaining salient information in this regard along with that from area residents and stakeholders. Following is the list of main issues and concerns :

- ❖ Agricultural land at some spot may be disturbed during construction;
- ❖ Air pollution due to emissions from asphalt plant, vehicles and construction machinery as well as dust and particulate matter during construction phase and movement of vehicles during operational phase;
- ❖ Disturbance of traffic flow and pattern at intersections during the construction phase of the project
- ❖ Contamination of surrounding soil and water resources from oil spills and release of contaminated water both during construction and operational phases;
- ❖ Noise and vibration, construction works and machinery movements during construction phase;
- ❖ Waste from construction activities as well as labour camp at different locations during construction phase;
- ❖ Mobility and safety of Livestock during construction and operational phases;
- ❖ Health and safety issues of labours at site during construction and at labour camp;
- ❖ Drainage issues during the construction phase and operation phase; and
- ❖ Discontinuation of irrigational water across the road for limited period of time, i.e., during Construction Phase.

Mitigation Measures

Landscape

To minimize the impact of the project on the geophysical environment, several measures have been included in the design of the project facilities and will ensure during construction phase. To reduce physical scarring of landscape, unnecessary widening and clearing of vegetation will be

avoided. Green areas' plantations will be maintained, and parking of construction vehicles will not be allowed on the median. Borrow areas will be selected in consultation and approval of Project Director and will not be much deeper to avoid alteration of drainage and soil erosion. The borrow area will be levelled and topsoil restored.

Water and Drainage

The canal water for irrigational purposes is available in the study area. The contractor may be advised to avoid the contamination of surface water during construction. Groundwater is available in the study area at shallow depth. The contractor will not be allowed to disturb the quality and quantity of groundwater in any case. The contractor will also prepare guidelines for workers to reduce water wastage. To maintain natural drainage pattern, culverts will be constructed. Surface water body crossing structure would be wide enough to allow easy flow of water. Road drainage is not available throughout the study area. To avoid the hygienic and environmental issues, proper road drainage is necessary at critical location along the proposed project.

Air Pollution

Dust emission from vehicular traffic will be restricted by imposing speed limits. Water will be sprinkled on roads and construction sites during the construction phase. The open body trucks and trollies will be covered during the transportation of road materials. Good housekeeping will also be followed to reduce dust emissions from construction sites. All equipment including generators and construction machinery will be kept properly tuned to reduce exhaust emissions. Asphalt plant will have proper dust control systems. The outdated and mechanically unfit construction machinery will not be allowed to avoid air pollution.

Soil and Water Contamination

To avoid contamination of soil and water, all fuels, oils and bitumen will be stored with concrete padding as well as bunding and secondary containment for curtailing leakages. No contaminated effluent will be released during storage and handling of such materials. The labour camp will be allowed at a reasonable distance from surface and drinking water sources to avoid contamination. In addition, a proper wastewater collection and disposal system will be arranged at camp sites. A proper septic tank will be maintained at camp sites to avoid the contamination of land, surface water and groundwater.

Noise Pollution

Construction machinery will be properly maintained to avoid unnecessary noise pollution. Road signs will be displayed along the construction site to avoid the pressure horns.

Mobility of Locals and Livestock

The contractor will provide appropriate crossing points for locals and livestock without compromising the safety.

Health and Safety

The contractor will comply with ILO Convention No 62 and workers will be trained in construction safety procedures. PPE use would be made mandatory. The contractor will also ensure adequate first aid kits, ambulances at camp and site. The basic medical facility will be provided at the camp sites by the contractors.

Proposed Monitoring

Compliance with the EMP is mandatory for the contractor. Air, water and noise qualities will be monitored against Punjab Environmental Quality Standards. Monitoring of other impacts will be against the mitigation measures highlighted above. Project/Site Engineer will be responsible for monitoring compliance by contractor with EMP.

Institutional Arrangements

The overall responsibility of EMP implementation rests with the Proponent. Project Director (PD), Deputy Project Director (DPD), Quality Control Specialist (QCS) and other official and supporting staff will be deputed by NHA. The PD / Site Engineers will be responsible for general administration, handing over of sites, coordination with other authorities to ensure timely relocation of various utility services, oversight of environmental safeguards, management of social safeguards, and performance monitoring of civil works implementation.

The contractor will also be responsible for the implementation of EMP at site. The contractor will hire qualified engineers/technical expert and fix their responsibilities for the proper implementation of EMP. All mitigation measures for adverse impacts proposed in the EMP will be duly and timely implemented in true letter and spirit. For this purpose, daily, monthly and annual checklists will be formulated and maintained by the contractor.

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LIST OF ABBREVIATIONS

AASHTO	American Association of State Highway and Transportation Officials
ACC	Associated Consultancy Centre
ACE	Associated Consulting Engineers
ACGR	Annual Compound Growth Rate
ACI	American Concrete Institute
AIDS	Acquired Immune Deficiency Syndrome
ASTM	American Society for Testing and Material
BOD	Biochemical Oxygen Demand
BOQ	Bill of Quantities
COD	Chemical Oxygen Demand
EA	Environmental Assessment
EIA	Environmental Impact Assessment
EIRR	Economic Internal Rate of Return
EIRRs	Economic Internal Rates of Return
EMMP	Environment Mitigation and Monitoring Plan
EMP	Environment Management Plan
EPC	Environmental Protection Council
GoP	Government of Pakistan
HIV	Human Immunodeficiency Virus
HSE	Health Safety Equipment
IEE	Initial Environmental Examination
IEM	Independent Environmental Monitor
M&E	Monitoring and Evaluation
NCS	National Conservation Strategy
NGOs	Non–Government Organizations
NHA	National Highway Authority
NOC	No Objection Certificate
O&M	Operation and Maintenance
OP	Operational Policy
Pak–EPA	Pakistan Environment Protection Agency
PAP	Project Affected Person
PD	Project Director
PEPA	Pakistan Environmental Protection Agency
PEPA	Punjab Environmental Protection Agency
PEPC	Pakistan Environment Protection Council
PEQS	Punjab Environment Quality Standards
PHED	Public Health Engineering Department
PKR	Pak Rupees
PM	Project Manager
PMC	Project Management
PPC	Pakistan Penal Code
PPE	Personal Protective Equipment
PSDP	Public Sector Development Project
PSDP	Public Sector Development Programme
PSQCA	Pakistan Standards Quality Control Authority

PTCL	Pakistan Telecommunication Limited
RE	Resident Engineer
ROW	Right of Way
SPM	Suspended Particulate Matter
SRO	Statutory Regulation Order
UBC	Uniform Building Code
VOC	Vehicle Operating Cost
WAPDA	Water and Power Development Authority
WHO	World Health Organization

WEIGHTS AND MEASURES

°C	–	degree Celsius
ha	–	hectare
km	–	kilometer
km ²	–	square kilometer
km/h	–	kilometer per hour
m	–	meter
mm	–	millimeter
m ³ /sec	–	cubic meter per second
mg/m ³	–	milligram per cubic meter
ppm	–	Parts per million
ppb	–	parts per billion
µg/m ³	–	microgram per cubic meter

1.0 INTRODUCTION

1.1 PROJECT DESCRIPTION

Road transport is the key component of economic and social development process, often absorbing a high proportion of national budget. Pakistan, with more than 220 Million people, has a reasonably developed transport infrastructure. Road transport is the backbone of Pakistan's transport system. Infrastructure is both a cause and consequences of economic growth. The role of infrastructure in integrating countries into the global economy by providing transport and telecommunication services is well known. Infrastructure can raise the quality of human capital, which is a key factor in achieving high and sustainable levels of growth. Improvements in the quality and quantity of infrastructure have a disproportionately positive impact on the poor, and thus play a vital role in reducing income inequality. Understanding the demand placed on the community's transportation network by development is an important dimension of assessing the overall impacts of development. All development generates traffic, and it may generate enough traffic to create congestion and to compel the community to invest more capital into the transportation network, whether it is in the form Roads and streets are the most important transport communication medium in the country and are used by almost everyone on a daily basis. Besides the fact that roads are provided for the benefit of the road user, they also play a significant role in promoting economic growth and the living standards of the population. Road infrastructure provide access to markets, places of work, clinics and hospitals, educational institutions, places for sports and leisure activities and vacations.

NHA has planned to dualize the road from Chishtian to Chak No 46/3R via Dahranwala on deposit work basis as the project road is a provincial road.

The project will facilitate construction material, agricultural product, industrial products, and commercial freight traffic movement of surrounding areas and between Pakistan and Afghanistan. Massive impact of the project on land use will surely help in the progress of area and local people, as employment and business will be generated in vicinity by the implementation of the project.

The project will be financed by the Government of Pakistan through PSDP 2022–23 through separate head / allocation.

1.2 IMPORTANCE OF PROJECT

The project will facilitate construction material, agricultural products, industrial products, commercial freight traffic movement of surrounding areas. Massive impact of the project on land use will surely help in the progress of area and local people as employment and business will be generated in vicinity by implementation of the project.

1.3 PROJECT LOCATION

Project is located in District Bahawalnagar of Punjab Province. Bahawalnagar is situated 262 Km. South of Lahore, 175 Km. East of Bahawalpur and 65 Km. far from District Pakpattan. River Sutlej passes on the northern side at a distance of about 10 Km. Chishtian is a Tehsil of District Bahawalnagar and Dahranwala is a city of Tehsil Chishtian. Dahranwala exists in the East of Haroonabad, West of Hasilpur South of Chishtian and North of Fort Abbas.

Key Map of the Project Location is shown in Figure – 1.1.

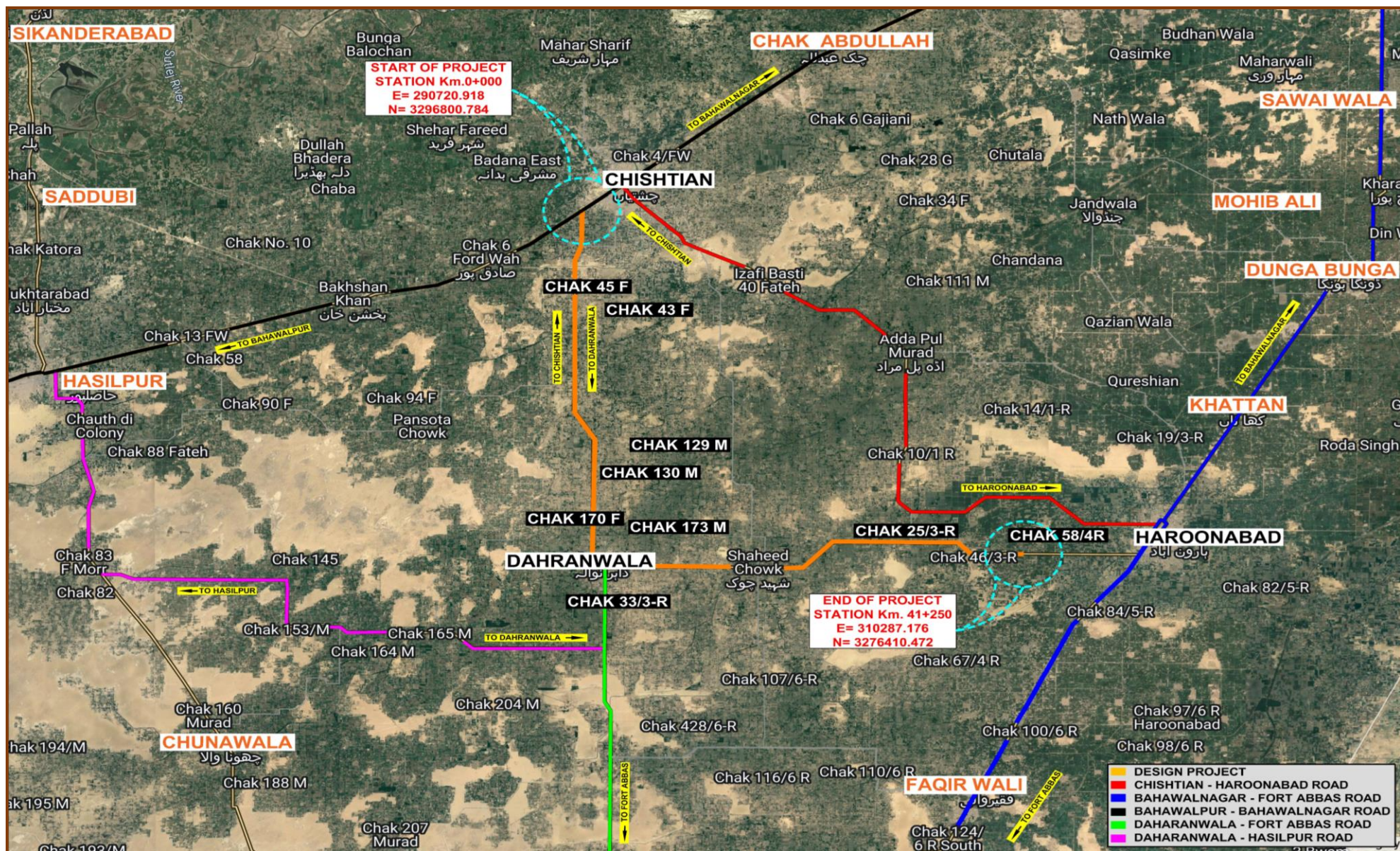


FIGURE – 1.1 : LOCATION MAP OF PROJECT ROAD

1.4 PROJECT OBJECTIVES

The construction of proposed road will provide a better road facility for inhabitants of area. The project objectives identified are as following :

- ❖ This section is intended to provide safer, quicker and more efficient passage.
- ❖ Smooth traffic flow will be possible and traffic accident ratio will be reduced to great extent.
- ❖ Vehicle operating cost will be reduced and travel time will be saved.
- ❖ Construction of this road will facilitate the population of surrounding areas.
- ❖ Employment opportunities during and after construction of the project, which will alleviate the poverty level of the area.

1.5 PROJECT DETAILS

The design parameters of subject road are as follows :

- | | | |
|---|-------------------|---|
| ❖ | No. of Lanes | 4-Lanes Dual Carriageway (2 Lanes on Each Side) |
| ❖ | Lane Width | 3.65 m |
| ❖ | Carriageway Width | 7.30 m |
| ❖ | Outer Shoulder | 2.5m + 0.5m Rounding |
| ❖ | Inner Shoulder | 0.6 to 1.0 m (as per Site Requirement) |
| ❖ | Median | NJB / Open Median |

1.6 PURPOSE OF THE EIA REPORT

This EIA Report has been prepared for and submitted to EPA in compliance with the section 12 of Punjab Protection Act 2012. The environmental assessment has been conducted in accordance with the requirements of Punjab Environment Protection Agency (EPA).

The specific objectives of this environmental assessment can be identified as follows :

- ❖ Collect the baseline data on physical, biological and socio-economic conditions of the project area using both primary and secondary sources.
- ❖ Carry out environmental assessment, including the supporting administrative and legal framework of the proposed road infrastructure.
- ❖ Identify mitigation measures for the potential environmental impacts.
- ❖ Propose institutional responsibilities and methods of monitoring the mitigation measures and monitoring procedures.
- ❖ Prepare the Environmental Management and Monitoring Plan

1.7 EXTENT OF THE EIA STUDY AND SCOPE OF STUDY

The present EIA report has been prepared in conformity with the rules and regulations of the Punjab Environment Protection Agency, Government of Punjab and those guidelines required for preparation of environmental assessment reports.

The main scope of the EIA study includes :

- ❖ Identifying the baseline condition of the project area.
- ❖ Evaluating the ability of site in view of social acceptance and environmental soundness.
- ❖ Providing maximum information to the proponent and other stakeholders about the existing environmental conditions and the implications of the proposed project.
- ❖ Identification of the potential environmental and social impacts related with the project implementation.
- ❖ Proposing mitigation measures to eliminate or to reduce the negative impacts to an acceptable level.
- ❖ Developing well-resourced environmental management and monitoring plans to identify mitigation strategies targeted towards avoidance, minimization and rehabilitation of the impacts.
- ❖ Preparing Environmental Management and Monitoring Plan to make the part of tender document.

The EIA aims to identify the likely potential impacts, both positive and negative, of the proposed project related interventions to quantify and, where possible value these, so that they can be used in a multi-criteria analysis for rational decision making by the project authority and policy makers. The overall aim is to ensure that the recommended intervention is carried out in environmentally sound and sustainable manner and that the EMP recommendations are followed by the project proponent / implementing agency during the project cycle.

1.8 METHODOLOGY FOR THE ENVIRONMENTAL ASSESSMENT

The report is based on the primary and secondary data and information collected through field investigation and data obtained from project authority. The activity carried out includes the following :

Activity 1 : In house discussion of consultants with different disciplines in order to have a clear idea of the route and components of the work.

Activity 2 : Collection and Review of Relevant Documents : The environmental specialist collected and reviewed project related primary and secondary data including technical information and design specification provided by engineering team.

Activity 3 : Reconnaissance : The first hand information and physical review were carried in two steps. Firstly, reconnaissance of all the road sections was done through site visit and secondly visit the project proponent office for confirmation of information RoW and other project related issues and,

Activity 4 : Field Investigation : Based on reconnaissance visit, important issues and parameters to be investigated were identified and checklists were prepared. In subsequent visits by the Environmental Specialist, various data were collected using

simple tools like checklist, questionnaire, discussion with local people etc. In the process of data collection habitations and places of importance in the vicinity of the right of way (RoW) of project area and in the surrounding area was done. A stock of ecological situation prevailing along the RoW was also taken into consideration.

Activity 5 : Public Consultation : Public consultations have been carried out from 16.12.2022 to 21.12.2022 by taking on board the Concerned Public and Representatives. Based on the above activities, the environment consultant gave recommendations in the public consultation chapter which is presented in the EIA Report. The following Flow Chart is depicting all the activities for the preparation of this Report.

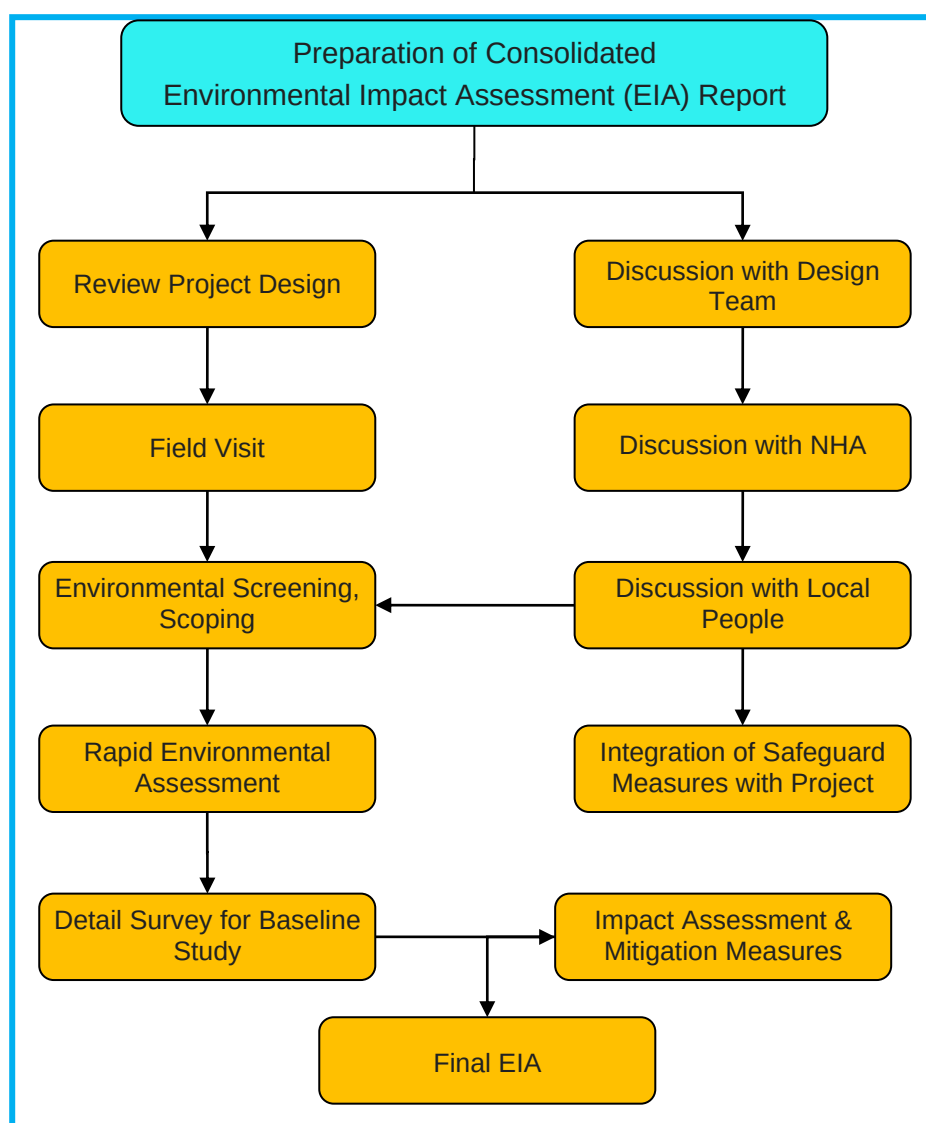


FIGURE – 1.2 : FLOW CHART OF PROJECT SCREENING ACTIVITIES

Based on collected data and information, potential adverse environmental impacts have been identified and examined during the site survey. Thereafter, possible mitigation measures have been spelled out and on the basis of findings of impact appraisal comprising the key elements embodied in this EIA; an Environmental Monitoring Plan (EMP) was developed. Discussions were undertaken with the executive agency and

technical team of the project consultant for integrating environmental management measures into the project.

1.9 SPECIFIC OBJECTIVES OF ENVIRONMENTAL ASSESSMENT FOR THE PROJECT

NHA seeks to minimize the impact of its activities on the environment, including those activities of its consultants, contractors and agents. NHA Project specific environmental goals and objectives are :

- ❖ To Protect Air Quality : Minimize air pollution, including dust, from all sections of road construction activities.
- ❖ To Reduce Noise Pollution : Reduce noise emanating from vehicles and plant operated by the authority and minimize the potential effects of noise from roads and traffic.
- ❖ To protect Water and Land Resources
- ❖ To avoid water sedimentation and minimize the pollution of surface water from road run-off on the water bodies of various rivers and open water bodies, maintenance and construction activities, site camps and depots.
- ❖ To avoid disrupting businesses and agricultural, social activities, including minimizing delays to traffic during road maintenance and construction.
- ❖ To minimize the need to resettle people in this project road construction activities by avoiding existing housing areas and homesteads, industries and businesses.
- ❖ To Protect Wildlife, Landscape and Cultural Heritage Resources (if any) : Avoid impacting upon ecological resources, especially notified and proposed national parks, game reserves and wildlife sanctuaries and endangered and threatened species.
- ❖ To Conserve Natural Resources : Avoid the waste of material and energy, and recycle materials, including road scrapings materials, wood, metal, oil, paper and other products.
- ❖ To Protect Human Life and Health : Reduce dangers from accidents for all road users, especially pedestrians, both during and after completion of construction, through the design of safe roads and bridges.
- ❖ To ensure disposal of all wastes and surplus materials in a safe and hygienic manner.
- ❖ To ensure that adequate drinking water is available for all employees and contractor's staff at the construction sites.
- ❖ To ensure that sewage and waste disposal facilities are provided for employees and contractor's staff and that they are sited an adequate distance away from sources of human and animal water supplies.

1.10 PERSONS PERFORMING THE EIA STUDY (TEAM MEMBERS)

The EIA study of the proposed project has been conducted according to Environmental Assessment Procedures–1997, Review of IEE and EIA Regulation–2000 as prescribed by the Federal Environmental Protection Agency (Pak–EPA), Government of Pakistan.

Study team of Environment Consultants which completed the EIA Report consists of following Experts :

TABLE – 1.1 : LIST OF EXPERTS PERFORMING EIA

NAME	STATUS IN PROJECT
Mr. Khalid Rasul	Project In-charge
Mr. Sameen Khokhar	Team Leader for EIA
Mr. Ali Raza	Monitoring In-charge for EIA

*Only the main roles of the team members are given. However, their role was not restricted to these, rather it also includes many other studies in their respective fields in the context of this EIA studies.

2.0 SCREENING OF PROJECT

2.1 SCREENING

According to the Punjab Environmental Protection Act 1997 ((Amended 2012) and its interpretation as per Review of IEE & EIA Regulations, 2000 for filing, review and approval of environmental assessments, the present project is categorized under Schedule II. The Regulation 4 states that "A proponent of project falling in any category specified in schedule II shall file an EIA". The following projects relating to transport sector fall in the Schedule II :

- (i) Airports
- (ii) Federal or Provincial Highways or Major Roads (except Maintenance Rebuilding or Reconstruction of Existing Roads) with a Total Outlay of Rs 50.0 Million or above.
- (iii) Ports and Harbour Development for Ships of 500 Gross Tons or above.
- (iv) Railway Works

Approximate construction cost of the project is **PKR 12,000 Million.**

As the total cost of the project is more than 50 Million Rupees hence and EIA Study is mandatory to be submitted in EPA Punjab and get its approval under section 12 of Punjab Environmental Protection Act 2012.

3.0 SCOPING OF PROJECT

The scoping identifies the key issues and impacts that should be further investigated. The Scoping defines the spatial and temporal boundaries, important issues and concerned raised during consultation and significant impact factors to be determined.

3.1 SPATIAL AND TEMPORAL BOUNDARIES OF ENVIRONMENT ASSESSMENT

The project starts from Dahranwala (Chishtian) Morr on Bahawalpur – Bahawalnagar Road. The route between Chishtian and Haroonabad via Dahranwala passes through multiple built-up areas and crosses a number of canals. The main populated town along the project road are Islam Pura, Dahranwala, Rajranwala and Haroonabad. The total length of the project is 41.250 Km. The spatial temporal boundaries are given in below map in Figure – 3.1.

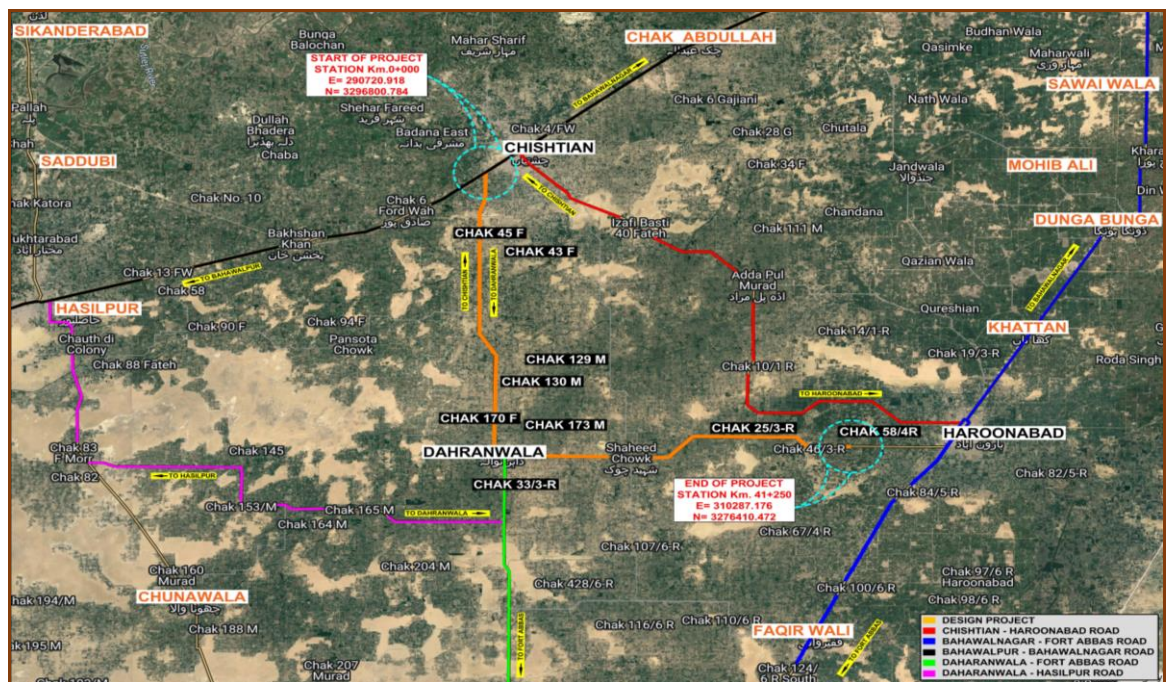


FIGURE – 3.1 : SPATIAL AND TEMPORAL BOUNDARIES OF PROJECT

3.2 IMPORTANT ISSUES AND CONCERNS RAISED DURING CONSULTATION

The consultation, scoping meeting was carried out in the project area to disseminate information about the project and its expected impact on the primary and secondary stakeholders. A number of relevant stakeholders were consulted regarding the proposed project activities during different interviews and discussions. The participants and detail of their professions are given in Table – 5.8 and Table – 5.9.

3.3 SIGNIFICANT IMPACTS AND FACTORS TO BE DETERMINED

Considered during EIA Study, it was unanimously agreed by almost all the consultation participants that the Construction of the project Road is necessary for smooth and safe traffic flow. However, the participants are concerned that the Environmental Impacts and their mitigations should be addressed during EIA study.

3.4 APPROACH TO WORK

The study has been conducted in accordance with Environmental Protection Agency (EPA), Government of Pakistan (GOP) Guidelines, 2000 and Punjab Environmental Protection Act 2012. The study is based on both primary and secondary data and information. The primary data includes data collected from field observations and secondary data includes a review of relevant information from Government Departments. Discussions were held with stakeholders including government officials, community representatives and a wide range of road users and roadside dwellers. The main purpose of this approach was to obtain a fair impression of the people's perceptions about the project and its environmental impacts.

3.5 METHODOLOGY

3.5.1 Project Orientation Meetings

Meetings and discussions were held between the consulting team of Consultants and the proponent to decide an Agenda for the execution of the EIA study. This activity mainly aimed at achieving a common ground of understanding regarding the EIA of proposed project.

3.5.2 Strategy Planning for Data Collection

After getting a clear overview of the project, a comprehensive data acquisition plan was formulated to develop EIA report. The plan identifies the various data requirements of the projects and delineates the sources from where they will be obtained.

3.5.3 Field Data Collection

A team of experts has visited the project locations to collect the area-specific primary data. Where required, the secondary data was also collected by the experts through perusal of previously published literature and web research related to the project area. The following activities were carried out for data collection :

- ❖ Site Reconnaissance Surveys
- ❖ Analysis of Maps and Plans
- ❖ Literature Review and Desk Research
- ❖ Public Consultations and Focused group discussions
- ❖ Field Observation and Site studies
- ❖ Monitoring and Laboratory Analysis

3.5.4 Review of Secondary Data

Previous environmental and social soundness assessment for Punjab region and other published and unpublished information was collected in order to gain a complete understanding of existing environmental conditions of the area including :

- ❖ **Physical Environment** : topography, geology, soils, surface and groundwater resources and climate;
- ❖ **Biological Environment** : habitat types, flora and fauna (particularly rare or endangered species), critical habitats / zones, and vegetation communities within the project area;
- ❖ **Socio-economic Environment** : settlements, socio-economic conditions, infrastructure and land use.
- ❖ **Heritage Aspects** : sites of cultural, archaeological or historical significance.

3.5.5 Two Stage Consultations

For this EIA study, two-stage consultation was carried out through one-on-one meeting. First stage consultation was limited to local government functionaries, affected persons and local communities were consulted. The objective of the consultation was to assess the long-term as well as short-term impacts of the new development of the proposed project at an early stage. In the second stage consultations will be carried through public participation if required.

3.5.6 Identification & Assessment of Impacts and Recommendations for Mitigation

Potential impacts arising from construction as well as operational activities of the proposed project were identified. These include effects of the activities on the physical, biological, socio-economic, archaeological and cultural environments of the area. Impacts were identified and assessed based on field data, secondary data, and expert opinion. Mitigation measures were identified to help, prevent or minimize all potential adverse environmental impacts from the proposed project activities. The proposed mitigation measures are based on the sensitivity and behaviour of environmental receptors within the project area.

3.5.7 Development of Environmental Management Plan (EMP)

An EMP for the proposed project activities was prepared. The EMP provides a framework for implementing and managing the mitigation and monitoring measures recommended in the EIA. The EMP includes the following :

- ❖ Mitigation and monitoring plan.
- ❖ Definition of roles and responsibilities of the proponent, contractors and monitoring teams.
- ❖ Requirements for communication, documentation, and training during the project.
- ❖ Restrictions on design, timing, and conduct of the project.
- ❖ Change Management Plan to cover unforeseen events/environmental conditions during the project.

3.6 EIA REPORT STRUCTURE

This document is part of the complete environmental Impact assessment as described by Environmental Protection Department (EPD) Punjab and EPA Pakistan.

3.7 INCORPORATION OF SAFEGUARDS DOCUMENTS IN CONTRACT DOCUMENTS

The proposed EMP forms part of the Request for Proposals Package / Bid Documents and its compliance is mandatory. The contractor will be required to prepare site-specific plans as stipulated in Environmental Mitigation and Monitoring Plan. These site-specific plans will then be embedded into the civil works contracts and therefore will be legally binding on the contractor. The site-specific plans must be submitted to the Project Director/Project Engineer for review and clearance within 30 days of the signing of the contract or before mobilization on site, whichever date is earlier.

4.0 POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

This section deals with the current environmental policy as well as legal and administrative framework required to carry out the Environmental Impact Assessment (EIA) of the Proposed Project. All relevant provisions of Environmental Policies laid out by the Government of Pakistan have been duly discussed and the Project Proponent will be required to adhere to these regulations throughout the course of the project. Upon a careful perusal of these legal frameworks the project has been categorised under Schedule II according to the Review of EIA and IEE Regulations, 2000 set by the Pakistan Environmental Protection agency and thus requires the formulation of an Environmental Impact Assessment/Environmental Impact Assessment study for the proposed project.

4.1 NATIONAL ENVIRONMENTAL POLICY, LEGISLATION AND GUIDELINES

The enactment of comprehensive legislation on the environment, covering multiple areas of concern, is a relatively new and on-going phenomenon in Pakistan. Whereas, a basic policy and legislative framework for the protection of the environment and overall biodiversity in the country is now in place. However, detailed rules, regulations and guidelines required for the implementation of the policies and enforcement of legislation are still in various stages of formulation and discussion. The following section presents a brief overview of the existing national policies, legislation and guidelines.

4.1.1 National Environmental Policy, 2005

In March, 2005 Government of Pakistan launched its National Environmental Policy, which provides a framework for addressing the environmental issues. Section 5 of the policy commits for integration of environment into development planning as instrument for achieving the objectives of National Environmental Policy. It further states in Clause (b) of Subsection 5.1 that EIA / IEE related provisions of Environmental Protection Act, 1997, will be thoroughly enforced for all developmental Projects. It also provides broad guidelines to the Federal Government, Provincial Governments, Federally Administered Territories and Local Governments to address their environmental concerns and to ensure effective management of their environmental resources.

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", NEP categorizes the set of sectoral and cross-sectoral guidelines to achieve its Goal of sustainable development. NEP suggests the following policy instruments to overcome the environmental problems throughout the country :

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

Although, the proposed project is not affecting the environment negatively, because the proposed project is about the upgradation of an existing highway. Anyhow, management of proposed project will ensure that the project will not add to the aggravation of the environmental issues identified in NEP and mitigation measures would be adopted to minimise or avoid any contribution of the project in these areas.

4.1.2 National Conservation Strategy

The Biodiversity Action Plan

The Biodiversity Action Plan (BAP), which has been designed to complement the NCS and the proposed provincial conservation strategies, identifies the causes of biodiversity loss in Pakistan and suggests a series of proposals for action to conserve biodiversity in the country. The BAP recognises that an EIA/IEE is used as a tool at a project level to identify environmental effects of a proposed project and to plan for reducing adverse effects. The BAP further stipulates that an EIA/IEE needs to be initiated at an early stage of project development and that public participation in the review of potential effects is important.

4.1.3 Pakistan Environment Protection Act, 1997

Pakistan Environmental Protection Act, 1997 (PEPA) is the 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. The main provisions of the Act are reproduced below :

Section 11 (Prohibition of Certain Discharges or Emissions) states that “Subject to the provisions of this Act and the rules and regulations made there under, no person shall discharge or emit, or allow the discharge or emission of, any effluent or waste or air pollutant or noise in an amount, concentration or level which is in excess of the Environmental Quality Standards”.

Section 12 (Initial Environmental Examination and Environmental Impact Assessment) requires that “No proponent of a project shall commence construction or operation unless he has filed with the EPA an IEE or, where the project is likely to cause an adverse environmental effect, an EIA, and has obtained from the Federal Agency approval in respect thereof.”

Section 14 (Handling of Hazardous Substances) requires that “Subject to the provisions of this Act, no person shall generate, collect, consign, transport, treat, dispose of, store, handle, or import any hazardous substance except (a) under a license issued by the EPA and in such manner as may be prescribed; or (b) in accordance with the provisions of any other law for the time being in force, or of any international treaty, convention, protocol, code, standard, agreement, or other Instrument to which Pakistan is a party.” Enforcement of this clause requires the EPA to issue regulations regarding licensing procedures and to define ‘hazardous substance.’

Section 15 (Regulation of Motor Vehicles) : Subject to provision of this clause of the Act and the rules and regulations made there under, no person shall operate a motor vehicle from which air pollutants or noise are being emitted in an amount, concentration or level which is in excess of the EQS, or where the applicable standards established under clause (g) of subsection (1) of Section 6 of the Act.

Section 17 (Penalties) : Whoever contravenes or fails to comply with the provisions of section 11, 12, 13, or section 16 or any order issued there under shall be punishable with fine which may extend to one million rupees, and in the case of a continuing contravention or failure, with an additional fine which may extend to one hundred thousand rupees for every day during which such contravention or failure continues : Provided that if contravention of the provisions of section 11 also constitutes contravention of the provisions of section 15, such contravention shall be punishable under sub-section (2) only.

This detailed EIA is prepared by the consultant for the construction of Chishtian to Dahranwala Road and submitted to the competent authority for the approval.

4.1.4 The Punjab Environmental Protection Act, 1997/XXXIV OF 1997 amended upto Act 35 of 2012, dated : 18.04.2012

Post the adoption of the 18th constitutional amendment in 2011, the subject of environment was devolved and the provinces were granted autonomy for environmental protection and conservation. Subsequently the Punjab government amended PEPA 1997 as the Punjab Environmental Protection Act, 1997 and later on amended in 2012. Under the provision of this act the Punjab Environmental Protection Council would be established which would look after matters of environment in the province under the chairmanship of chief minister.

4.1.5 Pakistan Environmental Protection Agency, Review of IEE and EIA Regulations, 2000

The Review of IEE and EIA Regulations, 2000, provide the necessary details on the preparation, submission, and review of IEE and EIA. 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.

In accordance with Schedule I Clause E, Subcategory 1 of these regulations, an EIA for the proposed project satisfying the requirements of Section 12 of the Pakistan Environmental Protection Act needs to be submitted to Pakistan Environmental Protection Agency in order to obtain Environmental Approval for it. Figure – 4.1 below depicts the whole process of the IEE / EIA in Pakistan. According to which the proposal undergoes the screening process to determine whether IEE or EIA is required for the proposal. Perspective approach would be employed for screening consisting of

Schedule–I and Schedule–II of IEE / EIA Regulations, 2000. The project falling in the list of Schedule–I would require IEE study while EIA would be carried out for the projects included in the list of Schedule–II.

In case of IEE, the IEE Report will be submitted to Federal–EPA (Pak–EPA). A majority of proposals having less significant impacts or no impacts would be screened out of EIA study; however, only few having significant impacts would go for further EIA. EIA including detailed EMP would be carried out by the project proponent and the report would be submitted to EPA for review and decision for its approval. In case, approval is granted, the implementation of the EIA and conditions of approval would be followed. For the projects which are not approved, the project should be re–designed and EIA should be resubmitted for review and approval. As per IEE / EIA Regulations, 2000 the review time period required for IEE is 45 days and for EIA is 90 days. A preliminary scrutiny is initially carried out by the Federal Agency for confirmation that the EIA / IEE is complete for commencement of a detailed review process. To ensure public participation the Federal Agency shall entrust the proponent to issue a public notice to be published in any English or Urdu national newspaper and in a local newspaper of general circulation in the area affected by the project, mentioning the type of project, its exact location, the name and address of the proponent and the places at which the EIA of the project can be accessed.

The notice issued shall fix a date, time and place for public hearing of any comments on the project or its EIA. The proponent will bear all expenses incurred during the public hearing and any arrangements to be made for it. The date fixed for the public hearing will not be earlier than 30 days from the date of publication of the notice.

The Federal Agency shall also ensure the circulation of the EIA to the concerned Government Agencies and solicit their comments thereon. All comments received by the Federal Agency from the public or any Government Agency shall be collated, tabulated and duly considered by it before decision on the EIA. In accordance with Regulation 7 of the Pakistan Environmental Protection Agency (Review of IEE and EIA) Regulations, 2000, the proponent is also required to submit a review fee.

4.1.6 Punjab Environmental Quality Standards (PEQS)

The PEQS promulgated under the PEPA (Amended 2012) specify standards for industrial and municipal effluents, gaseous emissions, vehicular emissions, and noise levels. The PEPA 2012 empowers the EPA to impose pollution charges in case of non–compliance to the PEQS.

On November 26th 2010, the SRO 1062(1)/2010 was issued which defines the standards for drinking water, air and noise. During the construction and post development phase of the project, PEQS will apply to all type of effluents and emissions.

4.1.7 National Environmental Guidelines

Sectoral Guidelines for Environmental Reports – Major Roads

This guideline categorizes Major Roads as motor ways, major rural roads and major urban arterial roads. Ancillary facilities such as all works within the right of way, restoration of access to surrounding property, traffic control devices, administration buildings, tollbooths, truck weighing facilities, rest and service areas, borrow pits, maintenance depots and construction compounds are also included within the scope of the guideline. The guideline aims to assist proponents in identifying the key environmental issues as well as mitigation measures and alternatives that should be considered during the construction of a Major Road Project.

4.1.8 Guidelines for Public Consultation

These guidelines are the part of a package of regulations and guidelines. The policy and procedure for filling, review and approval of environmental assessments require proponent to consult with the affected community and relevant NGOs during the preparation of an Environmental Assessment Report. It provides assistance throughout the environmental assessment of project by involving the public which can lead to better and more acceptable decision-making.

4.1.9 The Forest Act, 1927

The act empowers the provincial forest departments to declare any forest area as reserved or protected. The act also 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.

4.1.10 Pakistan Penal Code

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

The Pakistan Penal Code (PPC) 1860 deals specifically with the pollution of water in Chapter XIV on "Public Health and Safety". Here, "fouling" or "corrupting" the water of a public spring or reservoir is listed as an offence, punishable with up to three months in prison and/or a fine of 500/- Rupees (Section 277).

4.1.11 Antiquities Act 1975

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

EIA PROCESS IN PAKISTAN

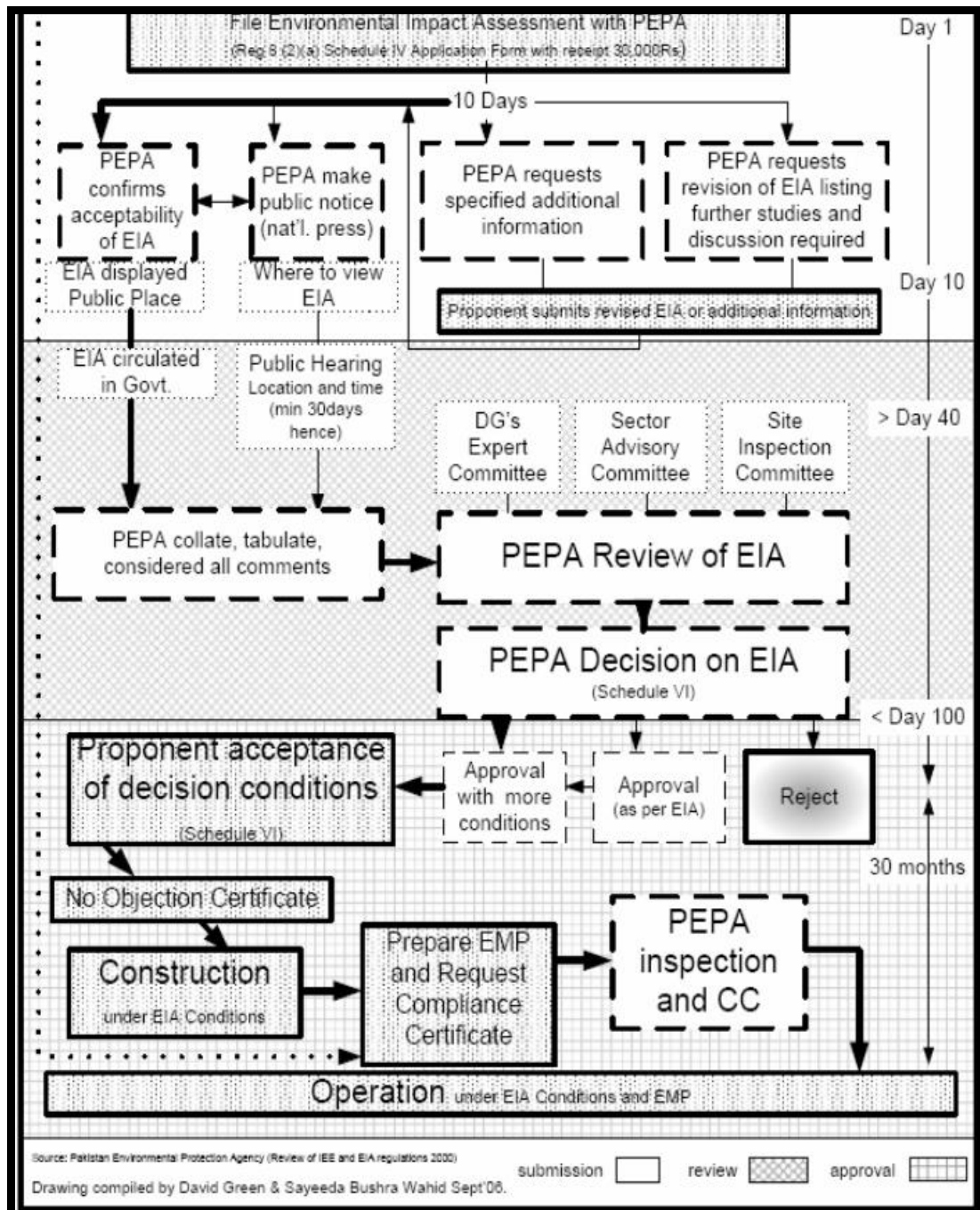


FIGURE – 4.1 : THE CURRENT EIA PROCESS

Source : Environmental Impact Assessment–Power Distribution Enhancement Project – TA 4876 PAK

4.1.12 Land Acquisition Act, 1894

The Land Acquisition Act (LAA) of 1894 amended from time to time has been the policy governing land acquisition, resettlement and compensation in the country. The LAA is the most commonly used law for acquisition of land and other properties for development projects. It comprises of 55 sections pertaining to area notifications and surveys, acquisition, compensation and appointment awards and disputes resolution, penalties and exemptions.

4.1.13 Explosives Act, 1884

Under the Explosives Act, 1884, the Project contractors are bound by regulations on handling, transportation and using explosives during quarrying, blasting, and other purposes. Such blasting and quarrying process are not involved in proposed project.

4.1.14 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.

4.1.15 Motor Vehicle Rules, 1969

Motor Vehicle Rules 1969 (MVR 1969) define powers and responsibilities of Motor Vehicle Examiners (MVEs). The establishment of MVE inspection system is one of the regulatory measures that can be taken to tackle the ambient air quality problems associated with the vehicular emissions during operation phase.

4.1.16 Regulations of Mines and Oil Fields and Mineral Development Act, 1948

This legislation provides regulatory procedures for the quarrying and mining of construction material from state-owned as well as private land.

4.1.17 The Pakistan Minimum Wages for Unskilled Workers Ordinance, 1969

This law was established with the aim of establishing a system for deciding on the minimum rates of wages for unskilled workers employed in certain commercial and industrial establishments in the Pakistan.

4.1.18 The Punjab Restriction on Employment of Children Act 2016

According to this Act, "child" means a person who has not completed his fifteen year of age. The act specifies that no child shall be employed or permitted to work in any establishment. The other relevant information is also explained in the above mentioned act.

4.1.19 Industrial Relation Ordinance 2010 Pakistan

This new draft gives worker right to form trade unions and collectively bargain as per the constitution and all related conventions of the ILO (International Labour Organization). Trade union could be formed only in an institution having at least 50 employees. The representation of staff member of a workplace in its trade union has been enhanced from the previous 75 per cent to 80 per cent. It envisages cancellation of a grade union's registration upon getting less than 15 per cent votes now in two referendums to be held

seeking the status of a collective bargaining agent. The law makes unfair labour practices by worker or employers a crime to ensure healthily trade union activity. At the same time is also empowers the government to order breaking of any illegal strike or lockout, or make them approach court for a decision. It allows CBA unions and employers to approach a labour court for the redress of complaint. It also empowers labour courts to grant interim relief in any case.

4.1.20 Labor Laws

The constitution of Pakistan contains a range of provisions with regard to labour rights found in Part II : Fundamental Rights and Principles of Policy :

- ❖ Article 11 of the constitution prohibits all forms of slavery, forced labour, and child labour.
- ❖ Article 17 provides for a fundamental right to exercise the freedom of association and the right to form unions.
- ❖ Article 18 prescribes the right of its citizens to enter upon any lawful profession or occupation and to conduct any lawful trade or business.
- ❖ Article 25 lays down the right to equality before the law and prohibition of discrimination on the grounds of sex alone.
- ❖ Article 37(e) makes provision for securing just and humane conditions of work, ensuring that children and women are not employed in vocations unsuited to their age or sex, and for maternity benefits for women in employment.

Pakistan's labour laws trace their origins to legislation inherited at the time of partition. The laws have evolved in response to socioeconomic conditions, shifts in governance, state of industrial development, population and labour force expansion, growth of trade unions, level of literacy, and the government's commitment to development and social welfare.

Under the constitution, labour is regarded as a 'concurrent subject,' which means that it is the responsibility of both the federal and provincial governments. However, for the sake of uniformity, laws are enacted by the federal government, stipulating that provincial governments may make rules and regulations of their own according to the conditions prevailing in or for the specific requirements of the provinces.

The labour laws are a comprehensive set of laws in Pakistan dealing with the following aspects :

- ❖ Contract of Employment
- ❖ Termination of Contract
- ❖ Working Time and Rest Time
 - Working Hours

- Paid Leave
- Maternity Leave and Maternity Protection
- Other Leave Entitlements
- ❖ Minimum Age and Protection of Young Workers
- ❖ Equality
- ❖ Pay Issues
- ❖ Workers' Representation in the Enterprise
- ❖ Trade Union and Employer Association Regulation
- ❖ Other Laws

4.2 ADMINISTRATIVE FRAMEWORK

4.2.1 National Highway Authority (NHA)

As the project proponent, NHA holds the primary responsibility for the implementation of the component I of the project. NHA ensures that it maintains liaison with its line departments to ensure compliance with all environmental regulations and laws which apply to the project including any construction prerequisites such as permits and clearances that need to be met before the commencement of the project. The office of Environment, Forest, and Social of NHA will be responsible for ensuring that all the measures proposed in the Environmental Management Plan are effectively implemented by the contractor during construction phase and by Directorate of Operation & Maintenance of NHA during operation phase of the proposed Project.

4.2.2 Pakistan Environmental Protection Agency, Pak-EPA

The Pakistan Environmental Protection Agency is the prime regulatory body which deals matters pertaining to Environment. It was established under section (5) of the Environmental Protection Act (PEPA), 1997 and functions as the leading authority for its implementation. The role of the Pak-EPA is to assess the EIA and make sure that it is in compliance with the PEPA 2000.

4.2.3 Punjab Forest, Wildlife and Fisheries Department

The Punjab forest, wildlife and fisheries department is working for the betterment of environment within the province. The Project is not involving the tree cutting and vegetation removal. Tree Plantation along the road forms an integral component of the mitigation measures undertaken to off-set the adverse environmental impacts of the project. Consultations will also be carried out with the Forest department for a careful selection of tree / plant species which could be planted in the project area.

This department also controls the wildlife throughout the province. There is no wildlife Sanctuary / Game Reserve present in the project area in accordance with the National Conservation Strategy.

**TABLE – 4.1 : NATIONAL / INTERNATIONAL REGULATORY FRAMEWORK
APPLICABLE TO THE PROJECT**

SR. NO.	POLICY	REMARKS
1.	National Environmental Policy, Legislation and Guidelines : ❖ National Environmental Policy, 2005 ❖ National Conservation Strategy	According to the National Environmental Policy, the proponent will ensure consideration for environmental resources while planning the project and the stipulations set out by the Pakistan Environmental Protection Act (1997) regarding the carrying out of an EIA / IEE study for the project will be met. The proponent will adopt measures for pollution prevention and control during the construction and operational phase of the project and will adopt a policy for waste minimization and re-use where possible. In accordance with the National Conservation Strategy, the project in general will adhere to the National Laws for prevention of Pollution, Water Conservation and sustenance of biodiversity.
2.	Pakistan Environment Protection Act, 1997 : ❖ Section 11 (Prohibition of Certain Discharges or Emissions) ❖ Section 12 (EIA / IEE) ❖ Section 14 (Handling of Hazardous Substances) ❖ Section 15 (Regulation of Motor Vehicles)	Under obligation of Section 11, the project proponent, construction contractor and all regulatory bodies responsible for the project will ensure that all emissions, effluent or waste discharges, release of air pollutants and noise levels will adhere to the National Environmental Quality Standards at all times. Under Section 12, a detailed Environmental Impact Assessment will be carried out for the project with and extensive baseline survey delineating the flora, fauna, socio-economic conditions of the project area and any sensitive receptors which may be present along the project alignment. Under Section 14 proper environmental approval will be obtained from the Environmental Protection Agency prior to use of any hazardous substances during the construction or operational phase of the project. Under Section 15, all project vehicles will abstain from releasing vehicular emissions or generating noise in excess of the limits set forth by the Punjab Environmental Quality Standards for Vehicular Emissions.

SR. NO.	POLICY	REMARKS
3.	Punjab Environmental Protection Act, 1997 / Punjab ACT NO. XXXIV OF 1997, Amended in 2012	A detailed Environmental Impact Assessment will be carried out for the project with and extensive baseline survey delineating the flora, fauna, socio-economic conditions of the project area and any sensitive receptors which may be present along the project alignment. After proper review and approval by appropriate regulatory authorities, the EIA report will be disclosed to the public in full transparency.
4.	Pakistan Environmental Protection Agency, Review of IEE and EIA Regulations, 2000	According to the PEPA, Review of IEE and EIA Regulations, 2000, the project is categorized under Category B of the regulations and a comprehensive EIA study will be carried out to assess its impacts on the selected project area and nearby surroundings.
5.	Punjab Environmental Quality Standards (PEQS)	The construction Contractor will ensure that the Punjab Environmental Quality Standards are met during the construction phase of the project. Regular Monitoring and Testing will be carried out for air, water and soil quality along with noise levels in the project vicinity by an EPA-certified Laboratory and the results will be reported to all relevant authorities.
6.	Punjab Environmental Quality Standards (PEQS) : ❖ Sectoral Guidelines for Environmental Reports – Major Roads ❖ Guidelines for Public Consultation	Key environmental issues for the project and all associated ancillary works will be identified using the Sectoral guidelines for Major Roads and included in the EIA / EIA Report along with appropriate mitigation measures to overcome these issues. The guidelines for public consultation will be utilized during the project for consultation with, and dissemination of information to the public and the communities affected by the project.
7.	The Forest Act, 1927	The Forest Act, 1927 will be used for the identification of any Forest Areas within the project vicinity. The project proponent will ensure protection of all such identified entities and guarantee that no encroachment or illegal trade will occur in such areas.

SR. NO.	POLICY	REMARKS
8.	Pakistan Penal Code	Under the Pakistan Penal Code, the project will not in any way foul or corrupt any public springs or reservoirs to render them unsuitable for public use and drinking purposes.
9.	Antiquities Act 1975	Under the Antiquities Act 1975, the Physical Cultural Resources or any monuments with historical or religious value attached to them will be protected against destruction, theft, negligence, unlawful excavation, trade and export. Any such resources which may be affected due to the project activities will be duly restored in consultation with the local Antiquities Department.
10.	Land Acquisition Act, 1894	Where land is to be acquired for a public purpose, the [Commissioner], and where land is to be acquired for a Company, the Provincial Government, is satisfied, after considering the result of the survey, if any, made under sub-section (2) of section 4, or if no survey is necessary, at any time, that any particular land included in a locality notified under sub-section (1) of section 4 is needed for a public purpose or a Company, as the case may be, a notification to that effect shall be published in the official Gazette, stating the district or other territorial division in which the land is situate, the purpose for which it is needed, its approximate area and situation, and where a plan has been made of the land, the place where such plan may be inspected, and the Collector shall cause public notice to be given of the substance of the notification at convenient places on or near the land to be acquired.
11.	Explosives Act, 1884	Under the Explosives Act, 1884, the Project contractors are bound by regulations on handling, transportation and using explosives during quarrying, blasting, and other purposes. (if required)
12.	Highways Safety Ordinance, 2000	Keeping in view the promulgations of this Ordinance, the Highways will be patrolled by the National Highway police; regulating and controlling traffic on the highway, and keeping it clear of encroachments.

SR. NO.	POLICY	REMARKS
13.	Motor Vehicle Rules, 1969	The Motor Vehicle Rules are a general set of regulations applicable to all vehicles which will be making use of the project corridor. The measures set out by these rules will be adopted by all motor vehicle owners in order to keep in check the ambient air pollution which may result from the operation of these automobiles.
14.	The Pakistan Minimum Wages for Unskilled Workers Ordinance, 1969	According to the application of this law all unskilled workers employed during the project will not be paid less than a set minimum rate and the employer shall be responsible for this payment either directly or through a contractor.
15.	The Punjab Restriction on Employment of Children Act 2016	The Act prohibits employment of children under the age of fifteen in any establishment and the project contractor will ensure that these stipulations are met with for the duration of the construction phase of the project.

5.0 DESCRIPTION OF THE PROJECT

5.1 PROJECT ALIGNMENT

The project starts from Dahranwala (Chishtian) Morr on Bahawalpur – Bahawalnagar Road. The route between Chishtian and Haroonabad via Dahranwala passes through multiple built-up areas and crosses a number of canals. The main populated town along the project road are Islam Pura, Dahranwala, Rajranwala and Haroonabad. The total length of the project is 41.250 Km.

5.2 OBJECTIVES OF PROJECT

The objectives of the project are :

- ❖ The construction of proposed road will provide a better road facility for inhabitants of area.
- ❖ Problem of traffic blockage and congestion in the project area will be solved.
- ❖ The new road will provide uninterrupted traffic flow and ultimate reduction of cost of all suppliers and cost of living.
- ❖ The prime objective of the proposed Project is to facilitate safe and quick movement of people and goods transport, by providing better access to enhance the efficiency of the existing road network. Moreover, other social benefits resulting from the project include increase in employment opportunities and reduction of distance between farms and commercial markets.
- ❖ It will reduce roadside accidents.
- ❖ Vehicle operating cost will be reduced.
- ❖ Construction of this road will facilitate the population of surrounding areas.
- ❖ Employment opportunities during and after construction of the project, which will alleviate the poverty level of the area.

5.3 TECHNICAL FEATURES

Construction of the project Road will be carried out as per NHA specifications and standards. The roadway is characterized under AASHTO classification as Rural Minor Arterial Road. Design vehicle as per AASHTO is classified as Interstate Semitrailer (WB-19) / Five-Axle Truck.

The design parameters of subject road are as follows :

SR. NO.	DESIGN ELEMENTS	UNITS	TYPE OF TERRAIN
			PLAIN
1.	Design Speed	Km/h	100
2.	Minimum Stopping Sight Distance	meter	185

SR. NO.	DESIGN ELEMENTS	UNITS	TYPE OF TERRAIN
			PLAIN
3.	Maximum Rate of Superelevation	%	6
4.	Horizontal Curvature		
	(i) Absolute Minimum Radius	meter	437
	(ii) Radius above which no superelevation is required	meter	3510
5.	Road Formation Width	meter	25
6.	Carriageway Width	meter	3.65
7.	Shoulder Width	meter	Outer Shoulder = 2.5m + 0.5m Rounding Inner Shoulder = 0.6 – 1.0m
8.	Cross Fall Slope	%	Carriageway = 2.0 Outer Shoulder = 4.0
9.	Maximum Grade	%	4
10.	Minimum Grade	%	0.1
11.	Rate of Vertical Curvature K Value		
	(i) K Value for Crest Vertical Curve	L/A	>52
	(ii) K Value for Sag Vertical Curve	L/A	>45
12.	Fill Slope		
	(i) 0.0 m – 3.0 m Fill Height	H :V	2 : 1
	(ii) >3.0 m Fill Height	H :V	1.5 : 1
13.	Cut Slope		
	(i) 0.0 m – 3.0 m Cut Height	H :V	0.5 : 1
	(ii) >3.0 m Cut Height	H :V	A* : 1
14.	Minimum Vertical Clearance	meter	5.5
15.	Right of Way (ROW)	meter	20 – 30

5.3.1 Structure Design Standards

The Structure Design is based on AASHTO LRFD Design Guide. Following Design Standards / Codes are referred too :

AASHTO (LRFD) : For analysis and design for all loads and load combinations. Pakistan Highway Code of Practiced for Bridges 1967. For vehicular loads, their spacing and impact factors appropriate modifier factors are applied.

UBC / IBC 2003 : For seismic zoning in addition to the revised seismic risk map of Pakistan.

ASTM : For Material Specifications & Testing

ACI : For analysis, design and detailing, only in case such details are not specified in AASHTO Vehicles live load West Pakistan Code of Practice for Highway Bridges 1967 (WPCHB) specifies more severe loads to be considered.

5.3.2 Seismic Design

International Building Code (IBC–2003) and Earthquake forces are calculated according to Article 3.21 of AASHTO, keeping in view the recent earthquake of October 08, 2005, the earthquake zones will be considered accordingly.

5.3.3 Geometric Design

The Geometric design of the road alignment was carried out by using surface modelling software Civil 3D and our design complies with the Geometric Design of Highways and Streets 2018 and requirements of the TOR. Following is the Geometric Design Criteria followed during design of this road.

TABLE – 5.1 : GEOMETRIC DESIGN CRITERIA

Total No. of Lanes	04 Dual Carriageway
Lane Width	3.65 m
Shoulder	Outer : 2.5 m + 0.5 m (Rounding) Inner : 06 – 1.0 m
Design Speed	100 KPH
Design Life	10 Years

5.3.4 Design Standards & Criteria for Highway Structures

The design criteria adopted is in accordance with the recommendations of the National Highway Authority and the following design standards and policies have been adopted :

- ❖ American Association of State Highway and Transportation Officials (AASHTO) : A Policy on Geometric Design of Highways and Streets (1995) for Geometric Design;
- ❖ Highway Capacity Manual, by the United States Transportation Research Board for the analysis of roadway capacity;
- ❖ AASHTO : Guide for Design of Pavement Structures (1993) and TRL Overseas Road Note 31 (1993) for the design of pavements; and
- ❖ Pakistan Highway Code of Practice for Bridges & ASTM for the analysis and design of structures.

5.3.5 Traffic Analysis

The primary objective for this traffic survey is to determine the current traffic plying on the project road to evaluate the existing traffic pattern, and an estimate of future traffic statistics including calculation of traffic ESALs and capacity analysis.

Following Table gives a Summary of Traffic (AADT) :

TABLE – 5.2 : SUMMARY OF AADT

VEHICLE TYPE	AADT		
	LOCATION-1	LOCATION-2	LOCATION-3
Motor Cycle	1938	2154	1385
Rickshaw	996	305	376
Car	1258	566	927
Pickup	212	113	91
Van	134	26	35
Mini Bus	164	32	69
Bus	203	37	42
Mini Truck	40	47	17
2–Axle Truck	112	33	74
3–Axle Truck	39	33	9
4–Axle Truck	10	6	3
Trailer / 5–Axle & Above	23	21	4
Tractor Trolley	198	126	177
TOTAL AADT	5,328	3,498	3,209

5.3.6 Pavement Thickness

The thickness of the different layers of the pavement as per design and mechanistic analysis are given below :

CONSTRUCTION OF NEW CARRIAGEWAY	THICKNESS (mm)
Asphalt Concrete Wearing Course	50 mm
Asphalt Concrete Base Course	80 mm
Aggregate Base Course	200 mm
Subbase	250 mm
Subgrade (CBR $\geq$ 7 %)	300 mm

Aggregate Base Course and Subbase from Sargodha Quarry meets with the required NHA Specifications Criteria. Lawrencepur produces good sand which can be used to produce high quality concrete.

5.3.7 Bridges and Culverts

Number of Bridges and other Cross Drainage Structures proposed for the facility are listed as below Table.

SR. NO.	STRUCTURE TYPE	NOS.
1	No. of Bridges	05
2	No. of Culverts	79

5.3.8 Acquisition of Land

Land will be acquired for construction of the project road and other structures of the project as per design standard / site requirements. Utilities to be relocated for widening. Detail of land to be acquired and relocation of the Utilities is given below :

TABLE – 5.3 : COST ESTIMATION OF LAND ACQUISITION AND UTILITIES RELOCATION

SR. NO.	DESCRIPTION	AMOUNT (Million Rs.)
1.	Land Acquisition	360.791
2.	Relocation of Utilities	25.000
TOTAL		385.791

5.3.9 Capacity Analysis

Capacity Analysis is done using Highway Capacity Manual (HCM) 2010. It is an AASHTO Publication which contains concepts, guidelines, and computational procedures for computing the capacity and quality of service of various highway facilities, including freeways, highways, arterial roads, etc. The output is given in terms of Level of Services (LOS).

LOS is a qualitative measure used to relate the quality of traffic service. LOS is used to analyze highways by categorizing traffic flow and assigning quality levels of traffic based on performance measure like speed, density, etc.

There are (7) levels of service starting from A to F. Top being A and worst being F.

LOS 'A' is free flow. Traffic flows at or above the posted speed limit and motorists have complete mobility between lanes. The average spacing between vehicles is about 550 ft. (167 m) or 27 car lengths. Motorists have a high level of physical and psychological comfort. The effects of incidents or point breakdowns are easily absorbed. LOS A generally occurs late at night in urban areas and frequently in rural areas.

LOS 'F' represents forced or breakdown flow. Every vehicle moves in lockstep with the vehicle in front of it, with frequent slowing required. Travel time cannot be predicted, with generally more demand than capacity.

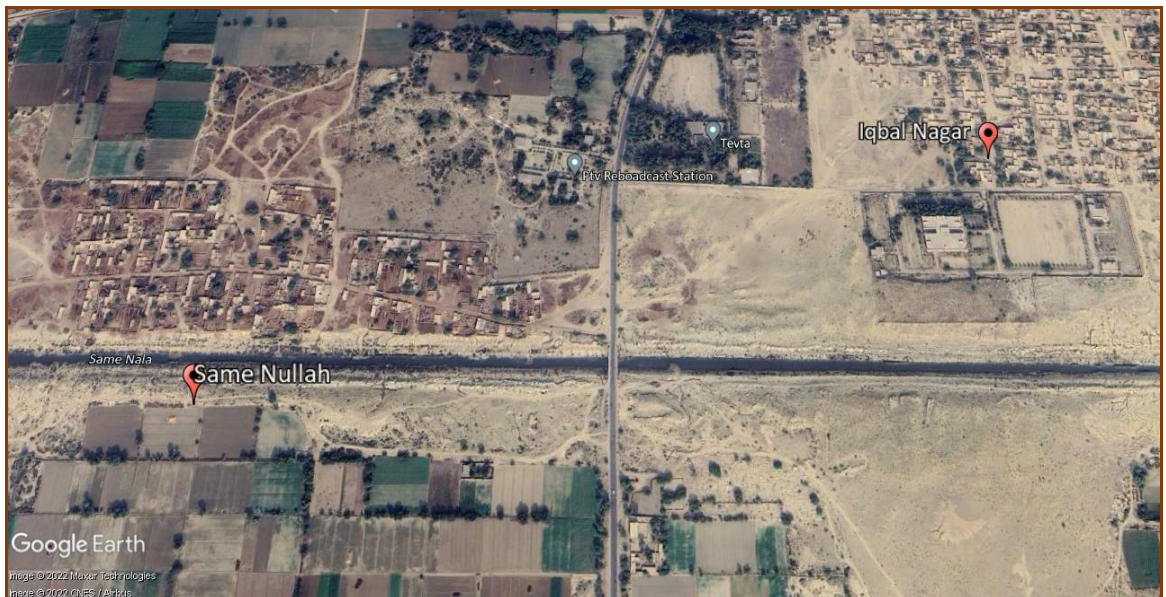
Highway Capacity Manual has been used for Capacity Analysis of project for present and future traffic analysis.

TABLE – 5.4 : LOS COMPUTATION FOR FOUR LANE ROAD

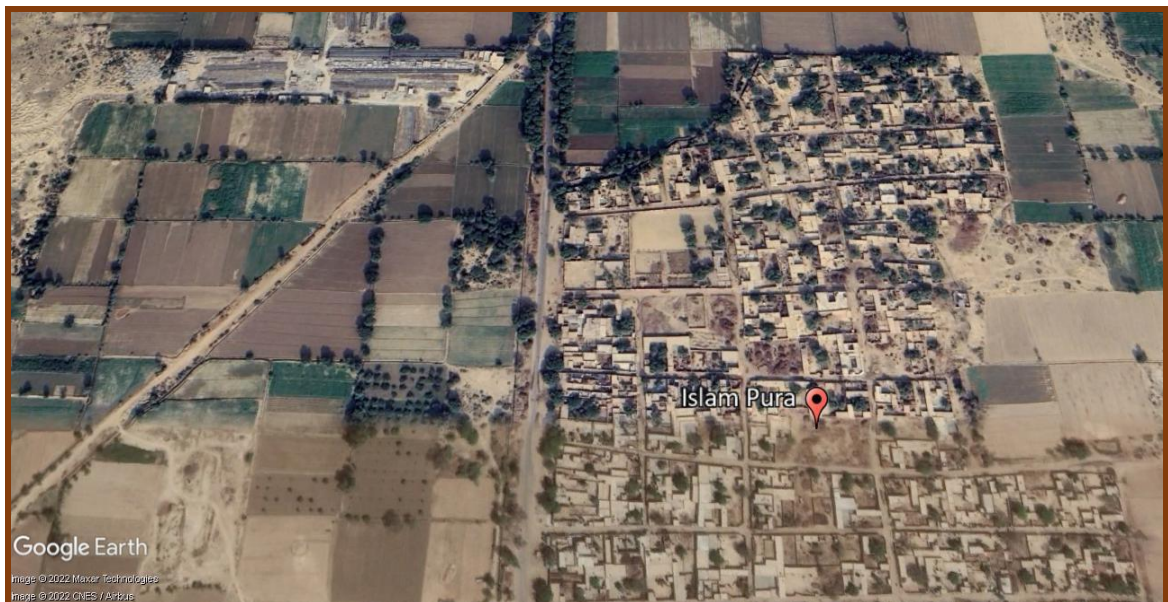
Period	AADT	PC / Hr.	LOS
2029	8514	383	A
2034	10358	466	A
2039	12602	567	A
2044	15332	690	B

A team of Consultant's experts has visited the site to obtain the basic information of the project area. The Site Visit is explained through photos of the site are provided below :

FROM BOP TO KM. 3+000



FROM KM 3+000 TO KM KM 6+000



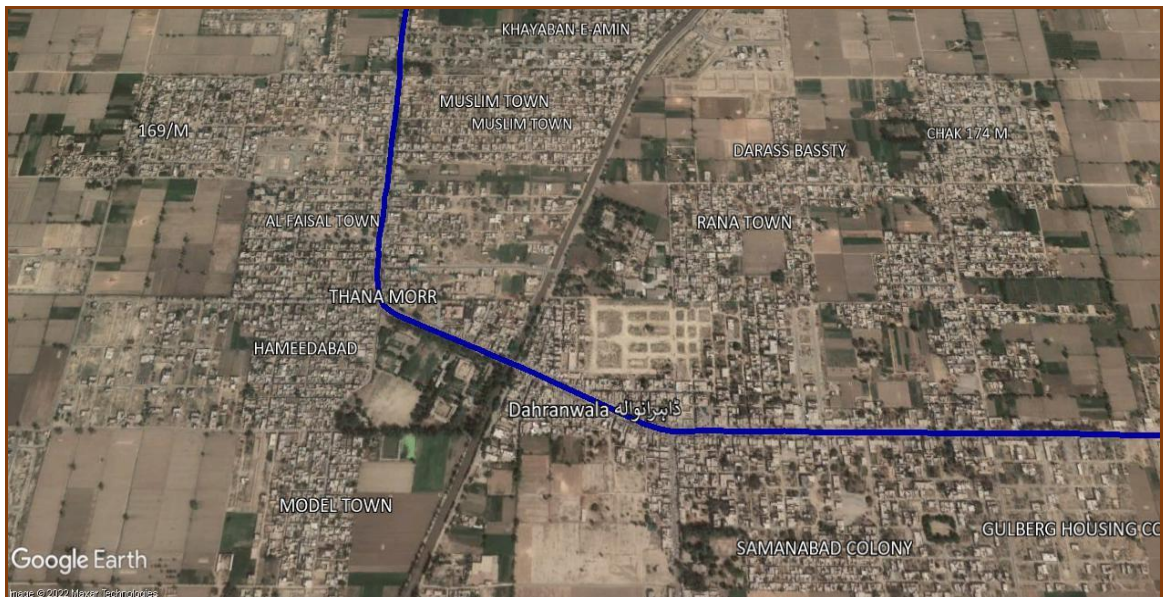
FROM KM 6+000 TO KM10+000



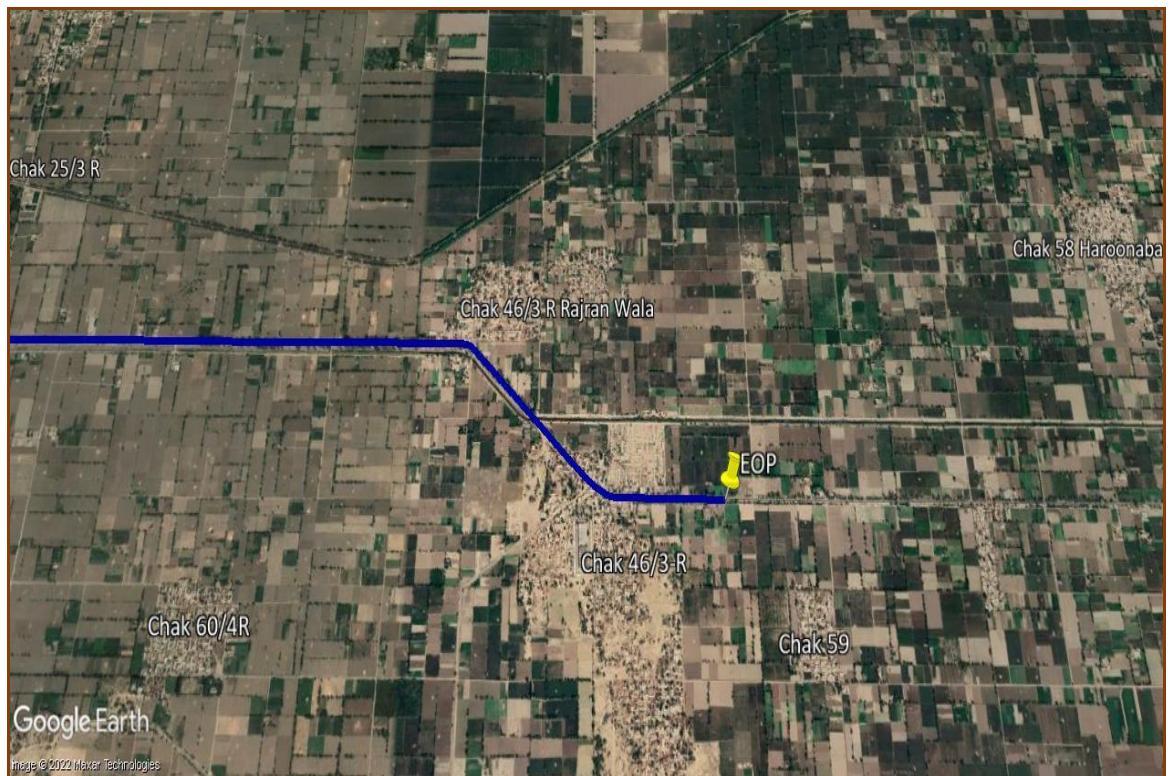
FROM KM 10+000 TO KM 14+700



FROM KM 14+700 TO KM 25+000



FROM KM 25+000 TO EOP



5.4 ROAD ACCESS

The project is already linked Provincial Highway Network as well as with local road network with surrounding areas. This is an existing road and current traffic will be using the road after its construction.

5.5 VEGETATION FEATURES OF SITE

As mention above the project Road passes through the agricultural land therefore it has vegetation alongside the road.

5.6 ADMINISTRATIVE JURISDICTION OF THE PROJECT

The proposed project is being designed by the NHA, however, after construction it might be handed over to Highway Department Punjab for operation & management.

5.7 WATER

Groundwater is available in the project area. Surface water present in the vicinity is of good quality. The laboratory results show that water is suitable for all construction requirements.

5.8 ASPHALT, REINFORCEMENT AND CEMENT

Asphalt, steel and cement will be transported from Attock, Lahore and Chakwal etc. for road construction.

5.9 COST OF PROJECT

Engineer's Estimate for Project has been prepared in January 2023. The cost has been estimated on the basis of the NHA Composite Schedule of Rates 2022 for Bahawalnagar District. Detailed Summary of Cost Estimates are provided in below :

TABLE – 5.5 : SUMMARY OF COST ESTIMATE

SR. NO.	DESCRIPTION	AMOUNT (Rs.)
1.	Bill No. 1 : Earthworks & Allied Activities	1,183,420,489
2.	Bill No. 2 : Subbase and Base Course	2,796,116,853
3.	Bill No. 3 : Surfacing and Pavement	1,102,831,323
4.	Bill No. 4 & 5 : Structures & Drainage Works	3,946,219,740
5.	Bill No. 6 : Ancillary Works	902,721,157
6.	Bill No. 7 : miscellaneous Items	258,860,000
7.	Bill No. 8 : Toll Plaza & Weigh Station	200,000,000
8.	Bill No. 9 : Electrical Works	61,118,222
(A) TOTAL CONSTRUCTION COST (RS.) =		10,451,287,784
(B)	Physical Contingencies @ 3% of (A)	313,538,634
(C)	NHA Establishment Charges @ 10% of (A)	104,512,878
(D)	Consultancy Fee for Design a& Supervision 3% of (A)	313,538,634
(E)	Price Escalation (6.5% on 2 nd Year Amount (60%))	407,600,224
(F)	Environmental Protection & Mitigation Charges (including Plantation)	20,000,000
(G)	Relocation of Utilities	25,000,000
(H)	Land Acquisition	360,791,553
GRAND TOTAL AMOUNT (RS.) =		22,447,557,491

5.10 WORK PLAN

The proposed commencement of the work is expected to be starts from January 2024. Estimated time for construction of the Project is taken as 18 months.

TABLE – 5.6 : TABLE SHOWING ESTIMATION OF WORK SCHEDULE

PROJECT COMPONENT	YEAR 2023 – 2024			YEAR 2024 – 2025			
	Q-2	Q-3	Q-4	Q-1	Q-2	Q-3	Q-4
Construction of the Project							
Construction Supervision							
Bill No. 1 : Earthworks							
Bill No. 2 : Subbase & Base Course							
Bill No. 3 : Surface Courses & Pavement							
Bill No. 4 : Structures (Culverts)							
Bill No. 5 : Drainage & Erosion Works							
Bill No. 6 : Ancillary Works							

5.11 RAW MATERIALS AVAILABILITY

The availability of suitable construction materials is given hereunder :

Coarse Aggregates : Crushed aggregate will be transported from Kirana Hills near Sargodha. Several medium size crushers are exploiting these quarries. The crushed aggregate shall be required to process as per specifications.

Sub base Material : Suitable Materials for sub base will be transported from Kirana Hills near Sargodha.

Embankment Material : Embankment material of will be hauled from suitable source in the adjacent areas.

Steel : Steel shall be procured from Lahore.

Cement : Cement for this project is available from District Chakwal

Bitumen : Bitumen manufactured at Attock Refinery will be used.

Sources of different materials required for construction are listed in the Table below :

TABLE – 5.7 : RAW MATERIAL AVAILABILITY

RAW MATERIAL	AVAILABILITY
Borrow Material	Nearest Quarry
Stones for Retaining Walls and Rip Rap	Nearest Quarry
Stone for Subbase, Aggregate Base Course, Asphalt Courses	
Bitumen	Attock Refinery
Asphalt	Attock Refinery
Brick	Nearby Brick Kiln
Cement	District Chakwal
Clean Water for Specific Uses	Nearby River
Other Water for Compaction and Sprinkling	Nearby River
Reinforcement Steel	Procured from Lahore
G.I. Pipes	Nearby Markets
Cement	Nearby Factories

5.12 CONSTRUCTION LOGISTICS

5.12.1 Work Base

Since all works are located along the alignment, the best option would be to set up the work bases near the respective project sites, probably through private rental deeds.

5.12.2 Labour Supply

The contractor will be contractually bound to employ maximum local people except for jobs where the local expertise is not available. By and large the daily wage rates fixed by the local authorities will be used.

5.12.3 Labour Camps

Majority of the labour force will come from local settlements. They will be picked up and dropped off by contractor transport. Some unskilled, most of semi-skilled and skilled labour will live in camps and will likely be brought in by contractor from far off towns. Being located near the work base, the camps will make the work access easy to the camp dwellers. Like camps, work bases will be required to be 500 m away from the nearest settlements.

5.12.4 Machinery Maintenance and Equipment Yards

Machinery and equipment yards will be sited near work camps. The yard will have enough storage and haulage space with ample moving and working space. The yard will be walled and will have a gate provided with ample security staff. The work base a machinery and equipment yard will be provided. The yard will have enough storage and haulage space with ample moving and working space. The yard will be walled and will have a gate provided with ample security staff.

5.12.5 Material Depots

Near work bases material depots will be required for storing construction materials. They will include temporary sheds for storing cement, steel and asphalt and open space for storing stones, shingles and bricks. The material depots will be walled and gate will be provided with ample security. A store keeper will keep account of incoming and outgoing material.

5.12.6 Machinery Repair Workshops

With a large number of vehicles and other similar machinery a repair workshop is essential. The contractor may establish his own workshop.

5.13 APPROACH TO WORK BASES

Since work bases will be established close to the road sections under can provide easy access to them. Public or private land (with the consent of owner and / or locals) can be used for providing supplementary access roads and paths to work bases.

5.13.1 Camp Offices

Adjacent to labour camps and to work bases, the contractor will be allowed to set up a camp office to run his day to day field affairs. For that the public or private land can be used by the contractor.

5.13.2 Security Arrangements

Given the prevailing field condition, security staff is necessary. Enough security will be required at Work Base, Labour Camp, Material Store, Equipment Yards and location of the work in progress on the work site. Coordination will be necessary with nearby law enforcing agencies.

5.14 HEALTHCARE

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

5.14.1 Labour Reporting Office

Along the road and in work bases special areas will be marked where the labour can gather at the time of pick and drop, emergency or briefing. Those places will be clearly marked and kept open and clean and as per requirement equipped with public address system.

5.14.2 Labour Transport

Almost all of unskilled labour will be employed from local sources. Contractor will provide vehicle(s), to pick and drop local labour every day. This will also keep the camps less pressurized and manageable.

5.15 MAN POWER REQUIREMENT

Following man-months in Public and Private Sector are envisaged to be employed for the Project Execution and Operation Phases. These are stated hereunder :

TABLE – 5.8 : PUBLIC SECTOR MAN POWER REQUIREMENT FOR THE PROPOSED PROJECT

SR. NO.	DESIGNATION	BPS	NO. OF POSTS	DURATION (Months)
1.	Project Director / Director (Engineer)	19	1	27
2.	Deputy Director (Engineer)	18	2	24

SR. NO.	DESIGNATION	BPS	NO. OF POSTS	DURATION (Months)
3.	Assistant Director (Engineer)	17	2	24
4.	Assistant Director (A/C)	17	1	24
5.	Surveyor	16	1	24
6.	Accountant / Superintendent	16	1	24
7.	Computer Operator	16	2	24
8.	Office Assistant	16	2	24
9.	Auto CAD Operator	11	1	24
10.	Qanoon Go	11	1	24
11.	Patwari	5	1	24
12.	UDC	9	1	24
13.	LDC	7	2	24
14.	Photo Copy Machine Operator	5	1	24
15.	Driver	4	4	24
16.	Naib Qasid	1	4	24
17.	Chowkidar	1	3	24
18.	Sweeper	1	2	24

TABLE – 5.9 : AUTHORITIES RESPONSIBLE FOR PROJECT ACTIVITIES

SR. NO.	RESPONSIBILITIES	AUTHORITIES
1.	Sponsoring	Ministry of Communications
2.	Execution	National Highway Authority
3.	Operation and Maintenance	National Highway Authority
4.	Concerned Federal Ministry	Ministry of Communications, Government of Pakistan

6.0 DESCRIPTION OF THE ENVIRONMENT

An environmental baseline study is intended to establish a data base against which potential impacts can be predicted and managed later. The EIA of the proposed project covers a comprehensive description of the project area, including regional resources which are expected to be affected by the project, as well as those which are not expected to be directly affected by the construction and operation of the project. The existing environmental conditions around the proposed project have been considered with respect to physical, biological and socio-economic aspects. A site visit was conducted to survey the field area and to collect environmental data on physical, biological and socio-economic parameters. Further, interviews were held with the general public and stakeholders of the project area in order to seek the public opinion on the implementation of the proposed project.

The baseline environment data has been compiled to cover the following areas :

- ❖ Physical Environment
- ❖ Biological Environment
- ❖ Socio-economic Environment

6.1 STUDY AREA

The project started from Dahranwala (Chishtian) Morr on Bahawalpur – Bahawalnagar Road. The route between Chishtian and Haroonabad via Dahranwala passes through multiple built-up areas and crosses a number of canals. The main populated town along the project road are Islam Pura, Dahranwala, Rajranwala and Haroonabad.

The Project area lies in the Districts of Faisalabad and Nankana Sahib. At the start the Project lies in Sangla Hill City District Nankana Sahib and the Project ends at Sahianwala Expressway of District Faisalabad.

6.2 PHYSICAL ENVIRONMENT

A physical environment is considered as an area that is tangible and supports, influences, and develops life. On Earth, many different types of physical environments, natural and synthetic, have existed throughout its history. The areas covered under physical resources are; climate, water resources, topography, seismology, geology and soil conditions. The objective of the study was to establish :

- ❖ Baseline conditions of surface and groundwater resources
- ❖ Assess the surface and groundwater quality
- ❖ Soil and geology baseline of the area

6.2.1 Topography, Geography, Geology, and Soils

District Bahawalpur is geographically divided into three zones; (i) desert area (ii) canal irrigated area; which was a part of the Cholistan and has been irrigated now and

(iii) riverine area which at some places is called as Bet. The riverine area lies close the river Sutlej which flows in the north along its boundary with Lodhran and Vehari Districts. The area is inundated during floods. The irrigated tracks are higher than the riverine area. Most of the land has been brought under cultivation. The desert area lies to the south and east of the irrigated track and north of the desert of the Bikanir and Jaisalmer in India. It extends along the entire eastern boundary of Bahawalnagar District in the north and Rahimyar Khan District in the South. The surface of these deserts consists of a succession of sand dunes, rising in places to a height of 150 meters and covered with the vegetation peculiar to the sandy tract.

6.2.2 Groundwater Resources

Ground water is extracted mainly through tube wells and hand pumps in the area.

6.2.3 Surface Water

Sutlej River is the major surface water body of the Bahawalpur and Bahawalnagar districts. However, the Hasilpur – Bahawalnagar Road alignment does not cross the river. Sutlej River originates in western Tibet, south of the Kailas Mountain Range. The total length of the river till the confluence with Chenab River is about 1,550 Km. The river reaches Pakistan about 10 Km. downstream of Ferozepur barrage, where the borderline mingles with the river alignment. Below the Rohi nallah confluence till Ferozepur barrage, the river again flows through Indian Punjab. Thereafter, it becomes border line for some kilometres and only from Bakerke onward, some 15 Km. downstream of Ferozepur, Sutlej runs entirely in Pakistani territory.

Floods in the Sutlej occur particularly around August due to heavy rainfall during the monsoon as a result of storm depressions originating from the Bay of Bengal.

6.2.4 Regional Geology

Geology of the districts can be divided into following :

6.2.4.1 Active Flood Plain

The active flood plain is the narrow belt along the Sutlej River which is flooded almost every year during the monsoon. It is subject to changes through formation of new channels, developing and drifting of sand bars and silting-up of old channels. The parent soil material consists of salty and river alluvium. The area is less than 400 years old.

6.2.4.2 Abandoned or Recent Flood Plain

This area is slightly higher than the active flood plain and normally does not receive any flood now. This land-form shows clear evidence of comparatively recent river activity. The soil is generally homogenized to a depth of 15 to 20 cm from the surface. The age of this land-form varies from 400 to 600 years.

6.2.4.3 Covered or Sub–Recent Plain

It consists of fine grained alluvium and features of a typical flood plain have been obscured in this area by sheet flooding in the past and the area has been converted into a level plain.

6.2.4.4 Sand Plain or Old Desert Remains

The age of this area is late Pleistocene that is 20,000 years old. Sandy deposits are aeolian in nature and derived from the deposits of lower Indus plains and Rajputana desert in India. Two types of surficial materials are present in the Cholistan which is of more geological importance (i) the northern part of the Cholistan is clay alluvium derived from Himalayas which is composed of calcareous sand and clay; and (ii) the central part is sandy alluvium deposited by Hakra (Ghagra) River.

6.2.5 Seismology

On the basis of Peak Ground Acceleration (PGA) values obtained through Probabilistic Seismic Hazard Assessment (PSHA), Pakistan is divided into five (05) seismic zones in line with the Uniform Building Code (UBC), 1997 of Pakistan. The boundaries of these zones are defined on the basis as shown in Table – 6.1.

TABLE – 6.1 : VALUES OF SEISMIC ZONES OF PAKISTAN

SR. NO.	ZONE	PGA (g)
1.	1	0.05 to 0.08
2.	2A	0.08 to 0.16
3.	2B	0.16 to 0.24
4.	3	0.24 to 0.32
5.	4	> 0.32 g

In general, the Proposed Project as per Building Code of Pakistan (BCP), 2007 (Seismic Provisions) falls entirely in the Zone–2A (Moderate Hazard) category with PGA 0.08 to 0.16 g of the Seismic Zonation Map as shown in Figure – 6.1. Hence, all the applicable provisions of BCP will be met during the design and construction for safety against seismic hazards.

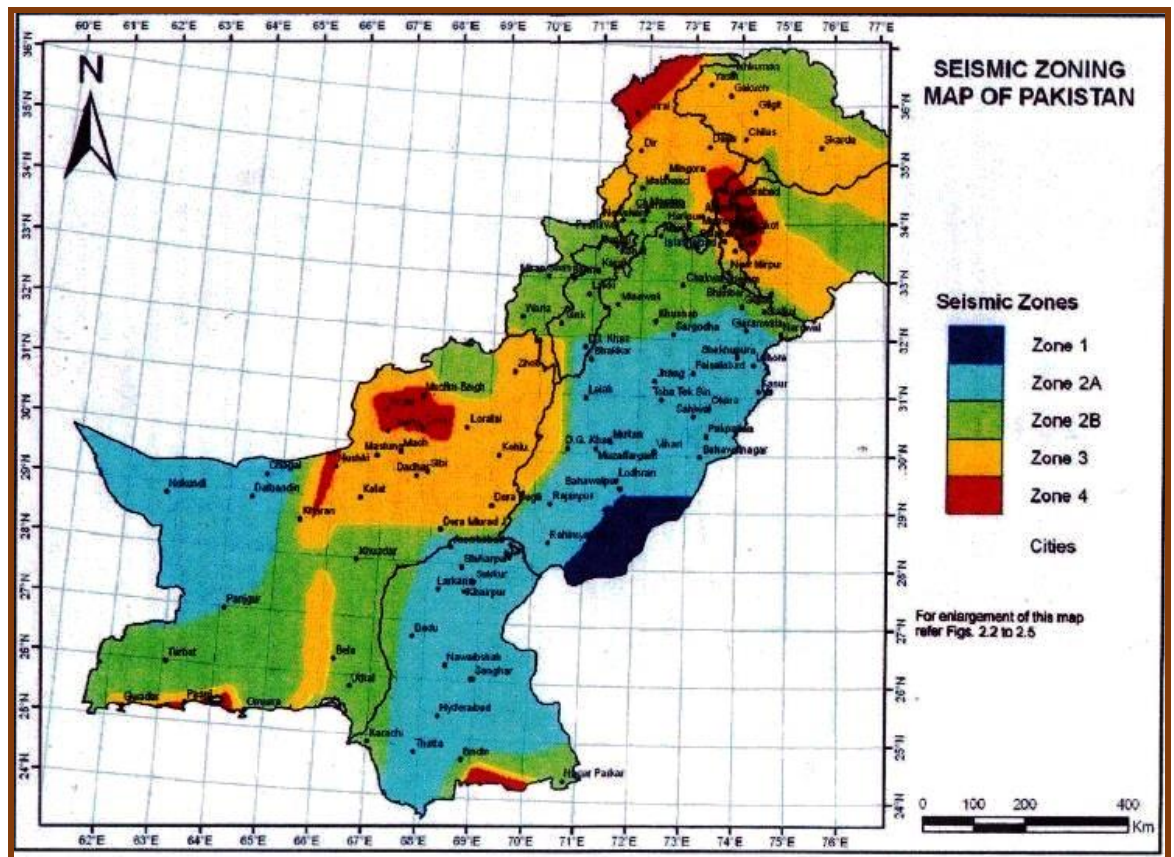


FIGURE – 6.1 : SEISMIC ZONING MAP OF PROJECT AREA

Seismic Hazard Mapping : Seismic hazard maps for Punjab based on Probabilistic Seismic Hazard Assessment (PSHA) conducted by the Pakistan Meteorological Department – Norwegian Seismic Array (PMD–NOSAR), 2007 and Rafi et al., 2012 in terms of PGA for the annual exceedance rates of 0.02, 0.01 and 0.002 (return periods of 50, 100, 200 and 500 years) for stiff rocks are presented in Figure – 6.2. These maps are designed to assist in the risk mitigation by providing a general seismic hazard framework. The higher seismic hazard in the Punjab Road project areas is seen in D.G. Khan District of the road project locations. Rest of the districts have a relatively low seismic potential.

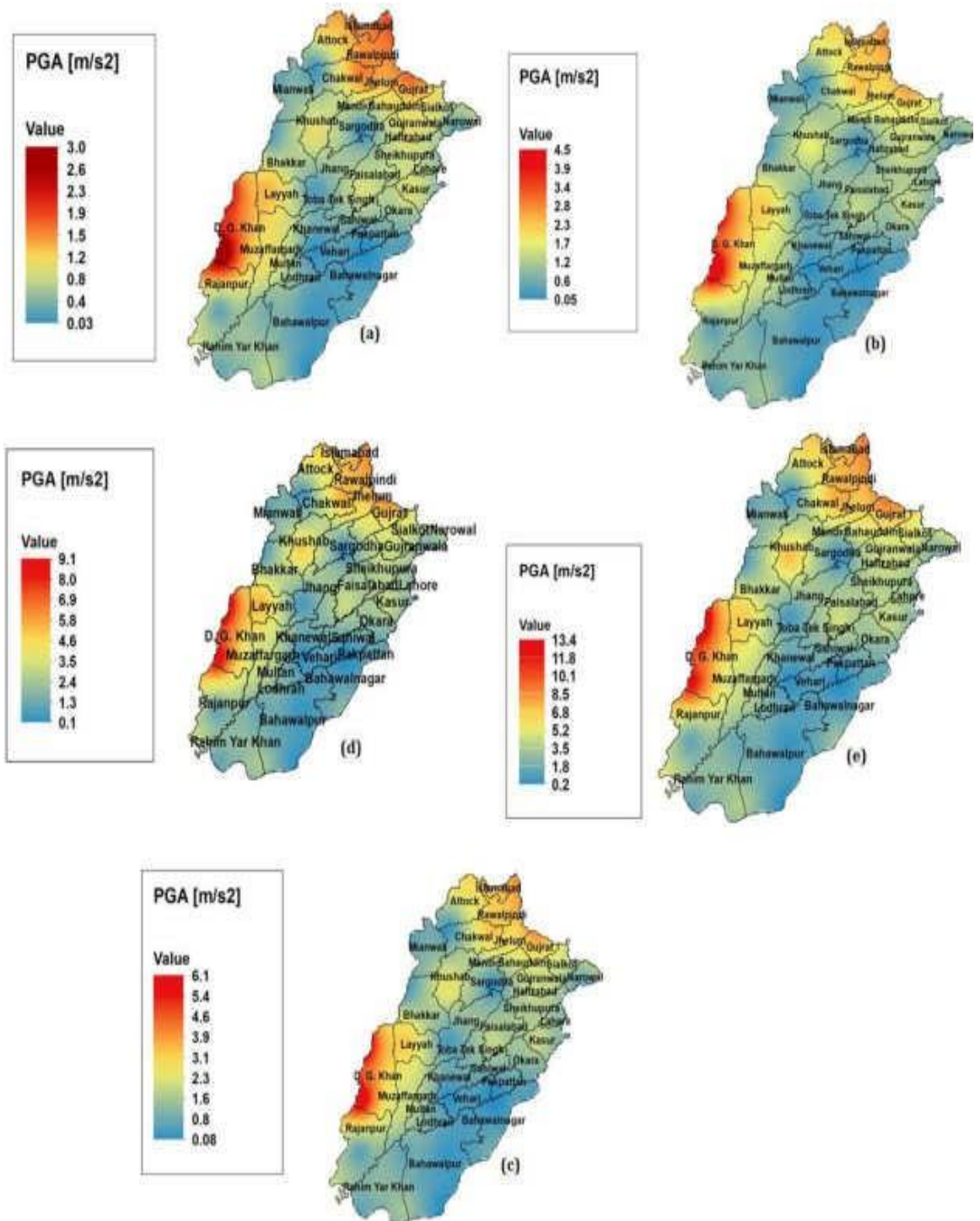


FIGURE – 6.2 : EARTHQUAKE HAZARD MAPS FOR PUNJAB IN TERMS OF PGA [M/S^2] FOR (A) THE 0.02 (50 YEAR) (50–YEAR RECURRENCE); (B) 0.01 (100–YEAR RECURRENCE); (C) 0.005 (200–YEAR RECURRENCE); (D) 0.002 (500–YEAR RECURRENCE); (E) 0.001 (1000–YEAR RECURRENCE) ANNUAL EXCEEDANCE PROBABILITIES

PGA values are given for a range of annual exceedance probabilities together with the expected PGA values at 50, 100, 200, 500 and 1000 years return period of different frequencies. It can be seen that expected PGA values are less than 0.5 (m/s^2) for all districts at 10% chance of being exceeding in a 50–Year interval. Below Table shows the Expected PGA for the Districts in Punjab.

**TABLE – 6.2 : TABLE SHOWS THE EXPECTED PGA
FOR THE DISTRICTS IN PUNJAB**

Annual Exceedance Probability	Return Period (Years)	Expected PGA (m/s ²) for the Districts of :								
		Faisalabad	Layyah	D.G. Khan	Jhang	T.T. Singh	Sahiwal	Okara	Pakpattan	Bahawalnagar
0.02	50	0.36	1.27	0.57	0.38	0.38	0.36	0.39	0.22	0.22
0.01	100	0.54	2.13	0.80	0.56	0.56	0.54	0.58	0.34	0.34
0.005	200	0.79	3.15	1.11	0.82	0.82	0.79	0.85	0.53	0.53
0.002	500	1.29	5.23	1.65	1.33	1.33	1.29	1.37	0.94	0.94
0.001	1000	1.86	7.50	2.22	1.90	1.90	1.86	1.94	1.45	1.45

6.2.6 Climate

The climate of District Bahawalnagar is extremely hot and dry in summer whereas cold and dry in winter. The summer season starts in April and continues till October. May, June and July are the hottest months with mean maximum and minimum temperatures of 42°C and 28°C respectively. December, January and February are the coldest months. The mean maximum and minimum temperatures during these months are 22°C and 6°C respectively. The months of November, February and March are pleasant. Dust storms are frequent during summer months. The annual precipitation is from 125 to 200 millimetres which usually occur during the monsoon season that is July and August. The average rainfall is 10 to 25 millimetres. The description of various climatic parameters in the project area is as follows :

6.2.6.1 Temperature

The proposed Project Area will be subjected to long periods of high temperature in summers and low temperature in winter. The Mean Monthly Temperature (Max. & Min.) of Bahawalnagar meteorological stations has been acquired from Pakistan Meteorological Department (PMD) for the 1981 to 2010 Years and presented in the Table – 6.3.

Average mean monthly temperatures of above mentioned stations have been discussed in this section which represents the temperature conditions. It may be seen from the Figure – 6.3 below that the temperature rises rapidly until June and the temperature drops with advent of monsoon in July. The months of December and January experience a severe drop in temperature. Summer is marked with monsoon rains, which occur usually in July / August.

**TABLE – 6.3 : MONTHLY TEMPERATURE RECORDED
AT BAHAWALNAGAR DISTRICT**

SR. NO.	MONTHS	TEMPERATURE (°C)		
		MEAN MAX.	MEAN MIN.	MEAN
1.	January	20.0	6.6	13.3
2.	February	23.3	9.5	16.4
3.	March	28.9	14.7	21.8
4.	April	36.3	20.7	28.6
5.	May	41.3	25.6	33.4
6.	June	41.9	28.2	35.0
7.	July	38.7	28.3	33.6
8.	August	37.8	27.7	32.9
9.	September	36.9	25.1	31.0
10.	October	34.5	19.5	26.8
11.	November	29.6	13.4	21.3
12.	December	23.2	8.1	15.4
ANNUAL		32.4	18.8	25.6

Source : Pakistan Meteorological Department

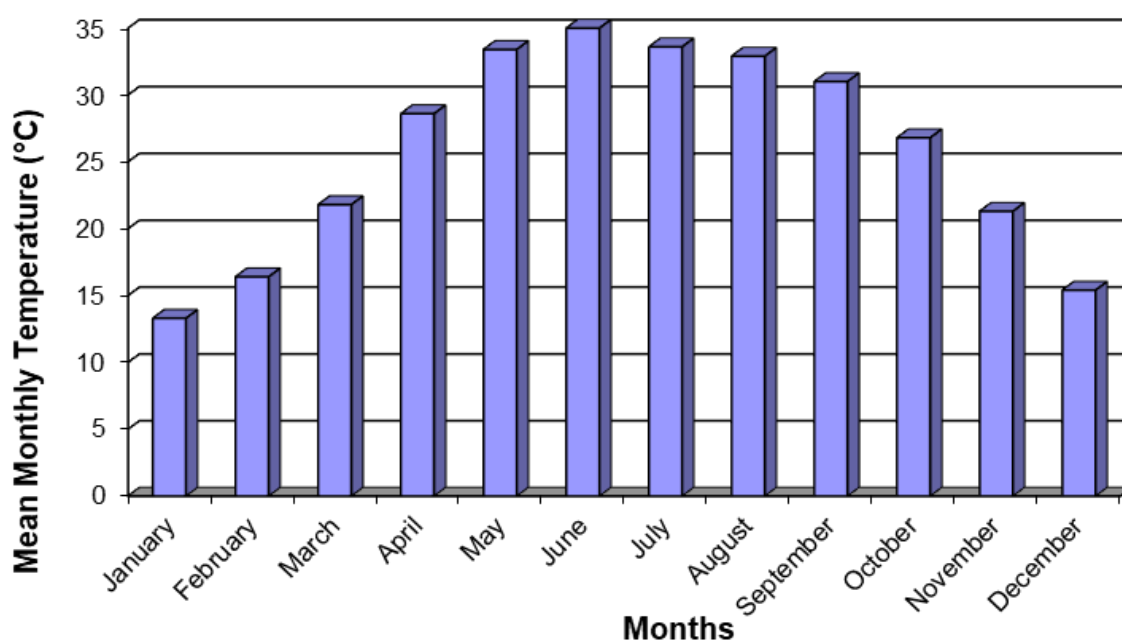


FIGURE – 6.3 : MEAN MONTHLY TEMPERATURE OF BAHAWALNAGAR DISTRICT

6.2.6.2 Rainfall

Mean monthly rainfall data recorded at Bahawalnagar meteorological station are given in Table – 6.4. The maximum rainfall occurs during the months of July and August. Winter rains generally occur during the months of February to April, whereas, November is normally the months with least precipitation.

**TABLE – 6.4 : MEAN MONTHLY RAINFALL RECORDED
BAHAWALNAGAR DISTRICT**

SR. NO.	MONTHS	MEAN MONTHLY RAINFALL (mm)
1.	January	11.4
2.	February	17.3
3.	March	15.7
4.	April	10.8
5.	May	13.2
6.	June	39.2
7.	July	70.8
8.	August	34.2
9.	September	14.9
10.	October	7.9
11.	November	2.5
12.	December	3.6
ANNUAL		242.1

Source : Pakistan Meteorological Department

Graphical representation of month-wise precipitation for each meteorological station is provided below in Figure – 6.4. The maximum rainfall occurs during the monsoon season in the months of July and August.

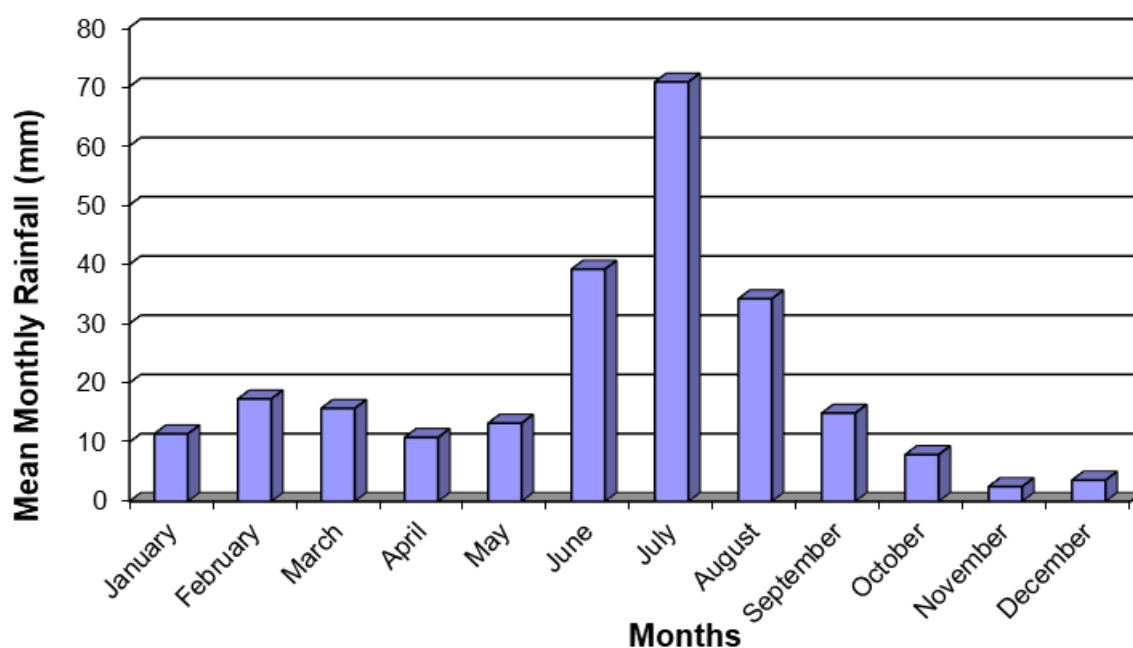


FIGURE – 6.4 : MEAN MONTHLY RAINFALL OF BAHAWALNAGAR DISTRICT

6.2.6.3 Relative Humidity

The relative humidity data of Bahawalnagar District is given in Table – 6.5. The data reveals that at 00:00 hours, the relative humidity levels are generally higher while lower relative humidity levels are recorded at 12:00 hours.

**TABLE – 6.5 : RELATIVE HUMIDITY RECORDED AT BAHAWALNAGAR DISTRICT
(1981–2010)**

SR. NO.	MONTHS	RELATIVE HUMIDITY (%)			
		00 UTC	03 UTC	12 UTC	MEAN
1.	January	88.60	85.80	49.50	74.63
2.	February	84.70	79.40	43.00	69.03
3.	March	79.20	70.60	36.70	62.17
4.	April	62.20	49.80	23.80	45.27
5.	May	54.40	43.50	21.60	39.83
6.	June	61.00	52.60	28.90	47.50
7.	July	74.60	68.60	46.10	63.10
8.	August	78.70	71.00	50.20	66.63
9.	September	79.10	70.50	44.50	64.70
10.	October	77.30	66.50	35.00	59.60
11.	November	81.20	72.60	39.30	64.37
12.	December	86.80	83.40	48.10	72.77
ANNUAL		76.20	66.40	39.30	60.63

Source : Pakistan Meteorological Department

Graphical representations of month–wise Relative Humidity of above mentioned meteorological stations are provided below in Figure – 6.5.

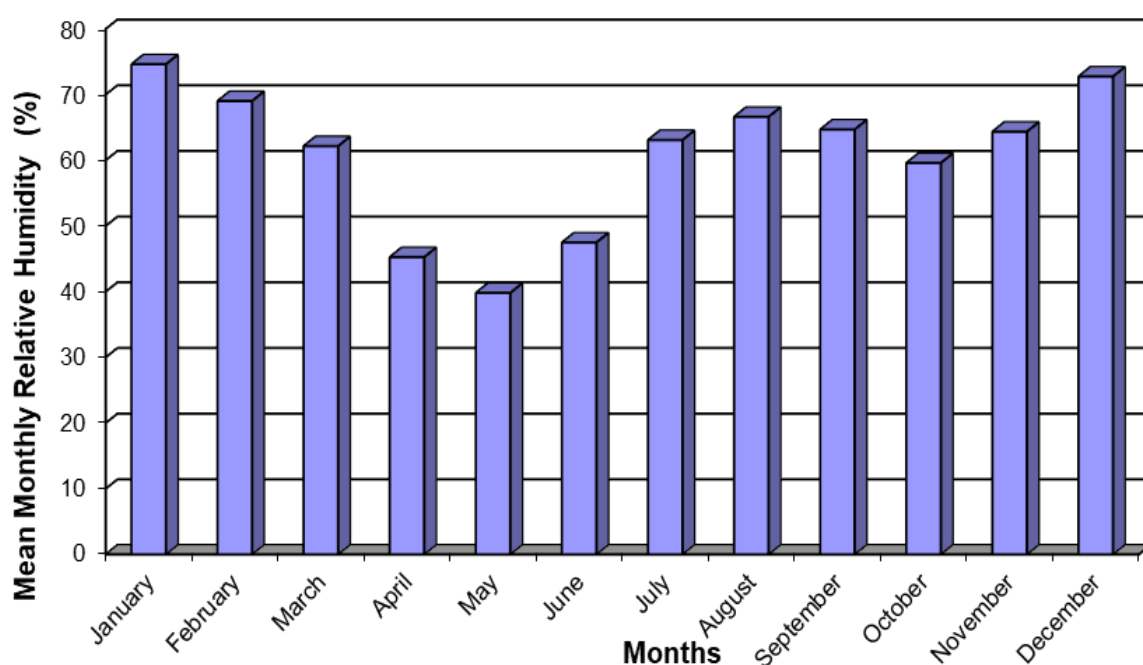


**FIGURE – 6.5 : MEAN MONTHLY RELATIVE HUMIDITY OF
BAHAWALNAGAR DISTRICT**

6.2.6.4 Wind Speed

The mean monthly wind speed recorded at Bahawalpur and Bahawalnagar meteorological stations is given in Table – 6.6. The data reveals that at 00 UTC, the wind speeds are generally lower while higher wind speeds are recorded at 12 UTC. During summers wind speeds are generally higher than wind speeds in winters.

**TABLE – 6.6 : WIND SPEED RECORDED AT BAHAWALNAGAR DISTRICT
(1981–2010)**

SR. NO.	MONTHS	RELATIVE HUMIDITY (%)			
		00 UTC	03 UTC	12 UTC	MEAN
1.	January	1.00	1.00	2.30	1.43
2.	February	1.30	1.30	3.20	1.93
3.	March	2.10	2.10	3.80	2.67
4.	April	2.00	2.40	4.10	2.83
5.	May	3.10	3.90	4.60	3.87
6.	June	3.30	5.10	4.90	4.43
7.	July	2.90	4.30	4.40	3.87
8.	August	2.80	3.60	4.40	3.60
9.	September	1.90	2.70	3.70	2.77
10.	October	1.10	1.30	2.30	1.57
11.	November	0.80	0.80	1.60	1.07
12.	December	0.70	0.70	1.50	0.97
ANNUAL		2.30	2.60	3.40	2.77

Source : Pakistan Meteorological Department

Graphical representations of month-wise Wind Speed of above mentioned meteorological stations are provided below in Figure – 6.6.

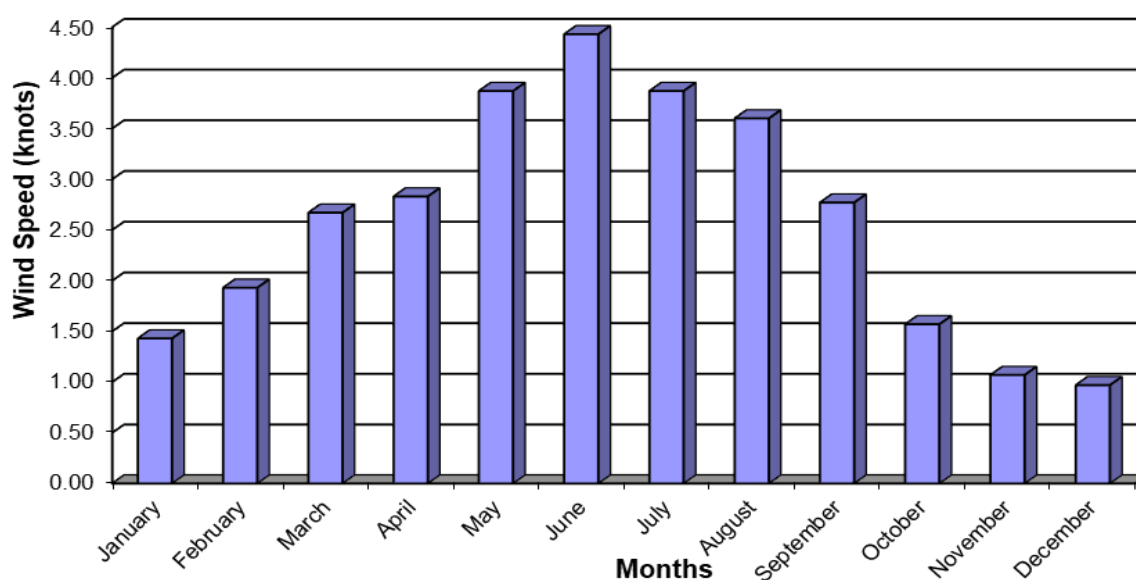


FIGURE – 6.6 : MEAN MONTHLY WIND SPEED OF BAHAWALNAGAR DISTRICT

6.2.7 Climate Change

According to the Global Climate Risk Index 2020, Pakistan was ranked as the 5th most-affected nation by extreme weather events (1999 – 2018). Natural disasters, which already disrupt livelihoods and the economy, are expected to increase in frequency and intensity with climate change. Projected temperature increases are expected to be above global averages, negatively impacting agricultural production, water availability, and human health. This will be particularly true for large parts of Punjab, Sindh, and Baluchistan Provinces, already considered intense heat zones.

Climate change will impact transport in myriad ways, depending on the mode and location-specific characteristics. All transportation infrastructure is constructed under design standards that consider very specific temperature and precipitation ranges and return intervals for extreme events, such as floods and extreme heat. Transport infrastructure malfunctions if weather conditions diverge from the design range, which could occur more frequently as the climate continues to change. Heat waves are likely to occur with a higher frequency and longer duration in the future. Paved roads are particularly vulnerable to extreme temperatures, while unpaved roads, bridges, and culverts are sensitive to precipitation extremes.

Punjab Provincial Highway Project

This Climate Risk and Vulnerability Assessment (CRVA) is conducted for Punjab Provincial Highway Project, which will dualize 485 Km. Provincial Highways. Climate change projections for the road sections of the Punjab Provincial Highway Project are constructed using the NASA Earth Exchange Global Daily Downscaled Projections (NEX-GDDP) dataset.

Observed Changes in Mean Climate

Punjab province is an area of a semiarid climate with high temperature and less rainfall (with high variability). The temperature differences between the upper and lower Indus basin plains are quite noticeable. A clear warming trend can be seen in the Punjab Road project areas particularly after 2000. Long term average mean temperature in this zone is 25.3°C and it has been increased by 0.5°C during this period. Annual total rainfall during 1901 – 2018 in this zone is 274 mm with negative spatial variation north to south. The overall rainfall during the long-term average has increased by around 64 mm with large inter annual variability, particularly in the last decade.

The New Design Values for Detailed Engineering Design of Punjab Road Projects

The overall approach is risk-averse. This is justified because (i) the procedures may be applied to structures with longer design life; (ii) there is large uncertainty in the magnitude, and sometimes even the sign, of projected regional precipitation changes; and (iii) there is strong observational evidence and a physical basis for expecting large increases in precipitation extremes linked to rising atmospheric moisture content.

Climate Risks and Vulnerabilities in the Project Area

The climate risks and vulnerabilities assessment of historical and future climate change indicates the future vulnerability of road transport infrastructure to projected changes in climate variables. Foreseen changes in climatic means of air temperature, precipitation, and associated extreme weather events can result in the following impacts on the project road :

Extreme Heat : The substantial projected increase in air temperatures as well as an annual number of days where the daily maximum temperature exceeds 35°C, indicates that heat waves are more likely to occur and may last longer. This means that prolonged exposure to extreme heat, resulting in heat stress, is expected to occur in the coming years. This poses potential increased risks related to asphalt pavement integrity and thermal expansion of bridge expansion joints and paved surfaces.

Extreme Precipitation : The increase in extreme precipitation events is considered the most important climate risk for the Project roads. This may lead to higher extreme discharges that exceed the systems' design capacity and cause flooding or inundation of road infrastructure. More extreme precipitation events can also lead to increased deterioration of road pavements resulting in more frequent maintenance.

6.3 ECOLOGICAL ENVIRONMENT

6.3.1 Methodology

All the available literature was thoroughly reviewed to have a better understanding of the project area and its surroundings including habitat, flora and fauna. The route alignment was thoroughly examined based on the primary and secondary (Flora of Pakistan–MI–Sheikh, Birds of Pakistan – ZB–Mirza–Mammals of Pakistan – TJ Roberts, Manual of silviculture for Pakistan [1965] Champion, Sir H.G.; Pakistan Forest Inst., Peshawar eng; Seth, S.K. Khattak, G.M.) data. This survey broadly covers ecosystem sensitivities (If any), vegetation, other flora and fauna. Numbers of trees along ROW / COI and in the project vicinity was recorded which includes Mature, sub-mature and pole crops. The survey was conducted in December, 2020 and January, 2021. The tree / flora count was done through GIS technology and the species identification (types of trees) carried out during the same visit. Wildlife species (including Birds) were identified during morning and evening (Dawn & Dusk) time for better understating and identification. Concerned wildlife departments and local people were also consulted for the purpose to enlist the local flora and fauna but along the road habitat is quite degraded so, those species are also part of the report which exists in the past and or having habitats away from the Col.

6.3.2 Major Habitats / Bio Diversity Features

The proposed road study area falls through two main eco-regions, i.e., Desert–Xeric Shrublands and Sub–Tropical Thorn area. The Desert–Xeric shrub land category includes some parts of district of Bahawalnagar and the eco-region of Sub–Tropical

Thorn area includes rest of the area. The habitat of the project area is falling in the category of "Modified Habitat". The native Forest and wildlife species are mostly disappeared because of human induced activities and climate change. Now the available habitat is quite degraded due to forest destruction, uncontrolled hunting and grazing resulting in loss of habitat for wildlife in the result of non-environmental friendly activities. The wildlife of the project area is connected with forest so, after damaging the tree cover wild species of the particular area are almost vanished and hardly some common wild fauna is reported.

6.3.3 Dessert–Xeric Shrublands

The habitat is typically influenced by extreme climate, mainly stretching over desert conditions. Because of low biomass productivity, the litter layer is almost non-existent with very low organic content of soil surface. The land is highly sensitive to grazing, burning, soil disturbance and other cover alteration. Soil restoration potential is very low with very slow regeneration capabilities. Temperatures range from freezing in winter to extremely hot (more than 46°C) in summer. The typical habitat is not purely falling in the Aol but near to the road proposed. The desert vegetation is quite varied due to range of temperature with Prosopis shrubs being the characteristic species along with cacti species with specialized photosynthesis mechanism to store more water. The animals found in desert ecosystem (called xerocoles) evolved to survive in this unique environment because they do not sweat and can retain water in their bodies. Most animals found in hot desert are much smaller in size such as rodents, rabbits and lizards.

6.3.4 Sub–Tropical Thorn Area

This type of habitat includes low, open and pronouncedly xerophytic species in which thorny leguminous species predominate. It occupies almost whole of the Indus plain except the driest parts. The climax tree species are Capparis, Salvadora, Tamarix, Prosopis and Zizyphus. The soils range from flat alluvial to heavy clays, loams and sandy loams. The climate varies from semi-arid (250 to 750 mm rainfall) to arid (less than 250 mm rainfall). The summer temperature in the tract is as high as 48°C. This tract provides an ideal habitat to the wildlife of the area which seasonally migrate according to their needs. Avifauna migration is from the lower hills towards the plains during cold winter in search of food and shelter, and from the flood plains towards the dry areas during floods and towards the rivers during the summer drought. The proposed road already exists so, no major habitat for the above assets were reported, as the current road is in the high influence of urbanisation from the decades and these species have been migrated to safe heavens.

6.3.5 General Flora and Fauna of the Route

The Project Area being part of the Indus basin the climate of the tract is arid, sub-tropical, the original flora of the area consists of tropical thorn forest type vegetation, in which thorny usually hard wooded species predominate, acacia species being particularly characteristic. No critical species are failing in the project corridor. The

trees have usually short boles and low branching crowns, which rarely meet except on exceptionally favourable spots. The usual height of tree is 6 – 10 m.

Following is the baseline of flora and fauna found in the COI :

6.3.6 Flora

In order to collect baseline data, field survey was conducted in the COI. On-site observation as well as local information was recorded for the floral species in the area.

TABLE – 6.7 : MAJOR FLORAL SPECIES FOUND ALONG THE PROJECT ROUTE ALIGNMENT

ENGLISH / LOCAL NAME	SCIENTIFIC NAME	CONSERVATION STATUS
Kandi	<i>Prosopis cineraria</i>	NF
Kikar	<i>Acacia nitolica</i>	LC
Khabar	<i>Salvadora oleoides</i>	DD
Shisham	<i>Dalbergia sissoo</i>	LC
Neem	<i>Azadirachta indica</i>	LC
Sufaida	<i>Eucalyptus camaldulensis</i>	NT
Ber	<i>Zizyphus jujuba</i>	LC
Date	<i>Phoenix dactylifera</i>	LC
Frash	<i>Tamarix aphylla</i>	NF
Ber	<i>Ziziphus mauritiana</i>	LC
Karir	<i>Capparis decidua</i>	NF
Mesquite	<i>Prosopis juliflora</i>	NF
Jhand	<i>Prosopis cineraria</i>	NF

(Least Concerned LC), (Not Found NF), (Data Deficient DD), (Near Threatened NT)

6.3.7 Fauna

6.3.7.1 Mammals

Mammals found in the Project Area are mainly jackal (*Canis aureus*), rabbit (*Lepus nigricollis*). Porcupine (*Hystrix indica*) and wild boar (*Sus scrofa*) are common in the plains. Domestic animals include cows, buffaloes, sheep's, goats, cats and camels. Another important domestic animal of the area is donkey, which is used for cart pulling.

Rodents : Squirrel (*Funambulus layardi*) and Mouse (*Mus musculus*) are the basic rodents found in the Project Area.

6.3.7.2 Reptiles

Reptiles include snakes such as black cobra (*N. naja*) and small sized lizards which are common in the area.

6.3.7.3 Amphibian

Toad (*Bufo bufo*) and Frog (*Rana tigrina*) are commonly found in the Project Area. The sighting of various species of fauna (mammals and avifauna) was carried out during field survey as well as information from locals was obtained.

TABLE – 6.8 : MAJOR FAUNAL SPECIES FOUND ALONG THE PROJECT ROUTE ALIGNMENT

ENGLISH / LOCAL NAMES	SCIENTIFIC NAME	IUCN STATUS
Jackal	<i>Canis aureus</i>	LC
Rabbit	<i>Lepus nigricollis</i>	LC
Porcupine	<i>Hystrix indica</i>	LC
Snake	<i>Elapidae bungaris</i>	LC
Lizard	<i>Cnemidophorus spp.</i>	LC
Toad	<i>Bufo bufo</i>	LC
Indian Mongoose	<i>Herpestes javanicus</i>	LC
Frog	<i>Rana tigrina</i>	LC
Indian Gerbil	<i>Tatera indica</i>	LC
Wild Boar	<i>Sus scrofa</i>	LC

6.3.8 Avifauna

Important resident bird species / avifauna found in Project Area are house sparrow, common crow, kite, dove, desert lark, cattle egret, etc.

TABLE – 6.9 : MAJOR AVIFAUNA FOUND ALONG THE PROJECT ROUTE ALIGNMENT

BIRDS		IUCN STATUS
ENGLISH / LOCAL NAMES	BIOLOGICAL NAME	
Sparrow	<i>Passer domesticus</i>	LC
Crow	<i>Corvus splendons</i>	LC
Dove	<i>Streptopelia decaocto</i>	LC
Hoopoe	<i>Upupa epops</i>	LC

BIRDS		IUCN STATUS
ENGLISH / LOCAL NAMES	BIOLOGICAL NAME	
Grey Partridge	<i>Francolinus pondicerianus</i>	LC
Quail	<i>Cortunix cortunix</i>	LC
Common Myna	<i>Acridotheres tristis</i>	LC
Kite	<i>Elanus caeruleus</i>	LC
Little Cormorant	<i>Phalacrocorax niger</i>	LC
Bulbul	<i>Pycnonotus cafer</i>	LC

6.3.9 Endangered Fauna

No Endangered Fauna was reported.

6.3.10 Game Reserves, National Parks and Wildlife Sanctuaries

The proposed Road will not pass through or cross any protected area, i.e., Game Reserves, National Parks, Wildlife Sanctuaries, etc.

6.3.11 Agriculture

The Project Area passes through various types of land uses including agriculture, grass land, etc. The major agricultural crops include Rice, Wheat, Cotton, Sugarcane, Pea nut, Fodder crop and Vegetables, Maize is also grown in addition to the crops mentioned above. No major cover of orchards reported in the Col.

6.3.12 Fisheries

Fishery activities were neither observed nor reported by the local inhabitants of the Project Area during field survey. As such, fishery discipline is conspicuous by its absence in the area; therefore, the Project will not pose any threat/impact to the Fishery Sector.

6.4 SOCIO-ECONOMIC ASPECT

The socioeconomic aspect has been studied with respect to human and economic development and quality of life values of the population in the Project Area. The human and economic development mainly focuses on population and communities, industrial development, infrastructure availability, institutions, transportation network, prevailing land use, power sources and agricultural pattern. Quality of life includes socio-cultural values, public health situation, recreational resources & development and archaeological / historical and cultural sites etc. Baseline information was gathered from literature, study reports, district census reports of Bahawalnagar and Bahawalpur Districts, 1998 and through field surveys comprising interviews and meetings by the Consultants' IEE team (Male and Female Sociologists and Environmentalists), using survey tool attached as

Annex – VI. During the field survey interviews and meetings with the different categories of respondents were held and observations were also recorded after giving due consideration during survey.

6.4.1 Objectives of the Study

The specific objectives of socioeconomic baseline survey were to :

- ❖ Collect socio-economic data or information pertaining to respondents and environment prior to the project execution;
- ❖ Analyze the collected data and interpret the analyzed data and present a meaningful discussion of the variables pertaining to the respondents and environment in question;
- ❖ Incorporate the baseline results in environmental reports; and
- ❖ Define magnitude of acceptability level, identifying perceived impacts and suggested measures to mitigate those impacts.

6.4.2 Study Area

The proposed project area falls in the administrative jurisdiction of the Bahawalnagar mainly 65 Km. and 10 Km. Bahawalpur District. the socio-economic survey focused on the project area and relevant information related to the districts.

6.5 ADMINISTRATIVE SETUP AND BRIEF DESCRIPTION OF DISTRICTS

6.5.1 Bahawalnagar District

The boundaries of Bahawalnagar in the East and South touches the Indian territory while Bahawalpur District lies on its West and River Sutlej flows on its Northern side. District Bahawalnagar spreads over an area of 8878 square kilometers and comprises of the following Tehsils :

- ❖ Bahawalnagar
- ❖ Minchanabad
- ❖ Chishtian
- ❖ Haroonabad
- ❖ Fort Abbas

6.6 HUMAN AND ECONOMIC DEVELOPMENT

6.6.1 Population Size and Growth

District Bahawalnagar : The population of Bahawalnagar District was 2,061,447 persons in 1998 as compared to 1,373,747 persons in 1981 with an average annual growth rate of 2.41 % percent. The sex ratio (males per 100 females) of the district was 107.4 in 1998. The average household size of the district was 6.7 in 1998.

According to Census of 2017, the population of Bahawalnagar District is 2,981,919 with an average annual growth rate of 1.96 percent from 1998 to 2017. The male population of Bahawalnagar District is more than the female population. Out of the total population, 50.8 percent are males and 49.2 percent are females and the sex ratio of the district is 103. According to census report 2017, the average household size for the district is 6.3 persons. Figure – 6.7 shows the graphical view of population by gender.

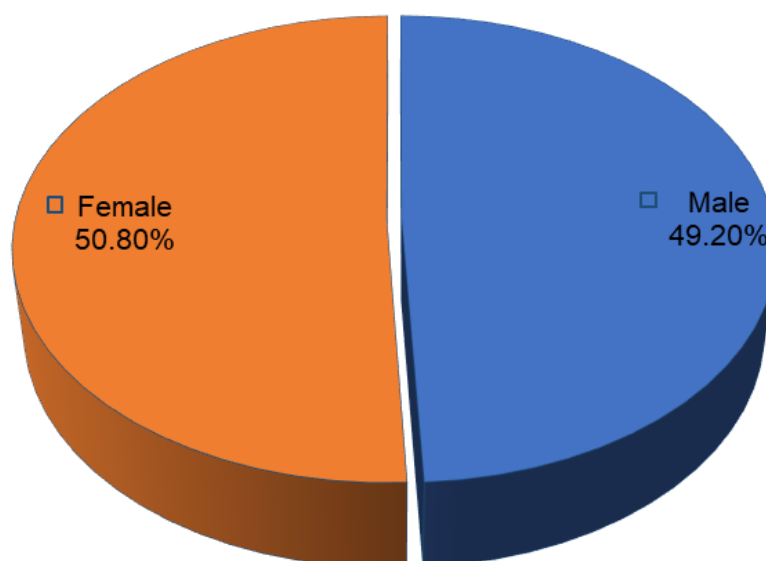


FIGURE – 6.7 : POPULATION BY GENDER

Rural and Urban Distribution : The rural population of the district was 1,668,646 persons and urban population was 392,801 Persons in 1998 constituting 80.95 and 19.05 percent respectively of the total population.

According to Census of 2017, the major portion of the district falls in the rural area having population of 2,360,823 constituting 79.2 percent of the total population, while the urban population of the district is 621,096 constituting 20.8 percent of the total population with number of households of 379,449 and 101,827 respectively. The rural and urban distribution of the population is shown in Figure – 6.8.

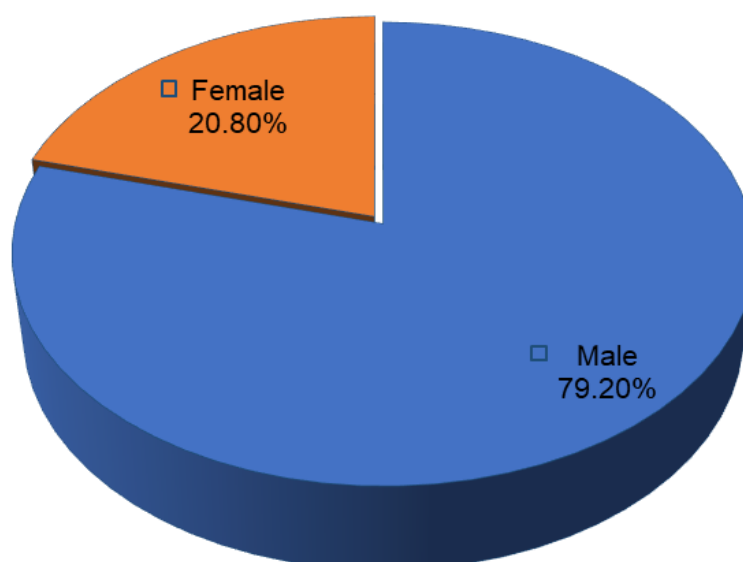


FIGURE – 6.8 : RURAL AND URBAN DISTRIBUTION OF THE POPULATION

6.6.2 Literacy Rate

According to the census 1998 literacy ratio in the Bahawalnagar district is 35.1 percent and in Bahawalpur District 35.0 percent. Table – 6.10 shows literacy ratio by sex in urban and rural areas of the districts.

TABLE – 6.10 : LITERACY RATIO BY SEX IN URBAN AND RURAL AREAS, 1998

SR. NO.	AREA	BOTH SEXES	MALE	FEMALE
1.	All Areas	35.1	45.5	23.8
2.	Rural	30.8	41.8	19.0
3.	Urban	51.9	61.2	43.9

Source : DCRs 1998

6.6.3 Religion

According to the 1998 Census the Bahawalnagar district is predominantly Muslims, i.e., 99.1 percent. The next higher percentage is of Christians with 0.6 points, followed by Ahmadi 0.2 percent. While other minorities like Hindu (Jati). Scheduled Castes etc, are very small in number. In Bahawalpur District Muslims, i.e., 98.1 per cent. The next higher percentage is of Hindu with 0.9 points, followed by Christians 0.6 percent. While other minorities like Ahmadi, Scheduled Castes etc. are very small in number.

6.6.4 Ethnic Structure

The main races and tribes of Bahawalnagar District were Syed Qureshi, Rajputs, Bhatti, Punwar, Chuhan, Kharal, Lunan, Wattoo, China, Balouch, Jat, Gujjar and Arain. While the main races and tribes of Bahawalpur district were Syed (Gilani, Bukhari, Gardezi, Hamdani and Mashhadi Syeds), Qureshi (Abbassi, Siddiqui, Doudpota), Balouch (Gopang, Chandio, Khosa, Rind), Pathans (Sadozai, Khakwani, Baber Malazai, Popalzai), Rajput, Jat, Gujjar and Arain.

6.6.5 Economically Active Population

The economically active population is defined here as the persons working most of the time during the year preceding the census date, i.e., 5th March 1998, looking for work, laid off and un-paid family helpers assisting their family. The economically active population as enumerated in the last census was 24.4 percent in Bahawalnagar district, while this ratio in Bahawalpur district was 26.4 percent. Further details can be seen in Table – 6.11.

**TABLE – 6.11 : PERCENTAGE OF POPULATION BY ECONOMIC CATEGORIES,
SEX & RURAL / URBAN AREAS, 1998**

ECONOMIC CATEGORY	ALL AREAS			RURAL		URBAN			
	Both Sexes	Male	Female	Both	Male	Female	Both	Male	Female
Economically Active	24.4	46.0	1.3	24.5	46.2	1.2	24.0	44.8	1.8
Not Economically Active	75.6	54.0	98.7	75.5	53.8	98.8	76.0	55.2	98.2
Children under 10	30.0	29.8	30.2	30.3	30.0	30.4	29.1	28.9	29.4
Students	6.3	11.0	1.2	5.9	10.2	1.3	8.0	14.8	0.7
Domestic Worker	33.9	3.2	66.8	33.6	3.1	66.5	34.8	3.7	67.9
Others	5.4	10.0	0.5	5.7	10.5	0.6	4.1	7.8	0.2
Unemployment Rate	21.0	21.4	8.6	21.2	21.5	9.5	20.4	20.9	5.9

Source : DCRs 1998

6.6.6 Industry and Trade

At present, the major industrial units operating in district Bahawalnagar and Bahawalpur Districts are sugar mills and textile spinning mills, mills, flour mills and rice mills. Soap making and cotton ginning are important enterprises; cotton, silk, embroidery, carpets, and extraordinarily delicate pottery are produced. Factories producing cottonseed oil and cottonseed cake. Bahawalnagar, Bahawalpur, Hasilpur and Chishtian are main cities for the commercial activities in the area.

6.6.7 Educational Institutes

The following main educational institutes are running Bahawalnagar District :

- ❖ The Islamia University of Bahawalpur (Sub Campus of Bahawalnagar);
- ❖ Divisional Public School Bahawalnagar, Bahawalnagar;
- ❖ Danish School Bahawalnagar;
- ❖ Govt. Postgraduate College Bahawalnagar;
- ❖ TEVTA;
- ❖ Punjab College Bahawalnagar Campus;
- ❖ Other Commerce and Post Graduate Colleges for Men & Women; and
- ❖ Various Government and Private Schools

6.6.8 Agriculture

Major crops and fruits of the districts are cotton, wheat, sugarcane, rice, rape / mustard seeds, dates, mangoes and citrus.

6.6.9 Livestock

Livestock in both districts represents a notable proportion of total animal population of Punjab province where livestock farming is also practiced under very difficult environment Cholistan area is very famous for livestock rearing.

6.6.10 Irrigation

Hakra Irrigation System is located in Bahawalnagar District in the southeastern part of Punjab province, while the area of Bahawalpur district is irrigated through the irrigation system off-takes form the left bank of Islam Barrage (Bahawal & Smaller Qaim Canal) and Sidhnai – Mailsi Link Canal.

6.6.11 Transportation

Buses run daily between Bahawalnagar – Bahawalpur and other major cities of Pakistan. Pakistan's longest national highway, N-5, also passes through town, connecting Bahawalpur to Karachi and Lahore. Two districts are connected with the railway line and Karachi – Peshawar Railway line which passes through Smaa satta.

6.6.12 Religious, Archaeological or Historic Places

The religious, archaeological or historic treasures that are of significance in the Project area are :

- ❖ Darbar Muhammad Shah Rangeela (Hasilpur)
- ❖ Tomb of Hazrat Baba Taj ud Din Sarwar Shaeed, (Chishtian)
- ❖ Mosque, Government High School (Chishtian)
- ❖ Tomb of Hazrat Khawaja Noor Muhammad Muharvi (Chishtian)

6.7 SOCIOECONOMIC BASELINE SURVEY AND IMPACT ASSESSMENT

The information regarding socioeconomic baseline survey is based on the primary data collected from the Project Area through field visit that was carried out from January 01 – 05, 2021. Baseline survey was carried out for :

- ❖ Informing the stakeholders about the proposed Project;
- ❖ Providing an opportunity to those involved with the planning of Project to ensure that the benefits of the proposal are maximized and that no major impacts have been overlooked;
- ❖ Providing an opportunity for the public to influence the Project design in a positive manner;

- ❖ Increasing public confidence in front of proponent, reviewers and decision makers;
- ❖ Providing better transparency and accountability in decision making;
- ❖ Reducing conflict through the early identification of contentious issues, and working through these to find acceptable solutions; and
- ❖ Creating a sense of ownership of the proposal in the minds of the stakeholders.

The information regarding socio-economic conditions is collected from primary and secondary sources. Methodology adopted for survey was based on collection of comprehensive information by utilization of all available resources with time effectiveness. Following methodology was opted for socio-economic survey impact assessment and development of baseline socio-economic conditions.

All available document related to socio-economic condition of the project area were studies, i.e., (District Population Census Reports for the concerned districts, documents related to designs, maps and Asian Development Bank Guidelines for socio-economic survey.

Meetings were held with the officials of relevant departments; feedback of all these meetings is also kept in view in study of socio-economic environment. Maximum information was utilized to complete the report.

After familiarization of the area and requirement for the study a comprehensive survey was carried out and primary data was collected through following data collection tools :

- ❖ Socio-Economic Survey
- ❖ Women Survey
- ❖ Public Consultations
- ❖ Gender Consultations

Moreover, expensive public consultations were conducted at different locations along the proposed route of the road and gender consultation were also done by female staff to get their apprehensions about the project and their suggestions were recorded to improve the design of the project. A sample of 110 respondents including (males and females) was taken from the different locations depending on the proportion of route of the proposed road passing in the areas on the basis of random sampling technique, which included local residents, farmers, shop keepers, pedestrians, drivers, government & private employees, laborers, transporters etc. The purpose of this survey was to assess socio-economic condition of the area and get responses about the perceived impacts and preferences towards the project implementation.

6.8 ENVIRONMENTAL MONITORING DATA

6.8.1 Air Quality

Motor vehicle emissions are composed of the by-products that come out of the exhaust systems or other emissions such as gasoline evaporation. These emissions contribute to

air pollution and are a major ingredient in the creation of smog in some large cities. A study by MIT indicates that 53,000 early deaths occur per year in the United States alone because of vehicle emissions.

The main source of air pollution in the Project area is from traffic congestion that occurs off and on in the Project Area. Traffic load has increased manifold due to the rapid growth of the City. Ambient air is being polluted due to the emission of fuel gases like Carbon Monoxide (CO), Nitrogen Oxide (NOx) and Sulphur Oxide (SOx) due to the vehicle exhaust. Untreated fuel from rickshaws also contains trace amount of Lead (Pb) in it.

Level of Emission is increasing over the period, implies with without project, the vehicles' speed is reducing and these are producing more emissions; and Cars and Pick-ups are more producers of carbon monoxide whereas Rickshaws and Motorcycles produce more hydrocarbons and heavier traffic produces more nitrogen oxides.

6.8.2 Noise

The project area falls under an urban environment and presently, the noise level is within the permissible limits of 85 db.

6.8.3 Water Quality

Water quality refers to the chemical, physical, biological, and radiological characteristics of water. It is a measure of the condition of water relative to the requirements of one or more biotic species and or to any human need or purpose. It is commonly compared with a set of standards against which compliance can be assessed. The water resource in the study area includes groundwater. The secondary data and the information collected during the field survey, the groundwater table depth varied from site to site. The groundwater is extracted by means of wells, hand pumps, and electric motors.

7.0 CONSULTATION, PARTICIPATION AND DISCLOSURE

7.1 OBJECTIVES OF CONSULTATION

Public consultation plays a vital role in studying the effects of any development project on stakeholders and in its successful implementation and execution. It affords an opportunity to exchange knowledge with those who as members of the society are concerned with the Project, immediately or remotely. Referring particularly to a project related to environmental assessment, involvement of public is all the more essential, as it leads to better and more acceptable decision-making. The overall objective of the consultation with the stakeholders is to help verify the environmental and social issues, besides technical ones, that have been presumed to arise and to identify those which are not known or are unique to the Project. In fact, discourse with many who have thoroughly observed the site conditions in the pre-developmental phase, goes a long way in updating the knowledge and understanding.

7.2 CONSULTATIVE ASPECTS

The proposed Project involves stakeholders from various segments of the society, who have direct or indirect interest in the developmental activity. The consultant team has endeavored to hold consultative sessions with a number of prominent stakeholders to evince their views on the proposed Project, inter-alia, their opinions, suggestions, understanding on various issues and concerns.

The consultations aimed specifically at :

- ❖ Exchange of information related to the Project and its possible utilization in the Project planning and execution.
- ❖ Dissemination of information through discussions, education and liaison.
- ❖ Collaboratively solving the problems.
- ❖ Eliciting the comments and feedback on the proposed Project.
- ❖ Documentation of information narrated by the stakeholders.
- ❖ Documentation of mitigation measures proposed by the stakeholders.
- ❖ Incorporation of public concerns and their addressal in the EIA.

7.3 STAKEHOLDER'S CONSULTATIONS

There are two types of stakeholders, i.e., primary and secondary stakeholders. The primary stakeholders are the initial stakeholders, such as affected persons, general public including women resided in villages in the vicinity of the sub-project area. Accordingly, the consultations were made with all primary stakeholders for sharing the information regarding the sub-project components, i.e., construction of new grid station, spotting of towers and installation of transmission line and community feedback regarding the project. However, the consultative meetings were also held with the secondary stakeholders including the officials/ staff involved in planning& design, and management.

7.4 PUBLIC SURVEY RESULTS

The findings of the social survey are described below :

- ❖ Most of the people of the project area were found to be aware of the need of the project considering the situation of traffic congestion
- ❖ Majority of the respondents contacted favoured the construction of the Road but at the same time demanded the fair and transparent compensation of their lost properties;
- ❖ The average working hours of the shop keepers were reported from 8 to 10 hours daily;
- ❖ Majority of the respondents contacted were between the age groups of 25 to 45 years, to be mature enough to give some response about the project implementation;
- ❖ Most of the respondents interviewed were associated with the profession of agriculture, shop and transportation sector keeping running their business in Project area during the day hours;
- ❖ The average household size was reported between 7 to 10 persons per household depending upon the number of family members living together;
- ❖ The main protective measures suggested by the respondents include the timely completion of the project, regular sprinkling of water at the construction site to control the dust emissions and proper compensation of the lost assets.

8.0 ALTERNATIVES ANALYSIS

Following alternative are considered for the said project in terms of Environmental Assessment, as such.

A. Road Alternatives

- ❖ No Project Option / Worst Scenario Option
- ❖ Alignment Options a New Route

B. Logistic Sites

- ❖ Siting of Contractor's Facilities, e.g., Labour Camp Site, and Machinery Yard on State Land.
- ❖ Siting the Contractor's Facilities on Private Lands.
- ❖ Siting Contractor's Facilities at Most Appropriate Site is in Public Land or Private Land.

C. Labour Options

- ❖ All labour local
- ❖ All labour from outside.
- ❖ An admixture of local and outside labour as per skill required.

Discussions on the analysis of all above alternatives are as follows :

8.1 ROAD ALTERNATIVES

8.1.1 No Project Option / Worst Scenario Option

Analysis

Strengths and Opportunities

If the project is not taken up at all then all the funds, efforts and inconvenience will be saved and these will become available for diversion to other projects. No land will be required and no disturbance will be caused to people through resettlement or land acquisition process. No disturbance will be caused to any physical, biological and social part of the environment. The people benefiting out of a status quo will continue benefiting.

Weaknesses and Threats

Not taking up the project would mean withholding the development of the entire area along the extended area of the project in whole of Bahawalnagar District. This would also mean restricting the trade opportunities between areas connected by road. Existing road, due to neglect does not meet the international standards and by keeping it as such

means declining to open the door of opportunity for better social uplift through education and poverty alleviation. Further the recurring cost of the construction of the road will be increased along with enhanced operational cost. The project would provide greater job prospects to people during construction as well as the operational phase. Not taking up the project would mean depriving the local people from a blessing of whole lot of new opportunities.

Conclusion

The “No project option” reveals the withholding of development activities in entire area, trade limitations and degradation of economic activities, therefore not recommended.

8.1.2 Alignment Options is Surveyed on Another Site

Analysis

Strengths and Opportunities

In addition to the proposed road other alignments options also considered. The capacity to handle inter–district traffic will vary manifolds. The proposed alignment will also give an opportunity to modify and improve design of road as well as the drainage.

Weaknesses and Threats

A very expensive new exercise will be undertaken without a real necessity. The expected volume of current inter–districts as well as the interprovincial traffic is not adequate to provide justification for an altogether new four lane road somewhere else. By opening up a new area new physical, biological, environmental and social problems will arise which may not keep the new effort positively productive at this point in time. The other alignment options may take the new double lane road close to or pass through any of the sensitive areas causing problems.

Access to new areas and settlements will not be developed and there will be no improvement in the existing road routes or in their limitations regarding distance and velocity. Furthermore, the depressed condition of the existing section will continue to exist.

Conclusion

There will be no heavy resettlement and land acquisition. New development will cause serious impacts on existing environment of the study area. Thus, considering the financial and environmental loss the “alternate route option” is not recommended.

8.1.3 Alternatives Comparisons

Table below summarizes environmental and social aspects. Based on above discussion the proposed project seems better under present scenario.

TABLE – 8.1 : SUMMARY OF KEY ENVIRONMENTAL, SOCIAL AND ECONOMIC IMPACT

ALTERNATIVES	ENVIRONMENTAL IMPACTS	SOCIAL IMPACTS	ECONOMIC IMPACTS
No Project Option	Increase in air (including dust) & noise pollution because of traffic congestion on the road Higher emission of CO, NO_x, SO_x, PM₁₀ / PM_{2.5} and oxidants Limited changes in existing ecology and biodiversity	Lack of efficient transport system and road condition Traffic congestion and Hazards Health Impacts due to air and noise pollution caused by increase in traffic on existing road Lack of additional employment opportunities	The road is designed to handle increased traffic load which will cause traffic congestions and deteriorate road conditions which would impact trade between the different districts
Alternate route option	Significant impacts on local ecology, hydrology, Agriculture biodiversity, and environment Increase in Noise and air pollution during construction phase	Significant resettlement and acquisition issues Labor influx issues	High resettlement costs Alternate route will be available for new developments
Project as proposed	Minimum landscape transformation Minor impacts on local ecology, flora, fauna, and hydrology Increase in Noise and air pollution during construction phase	Almost negligible land acquisition Reduction in road accidents and improves road safety Shifting of utilities lines, especially the electric transmission lines Labor influx issues	Travel time reduced significantly High initial investment costs Provides development Better jobs and employment opportunities

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

8.2 LOGISTIC SITES

8.2.1 Sitting of Contractor's Facilities on State Land

Advantages

The contractor will get land free of cost for the camping site and the equipment and material yard. This cost will not be reflected in BOQ and this will reduce the overall cost of the contract and thus the project. There will be very little possibility of local disturbance or manipulation from local communities and the contractor will have a free hand to manage his labour and works.

The contractor will not be encouraged to hire private agricultural land and therefore productive agricultural land will be saved. The activities and logistics of the contractor will be under full control of the project management and any adverse environmental or social spill over to outside territories will be eliminated.

Disadvantages

Best suitable sites of required size and descriptions may not be available within ROW. By refusing to contractor the option to go to adjacent private land, the management may be compromising with best site selection and other logistics and therefore overall efficiency of the execution of the contract. By way of leasing their land to contractor, communities may feel their participation in implementation of the project. For creating enough space for contractor at places, situation may arise where resettlement cases with heavy payment may arise.

Conclusion

In presence of adequate and encumbrance Free State land, the contractor may be given the option of using it for his labour camp, machinery yard and work bases. This is an acceptable option and is recommended.

8.2.2 Sitting of Contractor's Facilities on Private Lands

Advantages

The contractor will enjoy the freedom of choosing the best sites for his camps, machinery yards and work bases. By way of payment of base money to the land owner, his participation and ownership of the project will be achieved. No additional government land will have to be set aside for camping. No obligations will fall upon sponsor. No environmental challenge will come up at any stage.

Disadvantages

The contractor will be free to hire comparatively flat agricultural lands and will put productive land to non-productive use. The contractor will include the cost of leasing land in his BOQ included in the bid. This will increase the cost of the bids and thus project expenditure. Outside the direct control of the proponents, the contractor may indulge in unplanned environmental social or physical activities which may not be acceptable within the meanings of the project EIA.

Conclusion

In presence of adequate state land along the proposed highway taking the project to private land is not advisable. The weakness and threats of this proposal outweigh strengths and opportunities. The proposal of sitting contractor's facilities on private lands is therefore not supported. If the contractor chooses to establish his facilities and labour camp on hired private land, then NHA will bear no responsibility for his costs and commitments.

8.2.3 Sitting the Contractor's Facilities at Appropriate Site, be it Public Land or Private Land

Strengths and Opportunities

The option will create an operationally adjustable opportunity wherein the best site will be chosen by the contractor. Of course, all sites will be approved by the Resident Engineer.

The contractor will not be bound to remain restricted to the sites proposed by the NHA Resident Engineer and can plan his operations according his operational convenience and availability of facilities and services. Where enough state land is not available, and private land is available adjacently, the contractor can make necessary adjustments without changing the site.

Weaknesses and Threats

To the extent that the contractor moves out of state lands, establishment of camps, yards and facilities close to villages can cause social problems. Adverse effects may be caused on freedom of women to work in fields. Possibilities of spread of AIDS and other infectious diseases will get greater chances of spread.

Conclusion

As a second best option (after settling the contractor on state land) this is the 2nd best option. But for Contractor's activities on private lands NHA holds no responsibility for contractor's cost and commitments.

8.3 LABOUR

8.3.1 All Labour Local

Advantages

All labour will be local and their employment will fulfil a major social requirement of the contract. Local economy will benefit and poverty alleviation will take place. The project will become socially acceptable. A big advantage of local labour will be that most of them will come from and go to their homes daily and there will be very little pressure on labour camps.

Weaknesses and Threats

Three types of labour will be required; unskilled, semiskilled and skilled. All types of

labour cannot be available locally. So binding contractor to employ all labour locally can put limitation on contractor.

Conclusion

It is not possible to rely entirely on local labour for all trades. So, this option is not acceptable. However, all unskilled labour openings must be given to locals.

8.3.2 All Labour from Outside

Advantages

Labour from outside will be preselected and ergonomically sound. More efficient more dependable and well trained man power will be available. The labour will not be able to exert undue pressure on the contractor or the project. The outside labour will set model for untrained labour which may improve. Spending by outside labour will bring additional benefit, to local economy.

Disadvantages

Bringing outside labour will take away economic benefits of employment from the local communities and they will not develop a sense of ownership for the project. The project objective of poverty alleviation, social uplift and capacity building will be defeated. A social problem will be created.

Conclusion

In case the labour is brought from outside, the social losses will be much higher than the economic gains. However, the ergonomic limitations may necessitate bringing in a small percentage of outside manpower especially at skilled level. But as far as possible the local human resource will have to be preferred.

8.3.3 An Admixture of Local and Outside Labour as per Skill Required

Advantages

Unskilled labour can be locally 100%. Semiskilled can be local as per their skill wise availability, may be upto 50% of the total. Most of the senior technicians and skilled workers will have to be brought from outside the district. This flexibility will be possible only under the option of admixture of labour.

Disadvantages

Because of the presence of the outsiders there are likely to be social losses. Income of local communities will reduce.

Conclusion

From project implementation point of view, this option presents the best combination of local and outside labour. This option also presents an opportunity of transfer of skills from outside technicians to local workers.

9.0 IMPACT ASSESSMENT

9.1 POTENTIAL IMPACTS

Summary of Significant Impacts are listed in Table Table – 9.1 :

TABLE – 9.1 : SUMMARY OF SIGNIFICANT ENVIRONMENTAL IMPACTS

PROJECT ACTIVITIES	IMPACT
Land and landscape transformation	❖ Impact of taking material from the borrow sites ❖ Destabilization green belt / medians ❖ Clearing of vegetation and cutting of trees at proposed interchanges and flyovers
Canal crossing works	❖ Canal crossing works will affect the agricultural activities ❖ Other social issues related to reconstruction
Releases of air pollutants and dust during the construction	❖ Activities for widening and improvement of road generating dust, including fine particulates, causing nuisance and health effects for nearby communities and commercial areas. ❖ Gaseous emissions from vehicles and construction machinery causing health effects for nearby communities. ❖ Gaseous emissions from vehicles during operational phase may cause health effects for nearby communities.
Noise and vibrations	❖ Noise associated with construction may disturb local communities. ❖ Project equipment and vehicles used in project resulting in unacceptable increases in noise and vibration levels causing nuisance to local communities. ❖ Vehicles movements during operational phase resulting in unacceptable increases in noise and vibration levels in local communities.
Ecology and biodiversity disturbance	❖ Activities for construction and improvement of road resulting in ecological disturbance. ❖ Vehicle traffic resulting in animal disturbance both during construction and operational phases.
Contaminations of soil and water resources	❖ Soil contamination from diesel and other spills from construction machinery will be an issue. ❖ Release of contaminated water during construction of structures across / along water bodies such as bridges, culverts, drains, pitching, etc.

PROJECT ACTIVITIES	IMPACT
Disturbances to the community	❖ Activities for construction and improvement of proposed road sections disturbing land used by local communities. ❖ Activities for construction and improvement of road disrupting community transport routes. ❖ Labor and gender related issues

9.2 POTENTIAL IMPACT IDENTIFIED BY STAKEHOLDERS

Issues raised by stakeholders regarding the environmental implications of proposed project during construction and operations are listed below :

- ❖ Existing traffic on the road shall be affected during the construction.
- ❖ Noise and air pollution associated with trucking causing disturbance to residents along the road.
- ❖ Livestock safety during construction and use of roads.
- ❖ During the reconstruction of irrigational canals and culverts the agricultural activities will be disturbed.
- ❖ Project related traffic causing congestion
- ❖ Road safety measures required, such as speed breakers and restrictions, so speed limits are observed, to avoid road accidents
- ❖ Public safety for people crossing the road, particularly the elderly, women and children
- ❖ Heavy traffic destroying road
- ❖ Sanitation awareness in camping facilities
- ❖ Privacy related matters and cultural sensitivities
- ❖ Road drainage issues

9.3 IMPACTS AND MITIGATION MEASURES

9.3.1 Blockage of Irrigation Systems and Natural Drainage

The routes may also cross many irrigational channels and drainage. These channels and drains may be blocked during construction phase.

Mitigation Measures

To minimize the impact of the project on the geophysical environment, a number of measures have been included in the design that will need to be taken into account when constructing the project facilities. A second class of measures is related to the day-to-day management of the project during construction. Following specific measures are required to minimize potential impacts :

- (a) Unnecessary widening beyond the proposed design of the road shall be avoided
- (b) The alignment of the widening will be selected to minimize the clearing of vegetation; and minimized trees cutting.

- (c) The natural drainage pattern will not be disturbed, and culverts will be constructed where required.
- (d) Surplus soil and cleared vegetation will be disposed of to avoid disturbing the natural drainage.
- (e) The movement of construction equipment and vehicles will be restricted to work areas.
- (f) The one clear passage for transport will continue to be maintained during the project, and measures such as spraying water implemented to reduce dust emission and erosion.
- (g) Safe driving practices must be encouraged to minimize soil erosion. A speed limit of 40 Km. / hr. will be observed and monitored in the project area, and off-road driving strictly prohibited.
- (h) Environmental monitoring will involve checks for any signs of soil erosion so that remedial actions, such as applying water and compaction, can be implemented.
- (i) The state of the work corridor will be monitored during project to prevent any spill over outside the corridor.
- (j) During the construction period safety signs must be displayed.

9.3.2 Location of Labor Camp, Material Depots, Equipment Yards and Approach Roads

Location of camps near sensitive receptors like water resources and use of private lands without prior consent of landowners for dumping and storage of construction material and equipment can result in adverse environmental impacts and create server social issues.

Location of labor camp, material depot, equipment yard and approach roads will not cause any serious problem if selected in consultation with local communities and landowners and impacts can easily be mitigated.

Mitigations

The contractor will, in consultation with PD, select the location of all these facilities after a rapid assessment through the Screening checklist

The camp / other site facilities will be established on a flat land without much natural vegetation, at reasonable distance from the communities and surface water bodies.

Satellite imagery can also be used to select the suitable sites, to record the pre-construction conditions, and to monitor the condition of these sites during and after the construction phase.

9.3.3 Oil and Hazardous Materials Spillage and Leakages

Any leakage or spillage of diesel, oil or any other chemical will contaminate the soil which may in turn impact the water sources, nearby community and / or productive land.

Evaluation of Impact

The contamination of soil and water resources may affect the communities and biodiversity of the area. Categories of spillages and requirements are discussed as under;

Minor Spill / Leakage : Soil contaminated by minor spills / leakages (defined as leaks from vehicles, machinery, equipment or storage containers such that the area and depth of soil contaminated is less than 10 sq. ft. and 3 inches respectively) is to be scraped and burnt in a burn pit, away from population.

Moderate Spills are defined as spills of volume less than or equal to 200 liters is to be contained and controlled using shovels, sands and native soil. These equipment and materials are to be made available at campsites during the operation. The contaminated soil is to be excavated and stored in a burn area lined with an impermeable base. Depending on the volume, the contaminated soil is either disposed-off by burning in the burn pit or by specialized treatment such as bioremediation.

Major Spills (defined as spills of volume much greater than 200 liters) requires initiation of Emergency Response Procedures and Oil Spill Contingency Plan. These spills are to be handled and controlled according to the plan and require special treatment such as bioremediation.

Mitigation

Following measures shall be implemented to avoid such events :

- (i) Contractor will apply strict rules on his workers and labor to ensure that no spill or leakages are caused. All fuels, oils and bitumen will be stored appropriately, with concrete padding and bunding for containment in case of leakage.
- (ii) If the spills or leakages do take place, it must be followed by the treatment prescribed below as per the degree of spill or leakages.
- (iii) The contractor will employ the general criteria for oil and leakage at construction sites, as per standards set forth by "Guidelines for Oil Spill Waste Minimization and Management" issued by International Petroleum Industry Environmental Conservation Associate which are as follows : (Source : IPIECA Report Series, Volume-12, "Guidelines for Oil Spill Waste Minimization and Management")

9.3.4 Earthen Embankments or Concrete Work, Edge Scouring

Evaluation of Impact

Poor design and inappropriate construction procedures can potentially damage the embankments, concrete works or road edges. The impact is moderately significant but can easily be mitigated.

Mitigation

- (i) Edge scouring of earthen embankments or concrete work must first be dealt at design stage. Wherever such a situation is anticipated, aprons should be provided to secure edges and specifications must be kept of high standards.
- (ii) During the construction phase this aspect should be addressed through appropriate construction methodology and employing appropriate techniques such as protection walls and rip rap.
- (iii) Contractor will repair all damages to the earthen embankments, concrete works, or pavement edges caused by the construction works.
- (iv) During the operation phase appropriate measures need to be incorporated in the Operational Manual.

9.3.5 Impact of Borrowing Material from Earth Borrow Sites and Stone Quarrying

Evaluation of Impact

As per Construction Material Requirements, a large quantity of earth will be removed from borrow pits located within the state land on either side of the road. This can potentially cause slope instability, loss of soil/land productivity, uneven terrain, and altered drainage.

Mitigation

- (i) The topsoil up to 30 cm shall be removed and stored prior to excavation of fill material. After completion of borrowing the area would be levelled and the top soil would be restored to ensure no loss in productivity of land.
- (ii) Borrow sites would not be deeper than 3 ft. at any location to avoid alteration in drainage pattern and reduce the risk of soil erosion.
- (iii) The borrow areas will be selected after obtaining approval from the Resident Engineer.
- (iv) The contractor will ensure that the borrowing does not cause slope instability, loss of soil / land productivity, uneven terrain, and altered drainage.
- (v) Wherever possible / necessary, these places will be levelled and planted with trees using appropriate planting technology / methodology.

9.3.6 Water Resources

Water resources are available in the project area. The campsites will also be depending on these local water resources to meet personal use and construction requirements. Local water may be affected up to some extent due to implementation of project both in quantity as well as quality.

Mitigation Measures

The following measures are proposed :

- (i) Availability of water for campsite facilities and construction purposes will be ensured by the Contractor prior to start of construction activities. The Contractor will explore the alternative water resource including nearby streams and small tributaries so that the existing community water resources are not impacted. No existing water source under the use of community will be exploited by the Contractor for campsite facilities as well as construction purposes. In case of emergencies, the Contract may use water from local sources with prior approval from the local community and government.
- (ii) Water will be extracted only from a major source or main stream.
- (iii) The Contractor may use groundwater through wells for labour camps. In such circumstances, the extraction will be monitored to ensure that it does not lead to depletion of groundwater aquifer.
- (iv) The contractor will prepare guidelines for the workers for minimizing the wastage of water during construction activities and at campsites.

9.3.7 Disruption to Natural Drainage

As Pakistan is ranked quite high on the list of most vulnerable countries and keeping in view the shifting pattern of the monsoon rains, heavy rains are expected to continue in the future as well.

Mitigation Measures

- (i) Some of the important mitigation measures are listed below :
- (ii) Flood flow patterns as well as natural drainage to be taken into account in road planning and design;
- (iii) Permanent changes to hydraulics and hydrology should be avoided. Impoundment, damming, culver ting, realignment or other changes to hydrology of watercourses and aquifers must be considered;
- (iv) Surface water body crossing structure (bridge or Culvert) should be adequate to allow easy follow of discharge produced by the upstream watershed.

9.3.8 Contamination of Soil and Water

Effluents released as a result of the project activities, if not contained properly, may contaminate the soil and water bodies. If allowed to leach into the ground, the contaminants may also pollute groundwater. Potential sources of pollution in such cases include :

- (i) Domestic Waste (Sanitary and Kitchen Discharge)
- (ii) Oil and Grease
- (iii) Chemicals and
- (iv) Hazardous Materials

Evaluation of Impact

There is a causal link between effluent discharge and health, the impact of which is analyzed based on :

- (i) The nature of pollutants (oil and grease, chemicals, organic substances, etc.)
- (ii) Discharge rate and duration
- (iii) Discharge conditions
- (iv) Characteristics of surface drainage and receiving water body, e.g., water quality, flow rate, etc.
- (v) Location of receptors (communities) with respect to the discharge point
- (vi) Communities' exposure to pollutants (concentration of pollutants in water)
- (vii) Current and potential uses of water in the community
- (viii) Health risks due to pollutants.

Mitigation Measures

Mitigation measures to reduce the impact of waste effluents produced during project activities are listed below :

- (i) The camps will be located as to avoid proximity drinking water sources, maintaining a minimum distance of 500 m from such natural resources.
- (ii) No contaminated effluents will be released into the environment without having been treated.
- (iii) Sewage and other waste effluents will be handled to avoid contaminating surface and groundwater.
- (iv) Water from washing areas and kitchen will be released into sumps.
- (v) An appropriately designed septic tank will be used to treat sewage, and outlets will release treated effluents into sumps. The integrity of the entire system will be maintained and monitored.
- (vi) Septic tanks and sumps will be built at a safe distance from any water hole, stream or dry streambed, to prevent the entry of surface water, and the bottom of the sump will be kept above groundwater level.
- (vii) Sumps will be in a position such that they are :
 - (a) Fixed in absorbent soil
 - (b) Down-slope and away from the camp (and downwind, if practical)
 - (c) Downstream from the camp water source and above the high-water mark of any nearby water body (if any).
- (viii) When abandoning sumps, an extra cap of soil will be placed over them to allow compaction.
- (ix) Solid waste (including food waste) will be segregated and disposed of as follows :
- (x) Materials suitable for recycling will be stored separately and sold to approved recycling contractors
- (xi) Combustible waste, Non-combustible, non-recyclable rubbish will be sent to a landfill
- (xii) Solid residue from the septic tanks will be transported to municipal sewage treatment drains.
- (xiii) Vehicle and equipment maintenance, including washing, will be allowed only in designated areas underlain with concrete slabs and a system to catch runoff.

- (xiv) Fuels, oils, and other hazardous substances will be handled and stored according to standard safety practices.
- (xv) Fuel tanks will be appropriately marked by content, and along with oils, and chemicals will be stored in dyked areas lined with an impervious base.
- (xvi) Precautions, such as drip pans, will be used to avoid any spills that may occur during fuel and oil transfer operations.
- (xvii) Fuels, oil, and chemical storage facilities will be checked daily for any signs of leakage.
- (xviii) Precautionary materials, including shovels, plastic bags and absorbent materials will be kept available near fuel and oil storage areas.

9.3.9 Releases to Air

Emissions generated during the project are likely to include :

- (i) Dust emissions from vehicular traffic,
- (ii) Dust emissions from earthworks along the road,
- (iii) Exhaust fumes from generators, vehicles and construction machinery,
- (iv) Emissions from asphalt plants

Evaluation of Impact

Dust emissions caused by vehicular traffic on unpaved roads are a matter of great concern, primarily when such traffic passes near community settlements. Dust emissions cause the amount of particulate matter in the air to increase, and thus become a health concern. Crops may be damaged when dust settles on them although the significance of such damage varies from crop to crop. Dust clouds also reduce road visibility, creating a traffic hazard.

Emissions produced by generators, vehicles and equipment would include SO₂, NO_x, PM, etc. Smoke emission from asphalt plants is an important aspect. The location of such plants and proximity to the receptors is a matter of concern. Such plants are generally kept away from sensitive receptors.

Mitigation Measures

- (i) None of the potential effects are expected to exceed acceptable limits. The mitigation measures given below will further reduce their impact.
- (ii) All equipment, generators and vehicles used during the project will be properly tuned and maintained in good working condition in order to minimize exhaust emissions.
- (iii) Imposing speed limits and encouraging more efficient journey management will reduce the dust emissions produced by vehicular traffic. Water will be sprinkled where necessary to contain dust emissions.
- (iv) Dust emissions at the construction sites will be minimized using good housekeeping and management practices.
- (v) The asphalt plant will not be operated without properly functioning dust control system such as wet scrubber.

9.3.10 Noise and Vibrations

Potential sources of noise and vibrations include :

- (i) Equipment, generators and vehicular noise,
- (ii) Noise from materials handling,
- (iii) Construction machinery noise and vibrations,
- (iv) Transport related noise and vibrations.

Mitigation Measures

Following mitigation measures are being proposed :

- (i) Equipment in good working conditions shall be used and regularly maintained.
- (ii) The acceptable Noise Level threshold is 75 decibels for construction sites.
- (iii) Horns shall be avoided near sensitive receptors like schools, mosques, hospitals, etc. use of horns will be prohibited at night.
- (iv) Special care shall be exercised during loading and unloading of materials to minimize vibration and noise near receptors.

9.3.11 Ecology and Biodiversity Disturbance

Aspects affecting ecology and biodiversity along the corridors :

- (i) Temporary or permanent surface disturbance during construction
- (ii) Vehicle travel
- (iii) Equipment noise
- (iv) Vibrations during construction activities
- (v) Transport related noise and vibrations
- (vi) Illumination of Project infrastructure
- (vii) Fugitive dust from road transportation
- (viii) Change in chemical characteristics of water bodies as a result of spills
- (ix) Temporary construction camps, accommodation and waste disposal facilities

Evaluation of Impact

Construction of road will lead to direct and indirect ecological disturbance. However, it may be mentioned that the area has already undergone modification because of human settlements, building of the road, and associated vehicular traffic, therefore most of the wild fauna species have already left the area.

Mitigation Measures

- (i) No clearance of vegetation or killing/hunting/trapping of wild animal will be allowed.
- (ii) Compensation will be paid for any tree cutting on the private land.
- (iii) Compensatory tree plantation will be carried out.

- (iv) The Contractor will take appropriate care like watering, placing fence for protection from livestock; provide nutrients, etc. of this plantation during the construction phase and NHA during the operation phase.
- (v) Camps and other temporary facilities will be established in a manner that minimizes loss of natural vegetation including trees.
- (vi) Borrow material will be obtained without causing any damage to the natural vegetation.

9.3.12 Increased Risk of Accidents Caused by Partial Closure of Road during Construction

Current traffic on the road in the project vicinity is reasonable and traffic flow is likely to be affected during construction activities. At sections passing through populated areas, there will be limited scope for providing diversion tracks for the mobility of local and thorough traffic. During the project implementation phase the traffic volume will increase, there may be safety hazards for the locals residing along the edge of the road as well as vehicular traffic.

Mitigation

Proper site-specific measures will be carried out in consultation with supervisory consultants to ensure the safety of population residing along and around the project corridor. A detailed Traffic Management Plan (TMP) will be prepared and implemented by the contractor with the approval of the NHA, PD.

If a road would have to be closed for duration of time, it must be done with the permission of the Client and in consultation with the communities in the vicinity. Furthermore, to the extent possible alternate route(s) are to be provided through diversions, adequate signage and traffic management plan. Necessary measures will be taken to ensure the safety of traffic during construction, including barricades (including signs, pavement markings, flags, and lights) erected as required by the client (NHA) and set up as per local regulations.

The construction work will be managed such that part of the carriageway at a time is upgraded leaving the other part available to serve one-way traffic. Construction work will be carried out in small stretches instead of a long stretch.

9.3.13 Safety and Health Hazards

Occurrence of accidents/incidents during the construction activities, particularly from excavation activities is generally common. The workers and general public residing along the project corridor or near the work sites will particularly be at risk. In addition, contractor staff while on work may get injuries.

Mitigation

The contractor will comply with the safety precautions for construction workers as per International Labor Organization (ILO) Convention No. 62, as far as applicable to the

project contract. The construction workers will be trained in construction safety procedures, social awareness, equipping all construction workers with safety boots, helmets, gloves, and protective masks, and monitoring their proper and sustained usage. Contractor will ensure the provision of medicines, first aid kits, vehicle, etc. at the campsite.

9.3.14 Restricted Mobility of Local Population

During the construction phase the general mobility of the residents and their livestock in and around the project area is likely to be hindered. Likewise access to the natural resource may be affected. Construction activities, particularly excavation and movement of haul truck and machinery may disrupt the existing tracks leading from the main road to settlements. This will limit the accessibility of the local population to the main road.

Mitigation

The contractor will ensure that the mobility of the local communities and their livestock is not hindered by the construction activities. The contractor will provide crossing points at the road at appropriate places to facilitate the people for going across the road for their daily works and having free access to the natural resources.

The contractor will always consider the local sensitivities while performing the project activities. All the personnel engaged would also be properly briefed about the local norms and ethics prior to commencement of work.

9.3.15 Labor Influx Issues

Social impacts are critical to address, as even a modest labor influx already may lead to negative impacts on the host community. Pre-existing social issues in the host community can easily be exacerbated by the influx of labour. The list below indicates common categories of risks associated with labor influx :

- (i) **Risk of social conflict** : Conflicts may arise between the local community and the construction workers, which may be related to religious, cultural or ethnic differences, or based on competition for local resources. Tensions may also arise between different groups within the labor force, and pre-existing conflicts in the local community may be exacerbated. Ethnic and regional conflicts may be aggravated if workers from one group are moving into the territory of the other.
- (ii) **Increased risk of illicit behaviour and crime** : The influx of workers and service providers into communities may increase the rate of crimes and/or a perception of insecurity by the local community. Such illicit behavior or crimes can include theft, physical assaults, substance abuse, prostitution and human trafficking. Local law enforcement may not be sufficiently equipped to deal with the temporary increase in local population.
- (iii) **Increased burden on and competition for public service provision** : The presence of construction workers and service providers (and in some cases family members of either or both) can generate additional demand for the

provision of public services, such as water, electricity, medical services, transport, education and social services. This is particularly the case when the influx of workers is not accommodated by additional or separate supply systems.

- (iv) **Increased risk of communicable diseases and burden on local health services** : The influx of people may bring communicable diseases to the project area, including sexually transmitted diseases (STDs), or the incoming workers may be exposed to diseases to which they have low resistance. This can result in an additional burden on local health resources. Workers with health concerns relating to substance abuse, mental issues or STDs may not wish to visit the project's medical facility and instead go anonymously to local medical providers, thereby placing further stress on local resources.
- (v) **Inadequate waste disposal and illegal waste disposal sites** : Large populations of workers generate increased amounts of waste, for which no sufficient local waste management capacities may exist, which would likely lead to improper disposal practices.
- (vi) **Wastewater discharges** : Project-related activities, along with workers' camps, and a lack of appropriate wastewater discharges may pollute nearby water resources. Major health risks can occur if latrine pits spill over into local streams that are used for drinking water by the host community.
- (vii) **Increased demand on freshwater resources** : The provision of clean drinking water and water for hygiene purposes can result in increased pressure on freshwater resources in the project or camp site area.
- (viii) **Camp related land use, access roads, noise and lights** : The camp use can result in increase in noise and light pollution especially at night. The construction of new access roads can also lead vegetation removal and landscape transformation.

Mitigation

The following mitigation measures have been proposed :

- (i) The Contractor will prepare the construction camp management plan which, in addition to other components, will include the labor influx management plan. This will be reviewed and approved by NHA.
- (ii) The Contractor will select the specific timings for the construction activities particularly near the settlements, to cause least disturbance to the local population.
- (iii) Contractor will take due care of the local community and observe sanctity of local customs and traditions by his staff. Contractor will warn the staff strictly not to involve in any unethical activities and to obey the local norms and cultural restrictions.
- (iv) The Contractor will carry out the construction activities in such a way that the open defecation timings by the local community should not be affected. The normal defecation timings are early in the morning and at late in the evening. So, the Contractor will have to take care of these timings.
- (v) During construction activities, if privacy of the nearby households is affected, the Contractor will inform the house owner to make some arrangements. Similarly,

Contractor will take care as much as possible that the construction activities should not affect the privacy.

- (vi) The contractor will also ensure that solid waste and wastewater is disposed of in an environmentally friendly manner in designated areas and by approved methods only.
- (vii) The contract will explore alternative water sources and ensure that water usage by the project does not affect or compete with water requirements of the local community.
- (viii) The Contractor will also ensure that noise and light pollution from the labor camp is kept at minimal levels especially at night.

9.3.16 Gender Issues

The induction of outside labor may create social and gender issues due to the labor force being unaware of local customs and norms.

Gender-based violence : Construction workers are predominantly younger males. Those who are away from home on the construction job are typically separated from their family and act outside their normal sphere of social control. This can lead to inappropriate and criminal behavior, such as sexual harassment of women and girls, exploitative sexual relations, and illicit sexual relations with minors from the local community. A large influx of male labor may also lead to an increase in human trafficking whereby women and girls are forced into sex work.

Child labor and school dropout : Increased opportunities for the host community to sell goods and services to the incoming workers can lead to child labor to produce and deliver these goods and services, which in turn can lead to enhanced school dropout.

Mitigation

The Contractor will select the specific timings for the construction activities particularly near the settlements, to cause least disturbance to the local population particularly women.

Contractor will take due care of the local community and observe sanctity of local customs and traditions by his staff. Contractor will warn the staff strictly not to involve in any unethical activities and to obey the local norms and cultural restrictions particularly with reference to women.

During construction activities, if privacy of the nearby households is affected, the Contractor will inform the house owner and erect walls/fences to ensure privacy is maintained. At the same time, Contractor will take care as much as possible that the construction activities should not affect the privacy particularly with reference to women.

9.3.17 Social Conflicts and Employment of Locals on the Project

Due to the existing level of education and technical capacity of the local communities, it might be difficult for the contractor to find skilled workforce within the project area and so may hire it from elsewhere. There is no legal obligation to hire local labor.

Mitigation

Good relations with the local communities will be promoted by encouraging Contractors to provide opportunities for skilled and unskilled employment to the locals, as well as on-the-job training in construction for young people.

9.3.18 Rise in the Prices of Essential Commodities

Due to induction of outside labor for project works, the demand for basic items will increase thereby causing an increase in the prices of essential commodities. Additionally, the road improvement activities during the construction phase may disrupt the normal flow of trade and supply of essential goods.

Mitigation

In terms of labor induction, the project will exert no significant impacts on the prices of essential commodities. To avoid risk of such price hikes, majority of the unskilled and semi-skilled labor will be recruited from the local areas and specific clauses will be added in the Contracts of Contractor. NHA/Project Engineer and the Contractor will ensure that normal trade routes remain open and supply of goods is not severely impacted.

9.3.19 Graveyards and Physical Cultural Resources

Graveyards and burial sites are very sensitive for the local communities. The shifting of graves falling in the ROW may cause social disruption leading to possible conflicts, ultimately affecting the project works. However, in the proposed project, no graves or burial site would be affected.

Mitigation

Though the proposed project poses no destruction and disturbance to graveyards. However, if such a requirement were to arise, a detailed consultation with the local communities would be carried out. After the agreement and approval of the local community the affected graves would be relocated to some other site. For this, a proper shifting allowance would be provided.

9.3.20 Operational and Management Manual

At operational phase, the Project Manager will develop a comprehensive operational and Management Manual of the roads and an effective monitoring plan. Mistakes at operational level or handling of operations by untrained staff can prove very risky and costly. Important points to be attended at operational stage are as follows :

- (i) Strict application of prescribed M&E plan
- (ii) Continuous evaluation of design efficiencies
- (iii) Understanding and training of Operational and Maintenance Manual

- (iv) Regular maintenance of engineering works (mechanical as well as civil).
- (v) Continued Public consultation and feed back
- (vi) Refresher Training Courses for operational and maintenance staff

9.3.21 Socio-economic Impacts on the Overall Project Area

In ultimate analysis, the impacts of project on social and economic activities in the Project area will be mostly positive. The economic analysis shows very high economic benefits compared to the cost. Salient economic benefits of the project are :

- (i) The improved mobility of human and material resource leads to a better economy. The construction of roads in the area will not only provide markets to material resources, but will also give the local population access to job markets.
- (ii) Boosting of trade through ensured and enhanced capacity to take additional traffic.
- (iii) Increased economic activity with improved transport will ensure easy marketing of agriculture and livestock produce.
- (iv) With improved economy, there will be further improvement in services in the area and opportunities for employment, education, healthcare, especially for women and children, will improve.
- (v) Employment during construction phase will employ and train a large number of unemployed youths. They will receive a life-time benefit through skill training, capacity building and poverty alleviation. Many semi and unskilled workers in the project area will be hired.
- (vi) As populations grow, the limited village lands and resources cannot sustain the local community. To sustain the future communities, villages and settlements needs to expand, this is only possible through transportation networks.

TABLE – 9.2 : CHARACTERIZATION OF POTENTIAL ENVIRONMENTAL IMPACTS (CONSTRUCTION PHASE)

Environmental Components	Impacts		Nature of Impact		Duration			Location			Likelihood			Reversibility		Significance				Consequences
	Positive	Negative	Direct	Indirect	Short Term	Intermediate	Long term	Local	National	Global	Low	Moderate	High	Reversible	Irreversible	Major	Minor	Moderate	Beneficial	
Topography		•	•				•		•				•		•		•			L
Surface Water Quality		•	•		•			•			•			•			•			L
Ground Water Quality		•		•	•			•			•			•			•			L
Air Quality		•	•		•			•					•	•		•				M
Soil Quality/Erosion		•	•			•		•				•		•			•			M
Noise		•	•		•			•					•	•			•			M
Flora		•	•		•			•				•		•		•				M
Fauna		•	•			•		•			•			•			•			L
Disturbance to Public Life		•	•		•			•			•			•			•			L
Solid Waste		•	•		•			•				•		•				•		M
Traffic Management		•	•	•				•			•			•			•			L
Occupational Health & Safety		•	•		•			•			•			•				•		L
Local Economy and Employment	•		•			•			•			•		NA					•	Positive

TABLE – 9.3 : CHARACTERIZATION OF POTENTIAL ENVIRONMENTAL IMPACTS (OPERATION PHASE)

Environmental Components	Impacts		Nature of Impact		Duration			Location			Likelihood			Reversibility		Significance				Consequences
	Positive	Negative	Direct	Indirect	Short Term	Intermediate	Long term	Local	National	Global	Low	Moderate	High	Reversible	Irreversible	Major	Minor	Moderate	Beneficial	
Local Economics	•		•				•	•					•		•				•	Positive
Air Quality		•	•				•	•				•			•		•			L
Noise		•	•				•	•			•				•		•			L
Flora	•		•				•	•					•		•		•			L
Fauna		•	•			•		•					•		•		•			L
Traffic Situation	•		•				•	•					•		•				•	Positive
Lifestyle and culture	•		•				•		•				•		•				•	Positive
Community Development	•		•				•	•					•		•				•	Positive

LEGEND :

Levels of Negative Consequence :

High  Moderate  Low 

Levels of Positive Consequence :

Characterize Impact Positive  NA : Not applicable

10.0 SCREENING POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

10.1 GENERAL

This section identifies the potential impacts of the project under consideration of this EIA Report.

10.2 POTENTIAL IMPACT SOURCES

Environment and social impacts attributable to the project can broadly be classified into those taking place during construction and those occurring during operational phase. Some of these impacts can be anticipated and avoided through appropriate adjustments / provisions in the project design. Some can be mitigated by careful implementation of the project's Environmental Management Plan while some other can be adjusted by appropriately following the operational manual and an effective collaboration with concerned stakeholders.

Construction related Impacts are heavily dependent on :

- ❖ The contractor's work practices, especially those related to storage of construction materials and cleanliness of work site;
- ❖ Cooperation between local communities and local authorities and the contractor in terms of observance of stakeholders and use of public space and utilities;
- ❖ Project management's enforcement of correct construction practices and standards;
- ❖ The quality of Monitoring and Reporting of EMP implementation.

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

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

- ❖ Physical Environment
 - ♦ Land Resource
 - ♦ Water Resource
 - ♦ Air Quality
 - ♦ Noise Level
- ❖ Biological Environment
 - ♦ Flora
 - ♦ Fauna
 - ♦ Fish
 - ♦ Endangered Species

- ❖ Cultural and Historical Sites
- ❖ Socio-economic Environment

Table below provides a checklist of potential impacts associated with the project activities. In general, these areas are divided into groups based on general environmental aspects which are affected or likely to be affected from the modification in the flow of traffic. The set of impacts based upon physical, biological, cultural and social aspects have been classified as under construction and operational phases. Each sub-factor has been marked as curable, reversible or irreversible.

TABLE – 10.1 : ASSESSMENT OF ENVIRONMENTAL AND SOCIAL IMPACTS

ASPECTS	IMPACTS ASSESSED	ASSESSMENT								
		Slight			Moderate			Significant		
		1*	2*	3*	1*	2*	3*	1*	2*	3*
1. Construction Phase										
1. Impacts on Soils and Land Resources	Site for disposal of waste construction material					✓				
	Unstable soil or similar unforeseen conditions		✓							
	Location of labour camps, material dumps, equipment yard and approach road.		✓							
	Natural disasters heavy rains and floods, etc.					✓				
	Soil contamination from diesel and other spills from construction machinery								✓	
	Damage / blockage of drain, paths, roads, and cross drainage by moving machinery.					✓				
	Scouring of earthen embankment or concrete work edge				✓					
	Release of construction water on unstable slope or any public/private property							✓		
	Release of construction water to any water structure such as bridge / culvert.								✓	
	Impact of taking borrow martial from earth borrow site.								✓	

- *1. Avoidable through design (Avoidance) : Curable
 *2. Mitigation through contractor's obligation or by EMP implementation (Curative) : reversible
 *3. Non-reversible, Permanent change (to be adopted) : irreversible

ASPECTS	IMPACTS ASSESSED	ASSESSMENT								
		Slight			Moderate			Significant		
		1*	2*	3*	1*	2*	3*	1*	2*	3*
	Impact on paths or road used for transport of construction material.					✓				
	Impact of stone quarrying.		✓							
	Any blasting during Construction									✓
2. Impacts on Water Resources	Sourcing of construction water.		✓							
	Impact of surface water.		✓							
	Impact of ground water.		✓							
	Impact of drinking water.		✓							
	Diesel and other fluids spilling over to water body from machinery.				✓					
	Damages from floods of streams.								✓	
	Obstruction of flow of water in any stream.		✓							
	Effect on surface flow conditions in rains.		✓							
3. Air Quality and Noise Pollution.	Dust, smoke and other pollutants from construction Machinery including asphalt and concrete batching plant.					✓				
	Dust or other emissions from stored material and spoil keeps.					✓				
	Smoke from burning of waste material or burning firewood.					✓				
	Noise from use of old or outdate machinery.					✓				
	Noise due to any blasting.					✓				
	Soil compaction due to labour camps and machinery yards.	✓								
4. Impacts on Biological Resources	Damage to biological resources		✓							
	Damage to fisheries		✓							
	Impact on (adjacent) open land		✓							
	Impact on any migratory birds.		✓							
	Impact on endangered species.								✓	
5. Impacts on Socio-Economic Cultural and Archeological Issues.	Existing services education, health, electricity, water supply communication.		✓							
	Local ethnicity, Tribal Tensions, communal rivalries		✓							
	Impact on area under crops					✓				

ASPECTS	IMPACTS ASSESSED	ASSESSMENT								
		Slight			Moderate			Significant		
		1*	2*	3*	1*	2*	3*	1*	2*	3*
	Land ownership / Land tenure system		✓							
	Access to construction material.		✓							
	Adverse effect on cultural and archaeological heritage (if any).		✓							
	Public safety at construction site.					✓				
	Health and safety of labour and employees on construction site.					✓				
										✓
	Loss of livelihood due to loss of land and ancestral villages.		✓							
	HIV / AIDS and infectious diseases such as cholera and Jaundice in the labour, employees and nearby Public.		✓							
	Employment		✓							
	Women status : Exposure to employment and education opportunities.		✓							
	Hurdle in cultural Reunion.		✓							
	Hurdle in accessing market opportunities for agricultural produce.		✓							
	Reduction in recreation opportunities.		✓							
2. Operational Phase										
Monitoring and Evaluation as per operational manual and monitoring plan	Compliance of M&E plan.								✓	
	continuous evaluation of design efficiency								✓	
	Understanding and training of operational manual.								✓	
	Environmental annual Audit								✓	
	Regular Maintenance								✓	
	Staff welfare								✓	
	Continuous public consultation					✓				
	Continued gender issues and women consultation.					✓				
	Refresher courses for operational staff.					✓				

10.3 DESCRIPTION OF IMPACTS AND MITIGATION MEASURES

10.3.1 Disposal of Waste Construction Material

Impacts

The project area is comparatively flat. There may be surplus earth or waste construction material which needs disposal.

Mitigation Measures

The construction waste material will be disposed off in selected barren spots as allowed / approved by Resident Engineer and level it so that it becomes a useful. No waste material will be thrown into the nullah or other surface water bodies.

10.3.2 Sitting of Labour Camps, Material Depots, Equipment Yards and Approach Roads

Impacts

Because of availability of public/private land on either side of the road sections siting of labour camps material depots, equipment yards and approach roads will not cause any serious problem. Therefore, this is a matter of low significance that can easily be mitigated.

Mitigation Measures

The contractor will, in consultation with RE, select the siting for all those facilities within the public land. The camp / other facilities will be set up on a flat land without much natural vegetation, at least 250 m away from any community. Satellite images can also be used to select suitable sites, to record the pre-construction conditions, and to monitor the condition of these sites during and after the construction phase.

10.3.3 Natural Disasters : Heavy Rains, Floods and Earthquakes

Impacts

Natural disasters such as heavy rains, floods or earthquakes can potentially impact the project works especially the area in vicinity of the water body and bridges.

Mitigation Measures

Contractor in consultation with RE and local community will resolve the issues, in the best interest of the NHA. Neither party will however be held responsible for any force majeure.

10.3.4 Contamination from Diesel and Oil Spills from Construction Machinery

Impacts

Any leakage or spillage of diesel, oil or any other chemical will contaminate the soil which may in turn impact the water sources, nearby community and / or productive land.

Mitigation Measures

Contractor will apply strict rules on his workers and labour to ensure that no spill or leakages are caused. All fuels, oils and bitumen will be stored appropriately, with concrete padding and bunding for containment in case of leakage. If the spills or leakages do take place, it must be followed by the treatment prescribed below as per the degree of spill or leakages.

The contractor will employ the general criteria for oil and leakage at construction sites, as per standards set forth by "Guidelines for Oil Spill Waste Minimization and Management" issued by International Petroleum Industry Environmental Conservation Associate which are as follows : (Source : IPIECA Report Series, Volume-12, "Guidelines for Oil Spill Waste Minimization and Management") Minor Spill / Leakage : Soil contaminated by minor spills / leakages (defined as leaks from vehicles, machinery, equipment or storage containers such that the area and depth of soil contaminated is less than 10 sq.ft. and 3 inches respectively) is to be scrapped.

Moderate Spills are defined as spills of volume less than or equal to 200 liters is to be contained and controlled using shovels, sands and native soil. These equipments and materials are to be made available at camp sites during the operation. The contaminated soil is to be excavated and stored in a burn area lined with an impermeable base. Depending on the volume, the contaminated soil is either disposed off by burning in the burn pit or by specialized treatment such as bioremediation.

10.3.5 Damage to Roads, Cross Drainages

Impacts

Damage to roads, cross drainages can arise through carelessness of the heavy machinery drivers or operators. Such carelessness can cause considerable damage to paths, roads and drainages if the drivers/operators are not made aware, trained and bound to be careful. It is a concern of moderate significance but can be mitigated through care and regulation.

Mitigation Measures

Contractor will prepare standard operating procedures and impose strict control over operators and drivers of all types of vehicles to minimize any damage to roads or structures. Should any damage take place, the contractor will carry out repairs immediately. An effective sinology and a good traffic plan can reinforce the instructions to drivers.

10.3.6 Earthen Embankments or Concrete Work, Edge Scouring

Impacts

Poor design and inappropriate construction procedures can potentially damage the embankments, concrete works or road edges. The impact is moderately significant but can easily be mitigated.

Mitigation Measures

Edge scouring of earthen embankments or concrete work must first be dealt at design stage. Wherever such a situation is anticipated, aprons should be provided to secure edges and specifications must be kept of high standards. During the construction phase this aspect should be addressed through appropriate construction methodology and employing appropriate techniques such as protection walls and rip rap. Contractor will repair all damages to the earthen embankments, concrete works, or pavement edges caused by the construction works. During the operation phase appropriate measures need to be incorporated in the Operational Manual.

10.3.7 Impact of Borrowing Material from Earth Borrow Sites

Impacts

A large quantity of earth will be removed from borrow pits located within the designated / approved areas by the NHA. This can potentially cause loss of soil/land productivity, uneven terrain, and altered drainage.

Mitigation Measures

The borrow areas will be selected after obtaining approval from the RE. The contractor will ensure that the borrowing does not cause loss of soil/land productivity, uneven terrain, and altered drainage. Wherever possible/necessary, these places will be leveled and planted with trees using appropriate planting technology/methodology.

10.3.8 Impact on Roads / Infrastructure Used for Transport of Construction Materials including Asphalt, Bitumen

Impacts

Transport of construction machinery, construction material and construction workers will cause additional wear and tear of the roads/infrastructure and raise considerable dust. This impact will be a moderately significant and can be adequately mitigated.

Mitigation Measures

The contractor will be responsible to repair any damage caused to the local infrastructure by the construction activities. Water sprinkling will be carried out where necessary to minimize dust emissions.

10.3.9 Source of Drinking Water

Impacts

The construction activities can potentially damage/affect the drinking water sources of the communities. The usage of unsafe water by the construction workers can cause health problems.

Mitigation Measures

It will be ensured that the drinking water sources of the communities are not affected. The contractors will repair / replace / compensate for any damages caused by the construction activities. The contractor will make arrangements to supply safe drinking water to its staff and workers.

10.3.10 Dust and Gaseous Emissions from Construction Machinery or Asphalt Plants

Impacts

The construction activities and operation of vehicles and machinery will release exhaust emissions and also raise dust.

Mitigation Measures

The contractor will ensure that its vehicles, machinery, and generators are properly designed and maintained, and comply with the applicable PEQS. The asphalt plant will not be operated without properly functioning dust control system such as wet scrubber and will be located away from any residential or commercial settings. Water will be sprinkled where necessary to control the dust emissions.

10.3.11 Smoke from Burning of Waste Material or Burning Firewood

Impacts

A large number of big and small fires in the labour camp and burning of waste can produce smoke and smog which can cut off visibility, reduce visibility and cause suffocation along with causing diseases of the respiratory tract including cancer.

Mitigation Measures

The contractor will use clean and smoke free fuel in the labour camp. Cutting and burning trees / shrubs for fuel will be prohibited. Instead gas cylinders should be used in the labour camp for cooking purposes. Similarly waste burning will not be allowed. The contractor will prepare waste management plan and have it approved by the RE.

10.3.12 Noise

Impacts

The construction activities will generate noise, which can potentially affect the communities and also the construction workers.

Mitigation Measures

The contractor will strictly follow the environmental quality standards for ambient noise. All necessary measures such as noise barriers will be taken to reduce the noise

particularly near the communities. The personal protective equipment (PPE) will be provided to the construction workers and its usage will be made mandatory.

10.3.13 Disposal & Impact of Milled Asphaltic Material

Impacts

The project activities may potentially generate the surface milled asphaltic material disposal of which may cause potential environmental impacts of water through leaching process and solid waste material, therefore, proper utilization or disposal of the material is mandatory for a sustainable development.

Mitigation Measures

Reclaimed material can be used in asphaltic base course or in shoulders. Generally, 15–20% material can be usable. However, this may be done with the permission of NHA. As the project shall be implemented in segmented phase its suggested that contractor will devise disposal plan for sustainable disposal of the material. With the consultation of local community during project implementation some barren places can be identified for burial of this material. It is also suggested that some latest techniques for reclamation of Milled Asphaltic Material may also be adopted for utilization of this material on unpaved areas.

10.3.14 Damage to Biological Resources (Flora and Fauna)

Impacts

The project activities may potentially cause some disturbance to the wild species of the area; however, this impact is not significant. The area has already undergone modification because of human settlements, building of the road, and associated vehicular traffic, therefore most of the wild fauna species would have already left the area.

Mitigation Measures

No killing / hunting / trapping of wild animal will be allowed. Compensation will be paid for any tree cutting on the private land. Compensatory tree plantation will be carried out for Forest Department owned trees and for each tree removed, five saplings will be planted. Borrow material will be obtained without causing any damage to the natural vegetation. Since the project will be executed on alignment option presented above only small amount of tree cutting is expected to cut.

10.3.15 Damage to Fish and Fisheries

Impacts

Inappropriate waste disposal in the surface water can affect the aquatic fauna.

Mitigation Measures

No untreated waste, excess soil or garbage will be dumped in the surface water.

10.3.16 Temporary Land Acquisition

Impacts

Land required for establishing contractor's facilities including camp, workshop, plants, borrowing earth material and dumping excess spoil will be acquired directly from private landowners by the contractor. The provisions of the Land Acquisition Act, 1894 will not be invoked under the proposed Project, as the acquisition of the land will be temporary and will be covered by short-term lease agreements between the landowners and contractors under the approval of the Project Engineer. Rental terms will have to be negotiated to the satisfaction of the landowners concerned.

Mitigation Measures

The staff of the NHA and supervisory Consultants will monitor the process of restoration and ensure, through the terms of the construction contracts, that landowners are compensated according to the terms of the lease agreements, and the restoration actions agreed upon by the contractors are duly carried out. The photo-documentation of the existing land prior to temporarily acquisition should be available, which will be beneficial to resolve the restoration conflicts between the landowner and contractor.

Similarly, prior to the commencement of construction activities, the Contractor will carry out base line survey for selecting the camp sites, dumping sites, public and community / private owned utilities, in conformity with the requirements of project implementation. Project facilities, viz., construction camp and workshop will be located at a minimum distance of 500 m from existing plantation, and settlements. This limit will be 1,000 m in case of batching plant.

As far as possible, waste / barren land, i.e., areas not under agricultural, residential or forestation use, and natural areas will be used for borrow material (if required) and setting up project facilities.

Where the use of agricultural land is unavoidable for borrow of earth material, the top 30 cm of the plough layer will be stripped and stockpiled for redressing the land after the required borrow material has been removed. In case deep ditching is carried out, the top 1 m layer of the ditching will be stripped and stockpiled. The ditch will initial filled with scrap material from construction then levelled with the stockpiled topsoil to make it even with the rest of the area. It shall be ensured that the scrap does not contain any material that may produce obnoxious material that would contaminate soil or water resources.

Barren lands or valley side slopes will be used for dumping the excavated spoil material. Appropriate sites have to be located along the road for this activity.

These facilities will be regularly monitored and cleaning activities implemented during operation phase to improve the cross drainage facilities of area.

10.3.17 Infrastructure within RoW

Impacts

No public infrastructure such as schools, hospitals or offices falls within RoW. Budgetary provisions for camp site, asphalt and batching plant will be made accordingly.

Mitigation Measures

The cost of these utilities may be included in the project main cost.

10.3.18 Increased Risk of Accidents Caused by Partial Closure of Road during Construction

Impacts

During construction activities, traffic flow will be disturbed. At sections passing through populated areas, there will be limited scope for providing diversion tracks for the mobility of local and thorough traffic. As a result of road construction the traffic volume will increase during operation stage, there may be safety hazards for the locals residing along the edge of the road as well as vehicular traffic.

Mitigation Measures

Proper site specific measures will be carried out in consultation with supervisory consultants to ensure the safety of population residing along and around the project corridor. Traffic Management Plan (TMP) prepared in this report will be implemented by the Contractor with the approval of the Project Engineer.

Necessary measures will be taken to ensure the safety of traffic during construction, including barricades (including signs, pavement markings, flags, and lights) erected as required by the NHA and set up as per local regulations.

The construction work will be managed such that part of the carriageway at a time is upgraded leaving the other part available to serve one way traffic. Construction work will be carried out in small stretches instead of a long stretch.

Periodic inspections will be made by contracted firm particularly in monsoon season to identify the landslide areas and their remedial measures. In case of any land slide contracted firm will clear the road within minimum time. For this purpose the firm should be fully equipped and there should be contingency plan in case of any emergency/natural disaster.

10.3.19 Safety and Health Hazards

Impacts

Occurrence of accidents/incidents during the construction activities, particularly from excavation activities is generally common. The workers and general public residing along the project corridor or near the work sites will particularly be at risk. In addition, contractor staff while on work may get injuries.

Mitigation Measures

The contractor will comply with the safety precautions for construction workers as per International Labour Organization (ILO) Convention No. 62, as far as applicable to the project contract. The construction workers will be trained in construction safety procedures, social awareness, equipping all construction workers with safety boots, helmets, gloves, and protective masks, and monitoring their proper and sustained usage. Contractor will ensure the provision of medicines, first aid kits, vehicle, etc. at the camp site.

10.3.20 Restricted Mobility of Local Population

Impacts

During the rehabilitation phase the general mobility of the local residents and their livestock in and around the project area is likely to be hindered. Likewise access to the natural resource may be affected. This particularly implies to the women folk and children. Construction activities, particularly excavation and movement of haul truck and machinery may disrupt the existing tracks leading from the main road to settlements. This will limit the accessibility of the local population to the main road.

Mitigation Measures

The contractor will ensure that the mobility of the local communities and their livestock is not hindered by the construction activities. The contractor will provide crossing points at the road at appropriate places to facilitate the people for going across the road for their daily works and having free access to the natural resources.

Generally the contractor will avoid using the village tracks for hauling the construction material. However, if it is unavoidable, the existing ones will be widened, overlaid with shingle or surface treated to accommodate local as well as contractors traffic under the approval of the Project Engineer.

10.3.21 Social Conflicts and Employment of Locals on the Project

Impacts

The presence of outside construction workers may cause some degree of social disruption and even active disputes with the local community as a result of social/cultural differences. This particularly relates to the disruption of the privacy of women

folk working in the fields or even in the yards of their houses, should the house lying at lower elevation than the working sites. Likewise the risk of theft of the community assets by the Contractor workers and vice versa may occur.

Mitigation Measures

Good relations with the local communities will be promoted by encouraging Contractors to provide opportunities for skilled and unskilled employment to the locals, as well as on-the-job training in construction for young people.

10.3.22 Spread of Communicable Diseases amongst the Project Labour and Adjoining Population

Impacts

The presence of a large number of construction workers and other associated personnel may lead to the spread of communicable diseases such as Covid-19, HIV/AIDS and hepatitis.

Mitigation Measures

Contractor will arrange awareness programs for the communicable diseases in the field camps on regular basis by a qualified expert / doctor. Contractor will provide PPE's, i.e., mask, proper sanitation facilities to all the workers. Contractor will provide recreational facilities such as playing volleyball or football after the work hours. Similarly, he will provide indoor recreation in terms of radio and TV at the eating place. The Contractor will ensure regular medical check-up of the camp staff from a qualified doctor on fortnightly basis. If any person found affected with any of the transmittal diseases will be immediately shifted from the camp to the hospital for detailed check-up and treatment. The cost will be borne by the Contractor. Contractor will restrict his permanent staff to mix with the locals to avoid any social and health problems.

10.4 OPERATIONAL AND MANAGEMENT PHASE

At operational phase the Project Manager will develop a comprehensive operational and Management Manual of the Highway and an effective monitoring plan. Mistakes at operational level or handling of operations by untrained staff can prove very risky and costly. Important points to be attended at operational stage are as follows :

- ❖ Comprehensive O&M Rules as per ISO standards
- ❖ Strict application of prescribed M&E plan
- ❖ Continuous evaluation of design efficiencies
- ❖ Understanding and training of Operational and Maintenance Manual
- ❖ Annual Environmental Audit based upon tri-base assessment.
- ❖ Regular maintenance of engineering works (mechanical as well as civil).
- ❖ Staff Welfare
- ❖ Continued Public consultation and feedback on that

- ❖ Continue attention towards Gender issues and women consultation
- ❖ Refresher Training Courses for operational staff

10.5 SOCIOECONOMIC IMPACTS ON THE OVERALL PROJECT AREA

In ultimate analysis the impacts of project on social and economic activities in the Project area will be mostly positive. The economic analysis shows very high economic benefits compared to the cost. Economic Internal Rate of Return (EIRR %) has been worked out as 12%. Salient economic benefits of the project are :

- ❖ Boosting of trade through ensured and enhanced capacity to take additional traffic.
- ❖ Increased economic activity with improved transport will ensure easy marketing of agriculture and livestock produce.
- ❖ Employment during construction phase will employ and train a large number of unemployed youth. They will receive a life time benefit through skill training, capacity building and poverty alleviation. A large number of semi and unskilled workers in the project area will be hired.
- ❖ Greater awareness about Health care including HIV/AIDS and infectious diseases amongst the labour and the close by community will be created.
- ❖ At micro-level the hustle and bustle of economic activities may bring the cost of living down by making essential commodities available at cheaper rates. This combined with higher incidence of employments will bring the poverty line and crime rate much lower.
- ❖ The Project will have a favorable effect on the area, socio-economic uplift of the area. The venture shall result in a better quality all weather roads for Traffic from Chishtian to Dharanwala and will ensure greater opportunities for economic development of the area.
- ❖ The Project will provide speedy link and adjoining areas as well. It will also provide facilities for efficient and speedy movement of traffic. The implementation of Project will ensure safe and smooth flow of traffic and reduced vehicle operation costs.
- ❖ There would be numerous economic and social benefits and uplifts if a good quality road is made available. The development of this Project will provide smooth flow of traffic and reduction in vehicle operating speed, which will activate the overall development of the area and minimize the travel difficulty faced by the locals. This road would also serve as an alternate and safe route to existing road from Chishtian to Dharanwala.
- ❖ PEPO, 1983 Section 8 states that every proponent of a project, the construction or completion of which is likely to adversely affect the environment shall file with the Agency, at the time of planning the Project. The ministry of Environment in this regard prescribed the Guidelines.
- ❖ It became mandatory for all new projects since 1st July 1994 to seek environmental clearance from responsible agency, which in current case is Punjab EPA.

- ❖ The EIA process was strengthened under Section 12 of PEPA, 1997 and Guidelines were prepared with a consultative process with stakeholders, as a Result IEE / EIA Regulation, 2000 notified.
- ❖ Compliance with Punjab Environmental Quality Standards (PEQS) Pakistan is required.
 - ◆ In compliance, the EPA and Punjab are requested to accord NOC for the Project after carrying of required criteria and tests from the field investigations.

10.6 BENEFITS OF PROJECT

The main quantifiable benefits of the investment are (i) the savings in Vehicle Operating Costs (VOCs) for existing traffic using the road; (ii) VOC savings to generated / diverted traffic where applicable and (iii) the savings in the travel time. For the subject road benefits from diverted traffic have been taken into account after completion of the road. In addition to above the other non tangible benefits which may occur includes the increase in the rents or prices of the shops, less time consumed by commuters for shopping, increased tourism activities, new openings for hotels, etc. are not considered. Only benefits obtained from the savings in the VOCs and travelling time are considered.

The value of time has been estimated on the basis of per capita GDP of US\$ 1,196.6 in 2019¹. Per capita GDP is based on overall population including infants, children and senior citizens. It is, however, produced by the working population only. The labour force participation rate being 31.70 percent², GDP per employed person works out to US\$ 3,775. This gives value of working time of USD 1.29 per hour on the basis of 360 working days and 8 hours a day. The values are converted to Pak Rs. for analysis purpose. This has been taken as value of working time of a bus passenger. Value of working time of wagon and motor cycle passenger is taken at 1.5 times of time that of a bus passenger and of car passenger at twice the time of a bus passenger. Non-working time is valued at 1/3rd of working time. A minor component will be savings in periodic maintenance cost to be incurred. The savings in VOC are generated though better road surface conditions. As the access to markets, which reflects agricultural benefits, becomes better, it is expected that there will be more economic activities which results in development traffic.

The project achieves a positive rate of return. It is a very important Strategic Route and considering the geopolitical situation it requires immediate construction because of an industrial route. In addition, the subject area is one of the poorest areas in the country and construction of project will help in reducing poverty in the area. Therefore, it is recommended that the subject project may be approved.

1. World Trading Economics
 2. Pakistan Economic Surveys, 2017–18, Statistical Appendix, Table 12.9.

11.0 ENVIRONMENT MANAGEMENT PLAN (EMP) AND ENVIRONMENT MONITORING PLAN

11.1 GENERAL

Environment assessment of any development project plays an important role for sustainable project implementation. The proposed project is construction of Chishtian to Dharanwala, therefore, a detailed assessment was carried out in accordance to the Punjab Environmental Protection Agency (PEPA). To comply with the regulatory requirements of PEPA a comprehensive EMP has been devised for its implementation during the project execution.

11.2 ANTICIPATED ENVIRONMENTAL IMPACTS

The project activities will involve Construction of new road in all cases. Since the candidate road project will mainly include construction of road the project is unlikely to cause any significant adverse environmental impacts.

Potential issues during pre-construction stage are delays in obtaining required clearances and permits for establishment and operation of facilities such as hot mix plants and stone crushing plants. Anticipated impacts during construction which are typical of road construction projects include generation of dust from earthworks; noise and exhaust from operation of equipments / machinery / vehicles; generation of construction waste as well as wastes from construction and worker camps; water contamination and water supply issues; occupational health and safety issues with the workers and local communities. Key benefits of the project will be better connectivity through enhanced road quality and safety. Given this the main long term environmental impact will be increased green house gas emission from the increased traffic.

Mitigation measures that will be proposed to address these anticipated impacts will include but not be limited to : wet spraying to control dust; limiting working hours to minimize disturbance; regular maintenance of vehicles involved for construction; reuse or proper disposal of construction debris; maintenance of proper hygiene and safety standards and facilities in the camps and working areas; development and implementation of an erosion control and silt management measures; and compensatory plantation. These anticipated impacts will be addressed through mitigation measures provided in the Environmental Management Plan (EMP) which will be made mandatory for the contractor to implement. Further institutional mechanisms will be established between the Executing Agency, Construction Supervision Consultants, contractors and other concerned agencies to ensure all unanticipated environmental impacts are appropriately addressed.

11.3 INSTITUTIONAL ARRANGEMENT FOR IMPLEMENTING EMP AND RESPONSIBILITIES

NHA has a setup of Project Implementation Unit (PIU) headed by Project Director at its head quarter for the implementation of various projects. At present, there are two

different sections, i.e., Environment and Land sections. Environment section is operated by GM (Environment), whereas Land is headed by GM (Land) who may also look after social aspects associated with land. PMU established in NHA–HQ has its own active Safeguard Unit, i.e., other than EALS. Safeguard Unit is headed by In–charge Environment and Social Safeguard Unit (ESU) responsible for Environment and Social safeguard activities during Planning, Construction and Operational phase (when and where required). In Project Implementation Unit (PIU) in NHA Project Directors under PIU will be operating at Projects level, managing project activities through RE (Supervision Consultant) under PMU in NHA–HQ. An environmental specialist from the Project Supervision Consultant, if a supervision consultant involved, will provide technical support to the environment expert. An external monitor will conduct periodic external monitoring of EMP implementation. Environmental awareness and EMP implementation training will be held for contractors and Supervision Consultants.

11.4 MONITORING AND REPORTING

NHA has the responsibility for undertaking environmental due diligence and monitoring implementation of environmental mitigation measures for the project. The due diligence report as well as monitoring implementation of the environmental management plan needs to be documented systematically.

The EMP will have both internal and external monitoring. The monitoring reports will document progress made in EMP implementation, with particular attention to compliance with each component of EMP. Monitoring during construction will also be the responsibility of the NHA. Monitoring will relate to compliance with construction contracts, effectiveness of mitigation measures, and complaints (also known as “Project Performance Monitoring” or Compliance Status Report), and the state and health of nearby environmental resources (also known as “Ambient Environmental Monitoring”).

Monitoring during operation should be conducted on an as–needed basis.

11.5 ENVIRONMENT MANAGEMENT PLAN (EMP)

This EMP has been formulated to avoid, mitigate anticipated environmental impacts for the road sections :

TABLE – 11.1 : ENVIRONMENTAL MANAGEMENT PLAN (EMP)

Project Activities	Type of Impact	Potential Impacts on Environment	Where the Impact is likely to happen	When the Impact is likely to Occur	Magnitude of Impacts	Mitigation Measures	Institutional Responsibility	
							Implementation	Supervision
DESIGN & PRE CONSTRUCTION ACTIVITIES								
Alterations of drainage pattern of the site	Avoid dumping spoiled materials on nearby water Bodies	Physical Impact	To be checked all along the project corridor	At planning Stage	Low	❖ Design of cross drainage structures would be carried out so as to avoid alteration of drainage pattern. Design would be done considering 50 year return flood level to avoid overtopping of the roads and maintain natural drainage	Contractor	NHA / Supervision Consultant
Cultural / Environmental Sensitive properties	Impact on houses and shops etc. along the proposed RoW	Social Impacts	To be checked all along the project corridor	At planning Stage	Low	❖ Construction activities avoid any interference with cultural heritage/ environmental sensitive sites including houses and shops, etc. ❖ In case of unavoidable interference prior notification and consultation needed for consensus on options e.g. start of construction work	NHA in bid documents for Contractor, Environment Specialist	NHA / Supervision Consultant
Planning site activities	Construction causes danger to workers, locals	Community Health & Safety	To be checked all along the project corridor	At planning Stage	Low	❖ Prepare Community & Health Safety	Contractor	NHA / Supervision Consultant

Project Activities	Type of Impact	Potential Impacts on Environment	Where the Impact is likely to happen	When the Impact is likely to Occur	Magnitude of Impacts	Mitigation Measures	Institutional Responsibility	
							Implementation	Supervision
Damage to trees (Flora) along the RoW	Cutting of trees and bushes of different species	Ecological Impacts	Within the ROW	At planning stage	Medium	❖ The sufficient amount of planting will be done on the both sides. ❖ If a tree of rare species is growing within the ROW and is required to be removed. It will not be filled but uprooted and transplanted in close consultation with the forest department. ❖ Effort should be made to save as many trees as possible even if they are young or poll stage. Proper irrigation and maintenance of plants will be done.	Contractor	NHA/ Supervision Consultant
CONSTRUCTION PHASE								
CAMP SITE AND CONSTRUCTION WORKS								
Grievance Redress								
Grievances	Social Impact	Social Disputes	Valid for entire construction area throughout construction period	Throughout The project	Low if recommendations are followed	Official in charge of people's Grievance will be designated. A leaflet outlining environmental protection measures and listing grievance contact points will be Distributed. Community leaders will be given detailed information	PMU, Contractor	NHA, supervision consultant, Contractor, Grievance Specialist

Project Activities	Type of Impact	Potential Impacts on Environment	Where the Impact is likely to happen	When the Impact is likely to Occur	Magnitude of Impacts	Mitigation Measures	Institutional Responsibility	
							Implementation	Supervision
						on the grievance management process NGOs will be informed in the same manner as the community leaders.		
Construction Camps	Physical	Damage of topsoil Contamination related to fuel storage and fueling operations Sewerage related contamination Waste Management	Valid for entire construction area throughout construction period	Throughout project	Minor if recommendations are followed	Proper construction camp management in compliance with Construction Camp Management Plan Proper waste management in compliance with Waste Management Plan Proper spill management in compliance with Spill Management Plan	Design Engineer, Contractor	NHA, supervision consultant Environment Specialist, Contractor
Utilities								
Public Utilities	Social Impact	Possibility of Damage to gas or water pipelines, crop land. Disconnection & distortion of phone line	All along the construction site	During Construction	Medium	All public utilities likely to be impacted, such as gas and/or water pipes, power and/or phone lines etc. must be relocated to suitable places, in consultations with respective agencies proper compensation will be paid to the land owners.	Contractor	NHA, Environment Specialist, Contractor
Site selection and operation	Socio-cultural Environmental	Sanitary waste disposal, solid	Several sites along	Throughout construction	Minor if recommendations	❖ Prior consultation with local Contractor need to obtain	Contractor	NHA, supervision

Project Activities	Type of Impact	Potential Impacts on Environment	Where the Impact is likely to happen	When the Impact is likely to Occur	Magnitude of Impacts	Mitigation Measures	Institutional Responsibility	
							Implementation	Supervision
of construction camp. Store materials Human activities on site Travel to / from construction camp	Acceptability to public/owner; Friction with residents	waste (Kitchen waste) disposal, fuel leakage. Noise and additional traffic. Water usage of pollution	roadside for construction camp sites	period	are followed.	NOC for sitting work camps & workshop, or agreement made with the landowner ❖ Site construction to be supervised ❖ Proper storage and fencing / locking of storage rooms containing hazardous material ❖ Setting up of complaints office, advertising ways to voice complaints		consultant Environment Specialist, Contractor
Site restoration after the contract completion	Loss of roadside vegetation/assets and plantations if any in an area of scarce biodiversity and dissatisfaction on rehabilitation measures after completion	Loss of Plants in an area with already scarce biodiversity, and loss of functional benefits from roadsides plants	All along route, campsites	Long lasting	Moderate	❖ Manage design to minimize removal of roadside plantation ❖ Apply flexibility in decision in reducing locally the shoulder with. ❖ Plan for compensatory planting for each felled 10 plants of similar / local flora species ❖ Contractor will provide plan for removal & rehabilitation of site upon completion ❖ Photographical and botanical inventory of vegetation before clearing the site	Design Engineer, Contractor	NHA, supervision consultant Environment Specialist, Contractor

Project Activities	Type of Impact	Potential Impacts on Environment	Where the Impact is likely to happen	When the Impact is likely to Occur	Magnitude of Impacts	Mitigation Measures	Institutional Responsibility	
							Implementation	Supervision
						❖ Disallow introduction of exotic species or species with known environmental setbacks (e.g Eucalyptus etc.)		
Creation and burning of wastes at or near camp sites	Solid liquid waste generated and air pollution associated with burning garbage	Air pollution associated with burning garbage	Along campsites	throughout construction and after math	Moderate	❖ Disallow sitting for work camp, including waste dump sites, in distance closer than 300m to any inhibited areas ❖ Incorporate technical design features for refuse collection containers at sites that would minimized burning impacts ❖ Devise plan for safe handling, storage and disposal of harmful materials ❖ Disallow burning	Contractor	NHA, supervision consultant Environment Specialist, Contractor
Safety & Accident Risks								
Construction Activities and Accident Risks through transportation of material through labour	Health & Safety	Minor And major injuries, can even lead to fatalities in case of ignoring safety practices	Various construction sites throughout project corridor	During construction	low	Safety signals will be installed on all temporary routes During construction. Strict enforcement of traffic rules and regulations. Workers will be provided safety equipment such as helmets, masks, and safety goggles.	Contractor	NHA, supervision consultant Environment Specialist, Contractor

Project Activities	Type of Impact	Potential Impacts on Environment	Where the Impact is likely to happen	When the Impact is likely to Occur	Magnitude of Impacts	Mitigation Measures	Institutional Responsibility	
							Implementation	Supervision
						A readily available first aid unit, dressing Materials, ambulance, and nursing staff will be ensured at critical locations. Road safety education will be imparted to drivers of construction vehicles. Traffic management will be ensured during Construction periods. Information dissemination through newspaper, radio and / or TV and banners etc. about project time frame, activities causing disruption and temporary arrangements for public relief must be ensured.		
Loss of Access	Traffic congestion	Air pollution & fatigue	Various construction sites throughout project corridor	During Construction	Minor if properly mitigated	Alternatives and temporary accesses will be provided at all interchanges, bridges, and culverts, in congested areas. Such diversions will have proper drainage facilities.	Contractor	NHA, Environment Specialist, Contractor
Health and safety at work place	Health risks if work conditions provide unsafe and / or	Worker injury	Valid for entire construction area	At establishment of camp sites and	High	Drainage, sanitation, and waste disposal facilities will be provided at work places. Drainage will be	Contractor	NHA, Environment Specialist, Contractor

Project Activities	Type of Impact	Potential Impacts on Environment	Where the Impact is likely to happen	When the Impact is likely to Occur	Magnitude of Impacts	Mitigation Measures	Institutional Responsibility	
							Implementation	Supervision
	unfavorable work conditions		throughout construction period	construction period		maintained to avoid water logging, which leads to mosquitoes and disease. Suitable sanitation and waste disposal facilities will be provided at camps by means of septic tanks and soakage pits, etc. Sufficient water supply will be maintained at camps to avoid water-related diseases and to secure workers' health. Health education & preventive medical care will be provided to workers. Routine medical checkup of workers to avoid Communicable disease Provide basic medical training to specified work staff, and basic medical services and supplies to workers ❖ Layout plan for camp site indicating safety measures taken by the contractor, e.g. firefighting equipment, safe storage of hazardous		

Project Activities	Type of Impact	Potential Impacts on Environment	Where the Impact is likely to happen	When the Impact is likely to Occur	Magnitude of Impacts	Mitigation Measures	Institutional Responsibility	
							Implementation	Supervision
						material, first aid, security, fencing and contingency measures in case of accidents ❖ Work safety measures and good workmanship practices to ensure no health risks for labourers ❖ Protection devices (ear muffs) be provide to the workers operating in high noise generating machines, blasting ❖ Proper maintenance of facilities for workers ❖ Regular pest control measures in dormitories ❖ Obligatory warning of work staff if pest hazard is imminent or detected ❖ Awareness campaigns for protection from AIDS / HIV / Hepatitis		
Digging borrow pit areas	Physical environment	Borrow pit collect water, material mosquitoes	The entire length will require fill to raise the level of the carriageway	Early in construction	Low	❖ Used approved borrowed areas. Borrow roads made good on completion of the contract ❖ Inspection of sites ❖ Borrow pits shall be dewatered and fences	Digging borrow pit areas	NHA, supervision consultant Environment Specialist, Contractor

Project Activities	Type of Impact	Potential Impacts on Environment	Where the Impact is likely to happen	When the Impact is likely to Occur	Magnitude of Impacts	Mitigation Measures	Institutional Responsibility	
							Implementation	Supervision
						should be provided as appropriate, to minimize health and safety risks.		
Laying of asphalt	Physical Environment	Emission of dust and fumes from asphalt plant; Runoff of hydrocarbons during “curing” period	In asphalt batching plant area One length of road where surface laying is taking place	In latter stages of construction Within 48 hours of laying of asphalt	Low if laying of asphalt does not occur in rain	❖ Ensure Workers use appropriate clothing ❖ Lay asphalt during dry periods	Contractor	NHA, supervision consultant Environment Specialist, Contractor
Quarrying materials	Physical environment	Cuts scar natural hillsides	In mountain section	During construction	Low fill should be available	❖ Use existing quarry sites	Contractor	NHA, supervision consultant Environment Specialist, Contractor
Construction of structures, bridges / culverts.	Socio-cultural	Severance to local population	At points where road crosses established tracks	During construction	Low if provision for crossings is gives	❖ Ensure provision of adequate crossing points ❖ Work on irrigation canals shall be kept to a minimum to avoid disrupting water supplies to crop lands. Damaged irrigation canals shall be repaired immediately.	Contractor	NHA, Environment Specialist, Contractor
Planting trees	Ecological	Introduction of appropriate species	Alongside new road	After Construction	Medium	❖ Use Forest Departments to select appropriate plats. Require approved plan to be prepared and used	Forestry Department	NHA, supervision consultant Environment
	Socio-cultural	Trees create	Where trees	Once trees	Medium			

Project Activities	Type of Impact	Potential Impacts on Environment	Where the Impact is likely to happen	When the Impact is likely to Occur	Magnitude of Impacts	Mitigation Measures	Institutional Responsibility	
							Implementation	Supervision
		safety hazard	are planted	have matured		❖ Planting scheme to include shrubs close to road as barrier		Specialist, Contractor
Removal of Construction Camp	Socio-cultural	Adverse effects on residents	At camps	After completion of construction	Low if correct closure plan implemented	❖ Supervise and enforce closure plan Monitor	Contractor	NHA, supervision consultant Environment Specialist, Contractor
Closure Plan								
Clearing site	Damage not restored on departure	Loss land	Site in contractor custody	Completion stage	Medium	❖ Borrow roads made good on completion of the contract ❖ Supervise and enforce closure plan. Monitor	Contractor	NHA, supervision consultant Environment Specialist, Contractor
Discharge Control								
Drinking water	Water born disease	Workers/labour health	Const camp	Throughout construction period	Medium	❖ Contractor will ensure the Provision of safe drinking water to all the workers / labour ❖ Water quality should conform PEQS/WHO standards ❖ Should be reconfirmed once during construction phase	Contractor	NHA, supervision consultant Environment Specialist, Contractor
Waste water discharges	Water pollution	Contamination of water sources	Contractor Camp sites	Throughout construction period	Low	❖ Suitable sanitation and waste disposal facilities will be provided at camp by	Contractor	NHA, supervision consultant

Project Activities	Type of Impact	Potential Impacts on Environment	Where the Impact is likely to happen	When the Impact is likely to Occur	Magnitude of Impacts	Mitigation Measures	Institutional Responsibility	
							Implementation	Supervision
						means of septic tank linked with soaking pits. ❖ All discharges should be in compliance with PEQS through a certified laboratory ❖ Should be verified on monthly basis		Environment Specialist, Contractor
Noise from construction Equipments	Physical Construction site including road approaches	Noise and vibration nuisance to surrounding communities. Impact will be mainly limited to pile driving and compaction of access road.	Valid for entire construction area throughout construction period	At establishment of camp sites and construction period	High	❖ Maintenance of vehicles, equipment and machinery will be regular and to the satisfaction of the Engineer, to keep noise from these at a minimum. All vehicles and equipment used for construction will be fitted with exhaust silencers. During routine servicing operations, the effectiveness of exhaust silencers will be checked and will not exceed the prescribed limit of PEQS	Contractor	NHA, supervision consultant Environment Specialist, Contractor
Vehicular movement and operation of machineries	Emission from construction vehicles and machinery, causing public health risks, nuisance and	Dust and other emissions	Workshops at Contractor Camp sites	Throughout construction period	Low	❖ All temporary service and access roads be regularly to minimize the dust generation : Haul roads to be dust controlled, all vehicles carrying loose friable material to be	Contractor Approved Labs	NHA, supervision consultant Environment Specialist, Contractor

Project Activities	Type of Impact	Potential Impacts on Environment	Where the Impact is likely to happen	When the Impact is likely to Occur	Magnitude of Impacts	Mitigation Measures	Institutional Responsibility	
							Implementation	Supervision
	other impacts on the bio-physical environment					covered ❖ All machinery and plants will be placed at min. 300m at downwind direction to human settlements ❖ All vehicles, equipment and machinery used for construction be regularly maintained to ensure that the pollution emission levels conform to the PEQS ❖ Air quality parameters be monitored at determined sites on monthly basis ❖ Incorporate design features enabling continuation traffic flow and traffic jams ❖ Water will be sprinkled to avoid kick off dust.		
Generation of Dust	Dust generation from construction machineries causing health risks to operating workers, impact on biophysical environment	Dust emissions from crusher and screening plant Emission of dust and fumes from asphalt plant	At sites of plants, crushers	Throughout construction period	High	❖ Ensure precautions to reduce the level of dust emissions from, mixers, plants, crushers and batching plants, e.g. providing with dust extraction units. Crushers to be fitted with dust suppression equipment. Plant to have suppression	Contractor	NHA, supervision consultant, Environment Specialist, Contractor

Project Activities	Type of Impact	Potential Impacts on Environment	Where the Impact is likely to happen	When the Impact is likely to Occur	Magnitude of Impacts	Mitigation Measures	Institutional Responsibility	
							Implementation	Supervision
						equipment. ❖ Water will be sprayed in lime / cement and earth mixing sites ❖ Work safety measures like dust masks and appropriate clothing be used to ensure no health risks for operators ❖ Equipment be well maintained ❖ Asphalt plants be located 300m away from populated areas (downwind) and may have wet scrubber ❖ Water Sprinkling will be carried out		
Transportation of materials, and other construction activities that create dust and emissions	Physical	Dust and emissions from machineries causing health risks to operators impacts on the bio-physical environment	Throughout Project Road Construction sites near the major settlements	During construction	Low	❖ Vehicles delivering loose and fine materials like sand and fine aggregates shall be covered to reduce spills on existing road. ❖ Ambient air quality monitoring be carried out in accordance to the EMP ❖ If monitored parameters are above the prescribed PEQS-limits suitable control measures must be taken	Contractor	NHA, supervision consultant, Environment Specialist, Contractor

Project Activities	Type of Impact	Potential Impacts on Environment	Where the Impact is likely to happen	When the Impact is likely to Occur	Magnitude of Impacts	Mitigation Measures	Institutional Responsibility	
							Implementation	Supervision
Disposal of waste from rehabilitation works	Physical Health Risk	Degrading Soil and Water Quality	Project Road Construction sites near the major settlements	Construction	Low	❖ All construction waste collected ❖ Site kept tidy and no waste allowed building up in yard. ❖ Disposal sites to be kept away from the localities (preferably 300 meters / at least 500 meters)	Contractor	NHA, supervision consultant Environment Specialist, Contractor
FAUNA AND FLORA : Wildlife & Adjacent Ecological Sensitive Areas								
Access to sensitive areas fragile ecosystem	Poaching on wildlife plants, disturbance of nullah habitats	Disturbance to ecological sensitive area adjacent or near roads	Near nullah banks	Throughout construction period	Low	❖ The use of fire wood for cooking and execution of works be prohibited ❖ No open fires be allowed ❖ Restoration of vegetated areas ❖ Strict instruction from the Contractor to work staff (particularly the cooks) with respect to poaching local wildlife ❖ Signage for wildlife crossing to raise attention ❖ Assist in public awareness programs ❖ Special bushes / plants for sandy areas along road way ❖ Patrolling and enforcement	Contractor	NHA, supervision consultant, Environment Specialist, Contractor
Use of local resource and	Competition for natural		Agricultural area with	Throughout construction	Low	❖ Water supply / sanitation facilities labour not	Contractor	NHA, Environment

Project Activities	Type of Impact	Potential Impacts on Environment	Where the Impact is likely to happen	When the Impact is likely to Occur	Magnitude of Impacts	Mitigation Measures	Institutional Responsibility	
							Implementation	Supervision
products	resources, e.g. with farmers, livestock raisers and nomads for range land & water		tube well and canal irrigation limited water availability	period		exacerbate the existing shortages and environmental hazard; Contractors should primarily seek its own sources of water by deep well boring at 4–5 locations in due distance (min. 1 km) from local user's wells. ❖ Ensure labour do not exploit adjacent forest resources is ban on tree cutting		Specialist, Contractor
Environmental Enhancements								
Roadside Landscape Development			Various construction sites throughout project corridor	During Construction	low	❖ Avenue plantation of mixed specie aesthetics trees, shrubs, and aromatic plants will be carried out.	Contractor	NHA, Supervision consultant, Environment Specialist, Contractor
Roadside Amenities			Various construction sites throughout project corridor	During Construction	low	❖ Provision of bus shelters, bus bays, petrol pumps, restaurants, recovery areas and truck stops as per detailed design will be carried out. ❖ Road furniture including footpaths, railings, traffic signs, speed zone signs, wildlife warning boards,	Contractor	NHA, supervision consultant, Environment Specialist, Contractor

Project Activities	Type of Impact	Potential Impacts on Environment	Where the Impact is likely to happen	When the Impact is likely to Occur	Magnitude of Impacts	Mitigation Measures	Institutional Responsibility	
							Implementation	Supervision
						etc. will be erected at suitable places		
Cultural Properties	Socio economic / cultural		Various construction sites throughout project corridor	During Construction	low	❖ All cultural properties will be enhanced and the access roads will be provided, wherever required	Contractor	NHA, supervision consultant, Environment Specialist, Contractor

TABLE – 11.2 : ENVIRONMENTAL MONITORING PLAN

Environmental Quality	Parameters	Details of Location	Standards / Guidelines	Responsibility	Monitoring Frequency	Monitoring Duration
Air Quality	PM ₁₀ , Stacks (exhausts) emissions of vehicles / equipments used for construction (CO, NO _x , SO _x Smoke)	Construction area along the road	PEQS	Contractor	One Time during the Construction hours on each section of road	Continuous for 24 hours or one full working day
	PM ₁₀ all parameters as mentioned in PEQS for air	Three locations along the road	PEQS			Continuous for 24 hours or over one full working day
Water Quality	Drinking / Ground Water : Total Coliforms, Fecal Coliform, Total Colonial count, Fecal Enterococci, pH, TDS, Total Hardness, Nitrate, Chloride, Sodium) and all parameters as mentioned in PEQS for drinking water quality	Up to five locations along the road	National Drinking Water Quality Standards	Contractor	One time during construction period on each road package	Grab sampling
	Surface Water : pH, TDA, Total Hardness, Nitrate, Chloride, Sodium, grease & Oil	Up to five locations along the road	PEQS	Contractor	One time during construction period on each road package	Grab sampling
Waste Water	Wastewater : pH, TSS, BOD ₅ , COD and all parameters as mentioned in PEQS for effluents	Up to five locations along the road	PEQS		One time during construction period on each road package	Grab Sampling

Environmental Quality	Parameters	Details of Location	Standards / Guidelines	Responsibility	Monitoring Frequency	Monitoring Duration
Noise Levels	Noise Levels on dB (A) Scale	At equipment yard and construction site and during pile driving 7 meters from noise source	PEQS	Contractor	Once in a month during construction period on each package	24 hours @ 15 seconds internal over 15 min every hour, then averaged
		Not less than one location 15 meters from the edge of pavement and at locations of all potentially affected sensitive receptors	PEQS for Noise			24 hours @ 15 seconds internal over 15 min every hour, then averaged
For Operation Phase						
All Environmental Aspects	All Environmental Parameters	On all Road sides	PEQS	Executive Engineer of the area	As per EPA Laws	As per EPA Laws

TABLE – 11.3 : ENVIRONMENTAL MANAGEMENT COST

ENVIRONMENTAL COMPONENT	QUANTITY	AMOUNT (PKR)	DETAILS	REMARKS
A. Environmental Management Cost				
Health & Safety Measures : This will include the provision of Personnel Protective Equipments (PPEs) (Shoes, Gloves, Goggles, Helmets, First Aid Kit etc.) to be provided at the site for workers Workers Communicable Disease Screening Test	Lump sum	2,000,000.00	The workers are required to provide the PPEs for work site safety precaution and to avoid any safety hazard.	Amount to be included in the Project Budget.
B. Environmental Monitoring Cost				
(i). Air Quality Monitoring (as per EPA Standards)	20	410,000.00	01 Sample @ Rs. 20,500 / Sample	Amount to be included in Project Budget
(ii) Water Quality Monitoring (as per EPA Standards)	11	137,500.00	01 Sample @ Rs 12,500 / Sample	Amount to be included in Project Budget
(iii) Noise Level Monitoring (as per EPA Standards)	20	30,000.00	01 Sample @ Rs 1,500 / Sample	Amount to be included in Project Budget
Sub Total (B)		577,500.00		
C. Training to Staff and Cost of Environment Manager				
- In-country training of three officers in the road-related environmental issues. - Training Workshops of the projects for NHA, PIU, Supervision Consultants, Contractor & others - Training for data analysis, management, and application to the job scenarios of three officers.		2,322,500.00	Training related with the EHS and Ergonomics etc. for awareness	Required for implementation of true spirit of EMP

ENVIRONMENTAL COMPONENT	QUANTITY	AMOUNT (PKR)	DETAILS	REMARKS
D. Tree Plantation Roadside Tree Plantations of Endemic / Local Species		4,000,000.00	Landscaping around the road, establishment of green belt and compensation plantation will be done.	Required for implementation of true spirit of EMP
E. Solid Waste Management Excavated Material Disposal Hazardous Material Handling and Storage		10,000,000.00	Solid Waste management according to pollution prevention principles.	Amount to be included in the Project Budget.
TOTAL ENVIRONMENTAL MANAGEMENT AND MONITORING COST IN PKR (A + B + C + D+ E)		20,000,000.00	Summing up A, B, C, D, E	Amount to be included in the Project Budget

11.6 ENVIRONMENTAL MANAGEMENT TEAM ALONG WITH THEIR ROLES AND RESPONSIBILITIES

Administrative arrangements for implementation of project.

Ministry of Communication and NHA are sponsoring and executing agencies respectively. NHA will hire Government approved Contractor for execution of the Civil works. However supervisory consultant will also be engaged for quality execution work. NHA owns project staff will remain full time at project site upto completion of the project.

NHA STAFF

SR. NO.	DESIGNATION	BPS	NO OF POSTS	Duration (Months)
1.	Project Director / Director (Engineer)	19	1	21
2.	Deputy Director (Engineer)	18	2	18
3.	Assistant Director (Engineer)	17	2	18
4.	Assistant Director (A/C)	17	1	18
5.	Surveyor	16	1	18
6.	Accountant / Superintendent	16	1	18
7.	Computer Operator	16	2	18
8.	Office Assistant	16	2	18
9.	Auto CAD Operator	11	1	18
10.	Qanoongo	11	1	18
11.	Patwari	5	1	18
12.	UDC	9	1	18
13.	LDC	7	2	18
14.	Photo Copy Machine Operator	5	1	18
15.	Driver	4	4	18
16.	Naib Qasid	1	4	18
17.	Chowkidar	1	3	18
18.	Sweeper	1	2	18

OPERATIONAL STAFF

SR. NO.	DESIGNATION	BPS	NO. OF POSTS
1.	Deputy Director (Engineer)	18	1
2.	Assistant Director (Engineer)	17	1
3.	Computer Operator	16	1
4.	LDC / UDC	7 / 9	2
5.	Driver	4	2
6.	Naib Qasid	1	2

AS PER GOVERNMENT RULES AND REGULATIONS

CONSULTANT STAFF

DESIGNATION	NO. OF POSTS
Chief Resident Engineer	1
Resident Engineer	2
Assistant Resident Engineer (Highways)	4
Assistant Resident Engineer (Structures)	4
Material Engineer	2
Quantity Surveyor	4
Resettlement Monitoring Expert	1
Inspector (Highways)	12
Inspector (Structures)	8
Surveyors	12
Surveyor Helpers	18
Draftsmen	4
Office Manger	4
Computer Operator	4
Peons	8
Drivers	12
Chowkidars / Guards	24

11.7 TREE PLANTATION PLAN

Tree planting is often used to enhance the appearance of roads and to provide a natural buffer between the road and adjoining land. If trees are selected without due consideration to the special needs of roads, they can generate safety and sustainability problems. Inappropriate species can cause environmental damage. Tree plantations on top of embankments and rights-of-way will serve as small forests and wood-lots for local residents, having tangible benefits in the form of timber, fuel wood, and fodder. Besides soil retention and erosion control, such plantations will also provide aesthetic and visual screens against sound, dust, wind, toxic emissions, night glare, and pollution of waterways.

Tree plantation plan has been prepared for the proposed project keeping in view the design and length of the project. This plan is based on best possible estimations and can be modified accordingly at the execution stage. A total number of 5000 trees are to be planted in linear pattern, keeping the distance from plant to plant as 4 meters and also 4 meters between 2 rows of plants for 18 km length of the proposed project.

11.7.1 Trees Recommended

Following tree species are recommended, in general, for planting to create aesthetic as well as shade effect along the roadside. It is also recommended that 4 to 5 years old plants should be procured for the purpose.

TABLE – 11.4 : TREES RECOMMENDED FOR LINEAR PLANTING

SR NO.	LOCAL NAME	SCIENTIFIC NAME
1.	Neem	Azadirachta indica
2.	Kikar	Acacia Nilotica
3.	Sheesham	Dalbergiasisso

11.7.2 Cost

The cost of raising 5000 plants has been estimated budget has been allocated in EMP, earthwork, procurement of manures, continued supply of water to young plants throughout the year and its maintenance for five (5) years.

11.8 TRAFFIC MANAGEMENT PLAN

Contractors will develop and adhere to Traffic Management Plans throughout the construction phase of the Project. Safety of site access roads and intersection with classified road network is paramount. Safe sight distance and appropriate signals will be maintained. Suitable vehicles parking and storage area will be providing onsite and maintenance of construction vehicles will be providing onsite, with regular inspection of lighting system, brakes and tires.

The construction activities can potentially impact for the residents and use of construction vehicles on the roads in the project area. A Traffic Management Plan will be implemented that will aim at ensuring uninterrupted traffic during the construction hours. Where applicable to the activities being undertaken, contractors will identify measures in their Traffic Management Plans consistent with the measures described below related to :

- ❖ Road Safety Signs
- ❖ Diversion, Speed Limit Signs
- ❖ Control of and Restrictions for Project Roads;
- ❖ Access Roads to be Decommissioned after Project use; if available
- ❖ Traffic Control Measures;
- ❖ Brake Checks;

11.8.1 Objectives of TMP

The traffic must be managed to ensure :

- ❖ The continuous, safe and efficient movement of traffic for both the public and workers.
- ❖ The capacity of the Local Roads is maintained,
- ❖ Delays and disruptions are kept to a minimum.

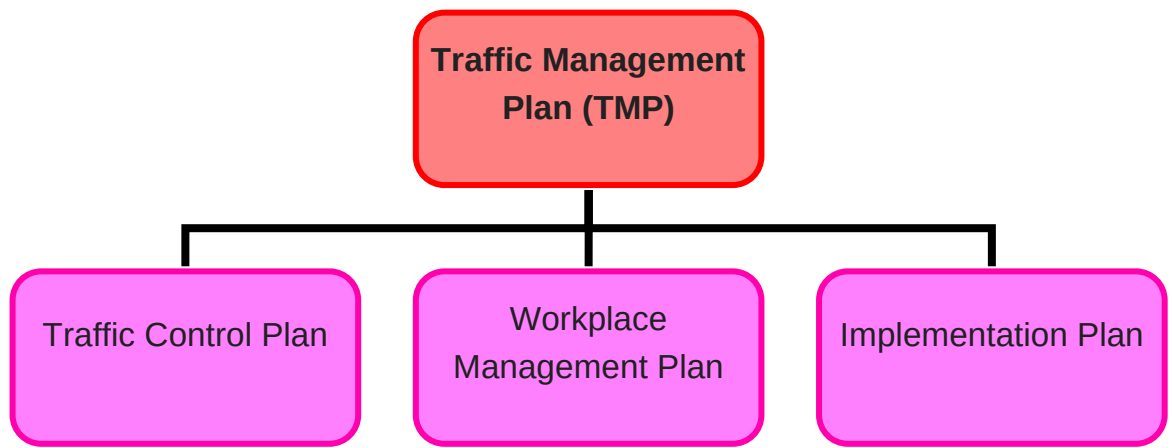


FIGURE – 11.1 : OBJECTIVES OF TMP

11.8.2 Responsibilities of Workers

Workers include logistics workers, operators, drivers, and so on.

Their responsibilities include :

- ❖ Follow workplace traffic instructions and safety warnings or signage's at the workplace;
- ❖ Attend workplace traffic safety and health training or briefing sessions
- ❖ Only operate plant or equipment if they hold valid licenses, possess the relevant safety certification and have been given the authorization to do so
- ❖ Observe emergency procedures, instructions and arrangements as established and instructed
- ❖ Operate equipment with care and do not use equipment (including vehicles) beyond their capacity or designated purpose
- ❖ Use all safety devices and PPE as provided
- ❖ Never misuse, interfere with or modify any of the devices or equipment
- ❖ Report any damage, malfunction or suspected defect of plant, equipment, safety device or PPE to their respective supervisor
- ❖ Report accidents, incidents, diseases and any workplace hazards to the supervisor or person-in-charge
- ❖ Suggest ways to improve traffic safety at the workplace if they identify any lapses during the course of work.

11.8.3 Advance Warning Area

The advance warning system must change the driver's normal expectation of the roadway situation, and inform him of what to expect.

11.8.4 Signing

Advance warning signs are intended to provide adequate time (and distance) for the driver to perceive and react to the condition ahead.

11.8.5 Flags / Warning Lights

Red flags attached to a sign attract attention during daytime operations, and should be considered for application on the first advance warning sign. Flash warning lights add emphasis during nighttime operations.

11.8.6 Rumble Strips

Rumble strips present vibratory and audible warnings, which alert drivers. They are used with the first warning sign or any other arrangement approved by Engineer.

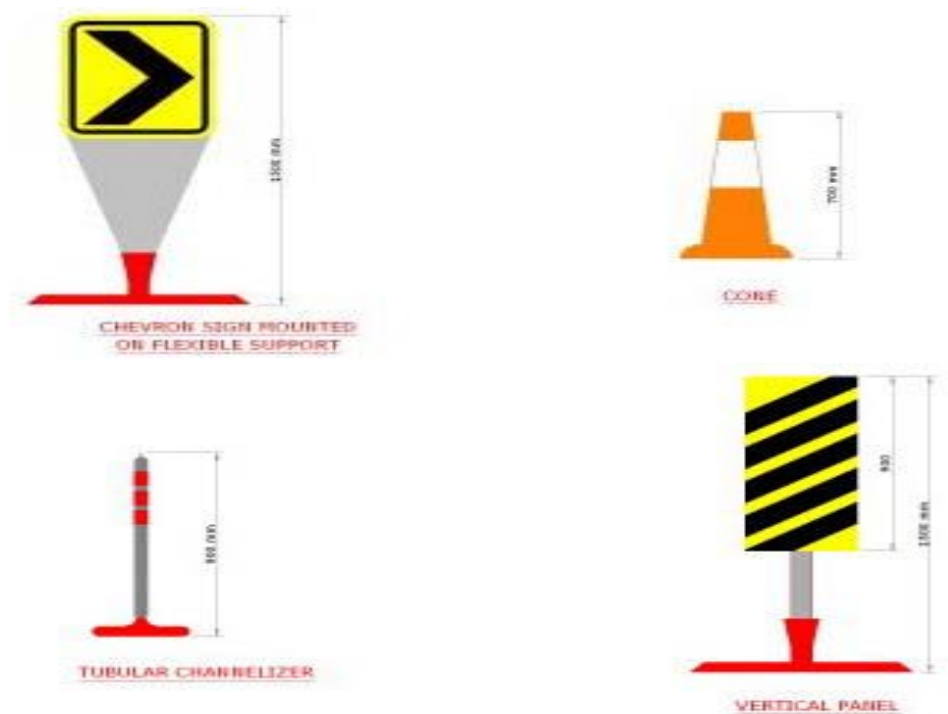
11.8.7 Speed Reduction

A basic principle of good temporary traffic control is that traffic movement should be inhibited as little as practical. Drivers will reduce their speed only if they clearly perceive a need to do so.

11.8.8 Requirement for Transition Area

- ❖ Tapers
- ❖ Channelizing Devices
- ❖ Chevron Sign

The Chevron sign should be used on curves and tapers to supplement other devices and provide additional emphasis and guidance for the motorist. Spacing shall be such that at least three Chevron signs are always visible to the motorist. Chevron signs shall be mounted on flexible supports.



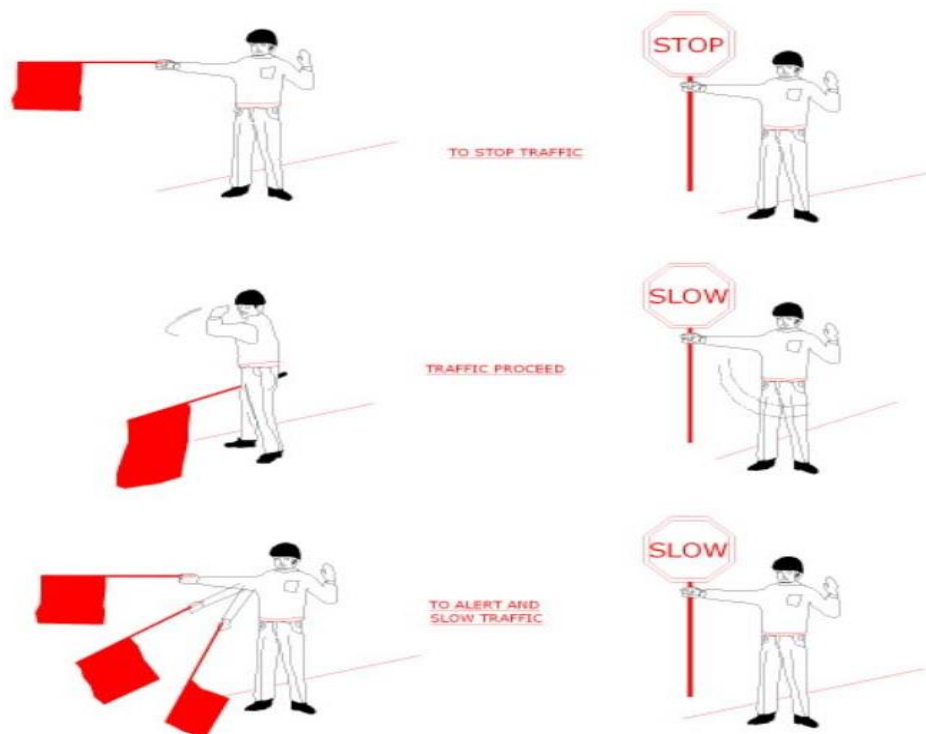


FIGURE – 11.2 : CHEVRON SIGNS

11.8.9 Buffer Area

The Buffer Area separates traffic flow from the work activity. It provides a recovery space for errant vehicles and safety for workers. Design guidelines for the buffer space include :

- ❖ The buffer space length must be at least as long as the taper length.
- ❖ Channelization devices shall be spaced every 10 meters along the parallel portion of the buffer area.

11.8.10 Working Area

It is preferred that an approved barrier by NHA be used to separate traffic from the Work Space. Concrete portable crashworthy safety barriers are an example of a barrier that prevents vehicles from penetrating work areas, and also minimizes vehicle occupant injuries. However, type of barrier to be used can be decided at site depending upon the duration of work in working area, availability of material and traffic volume.

11.8.11 Termination Area

The downstream end of the work site may require a closure taper to reduce the chance of a vehicle coming from the opposite direction entering the work site at high speed. The closure distance from the work site, including taper, is usually a distance of 50 meters.

11.8.12 Flagging Procedures

Flaggers must be well trained and must be provided frequent relief during the flagging operation. The flagger must wear a reflective safety vest and should be positioned at least 150 meters upstream of the work site. Illumination must be provided when flaggers are operating during nighttime conditions. In preparing a layout of traffic control devices, the used distance guidelines shown in the application diagrams. Beginning at the Work Area, workers work back through the Buffer Area, the Transition Area and the Advance Warning Area.

Typical application diagrams are presented on the following pages for a variety of highway conditions. These are not intended as a substitute for engineering judgment. Typical applications can be altered, when necessary, to fit the conditions of a particular temporary traffic control zone.

Upon completion of the above procedure, the supervising Engineer at site must inspect in the field, the location where the initial sign in the Advance Warning Area is to be placed. The initial sign must be visible to incoming traffic for a long distance. If necessary, additional signs must be placed to assure good visibility.

A trained person is proposed to be assigned the responsibility for safety at the work site. He must monitor operations when the site is initially opened and at routine intervals, both day and night, and assure that all traffic control elements are effective in providing safe conditions for both motorist and workers. He is expected to implement changes, when necessary, to assure safe conditions.

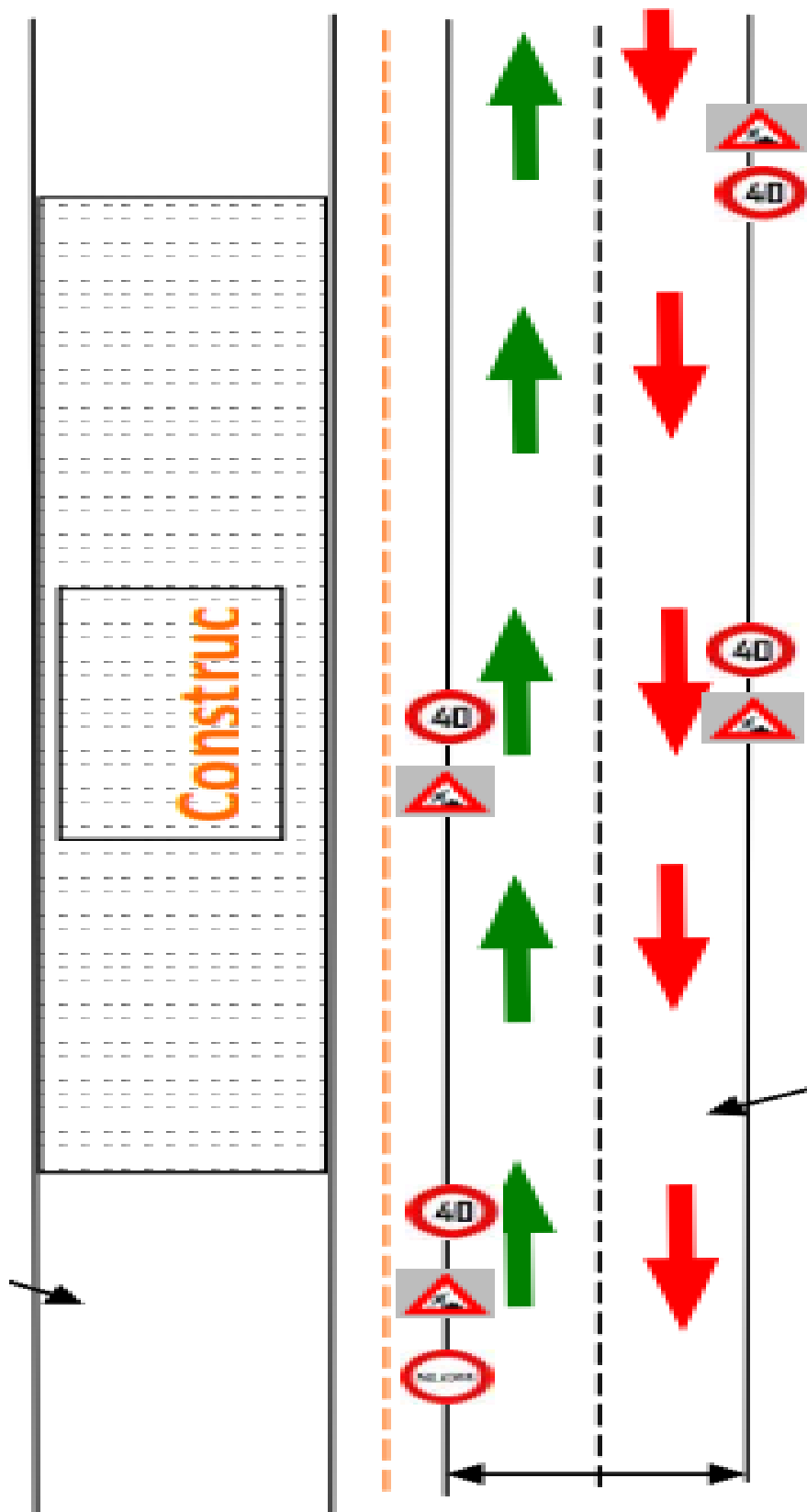


FIGURE – 11.3 : TRAFFIC DIVERSION SIGNS

11.9 MUCK DISPOSAL PLAN

Environmental Management Plan for the disposal of muck generated by the road construction. The Plan was developed on the basis of the specifications and recommendations provided in the Manual for Developing Environmental Management

Plans for Works under Concession, published by the Ministry of Public Works (2004). In particular, it establishes the environmental considerations for operating the muck disposal sites to be implemented during the road construction phase.

11.9.1 Objective

The objective of the Environmental Management Plan is to provide the data on the location of the muck disposal sites, the related activities of the construction phases, the identification and assessment of associated impacts, the control, mitigation and restoration measures, and the monitoring plan.

The selection of locations, the design and the management practices relating to the muck disposal sites were all based on technical, environmental and safety criteria

11.9.2 Location

In selected barren spots as allowed/approved by Resident Engineer.

11.9.3 Description of Activities and General Environmental Criteria

The activities and environmental criteria associated with the setup, management and abandonment of the muck disposal sites are discussed below, based on the Manual for Developing Environmental Management Plans for Works under Concession.

The measures adopted during the setup, operation and abandonment phases of the muck disposal sites will be implemented by the works contractor.

11.9.4 Muck Disposal Site Setup

The activities involved in setting up the muck disposal sites include :

(i) Identifying the Work Areas

The location of the muck disposal site followed the environmental criteria.

(ii) Topographic Layout

The filling sites have been located adjacent to natural elevations, so that the filling terraces will provide continuity to the area's general morphology. When setting up the disposal sites, care will be taken to ensure that the height of the dumps and their final form at closure adapt to the topographical features of the area where they are located.

(iii) Rehabilitating Access Roads for Muck Disposal Operation

As long as the muck disposal sites are operational, access to the deposit areas will be controlled. The public roads to be used to access the muck disposal sites will be rehabilitated with the traffic solutions and signaling proposed by the study of the road capacity

(iv) Installing Safety Signs

Safety signs will be installed for the protection of workers and visitors.

11.9.5 Muck Disposal Site Operation

Deposition Mechanisms

During the operation phase of the muck disposal sites, the following measures will be adopted to protect the environment :

- ❖ People who are not involved in the works and animals will not be allowed in the muck disposal sites. For this purpose, fences with gates and controlled access points will be installed.
- ❖ The areas surrounding the muck disposal sites, as well as the access roads, will be kept clean of excavated material, dampened and perfectly passable.
- ❖ All roadways used by project-related equipment and vehicles will have an adequate signalling system.
- ❖ Equipment and vehicle traffic will be restricted to the access points and roads designated for Project works. The contractor will be responsible for clearly delimiting the roadways and parking areas to be used for carrying out activities, and ensuring that unauthorized areas are not used.
- ❖ Dumping of organic waste, scrap, wood, paper, mud, petroleum derivatives and hazardous waste will be prohibited.
- ❖ Burning of waste material will be prohibited.
- ❖ The muck disposal sites will not accept construction debris. The latter will be transported to an authorized dump site.

Equipment

The operation of the muck disposal sites requires the following equipment :

Dump trucks and Haulage trucks will transport waste to the disposal sites.



FIGURE – 11.4 : MACHINERY USED FOR DISPOSAL OF MUCK

Muck Disposal Site Abandonment

Site abandonment activities include :

- ❖ The final shape of each deposit will fit into the local topography. The terraces will be levelled to form a flat surface, and the slopes resulting from the piling and compacting of the waste material will be graded. The finished slopes will not exceed 30% to prevent landslides and water erosion.
- ❖ All temporary structures or facilities set up by the contractor will be removed, together with the signalling system.
- ❖ Sterile material will be covered with scarified soil from the slopes of the dump itself, the roads and other above-ground works. The thickness of the cover will be of at least 20 cm.

Period of Use

The period of use will vary across muck disposal sites, depending on the rate of progress of the work front, and the site's storage capacity and shape.

In general, muck disposal sites will operate parallel to the daily activities at the work fronts.

To the extent possible, disposal site activities involving the use of equipment will be carried out during the day.

11.9.6 Rainwater Management

Although construction period will produce inert material, the residual water that could eventually result from the contact of the muck with rainwater or snow will be controlled as follows :

- ❖ The ground surfaces of the muck disposal sites will be graded so that rainwater runoff is directed outward.
- ❖ Trenches dug along the perimeter of contact between the sites and the ground surface will stop runoff from adjacent terrains

11.10 BATCHING AND ASPHALT PLANT MANAGEMENT PLAN

The Contractor shall ensure the use of a relatively new, well maintained hot mix plant (batch type) so that any emission conforms to the PEQS norms and be fitted with a dust extraction unit to avoid prolonged engine powered equipment illness. Hot mix plant, WMM plant, batching plant, generator set & crusher shall be located more than 500 m from any community or residence. The concessionaire has to obtain necessary consent / clearance from state pollution control board to operate hot mix plant, WMM plant, batching plant & crusher before commencement of works. All vehicles, equipment and machinery needed for construction will be regularly maintained to ensure that pollution emission levels conform to PEQS norms. All vehicles will be fitted with silencers.

Construction vehicles, machinery & equipment will move or be stationed in designated areas to avoid compaction of soil to ensure the preservation of the top soil for agriculture.

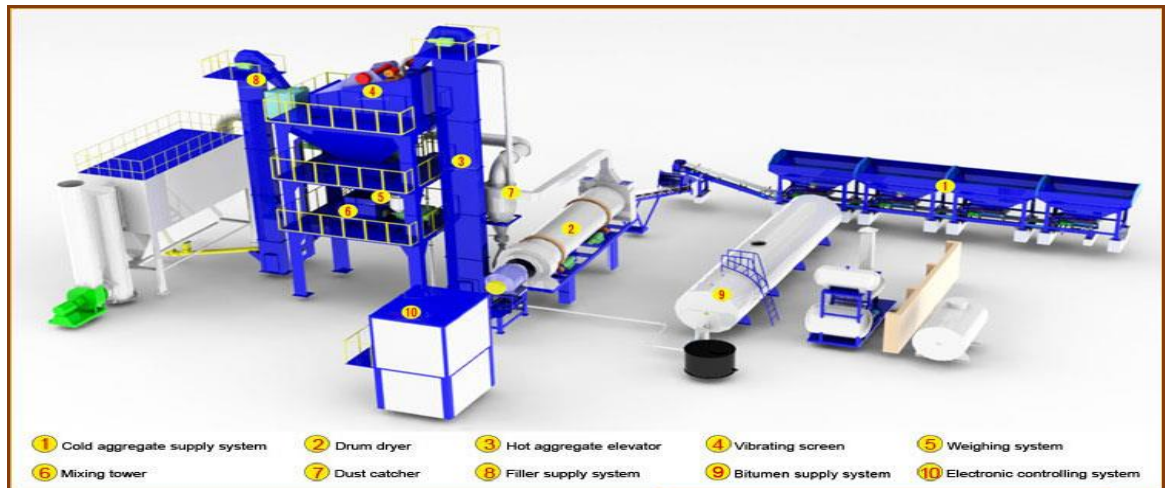


FIGURE – 11.5 : TENTATIVE DESIGN OF ASPHALT PLANT

Where it is necessary to use some such substance which can cause injury to the health of the workers, the contractor shall provide suitable protective clothing or appliances to his workers, viz. Earplugs, helmets or dust masks. Additionally following management measures will be adopted :

- ❖ The asphalt plant will be equipped with pollution control devices. According to the specification; no gases emissions will result from asphalt plant operation itself.
- ❖ Insuring proper operation conditions such as sufficient flame volume, clean combustion to ensure lowers VOC's are produced.
- ❖ Provide the workers with all safety measures; including masks, ear muff, gloves and other safety means and periodic medical testing.
- ❖ Periodic maintenance and replacement of filters of the asphalt plant and generator wherever this possible
- ❖ For staff and persons whom will be working within noisy zone they will be supplied with personal protective equipment (PPE) in order not to impair on their health as a result of over exposed to noise. It is expected that all the noise generated during asphalt plant operations to be within the required norms. Moreover, the plant generators are all fitted with noise reduction equipment. The placement of a noise breaker screen at the site will also be further investigated if needed.
- ❖ For the sludge waste, it's dealt with the asphalt plant manager to use it to pave some surfaces to reduce the dust emission, or it can be reused and utilized through recycling it back into the asphalt.
- ❖ The domestic wastewater generated by the working staff at the asphalt plant will be disposed of in a septic tank which is acting as a holding tank with sealed bottom and walls and drained from time to time to wastewater septic Tanks. An official permit from the municipality will be gained by the contractor to dispose

this waste. Wastewater from wash basins (gray water) will be collected separately where there will be two separated sewage networks and used for irrigation and water sprinkling activities.

- ❖ The following measures will be adopted in order to ensure the effectiveness of safety within the premises.
 - ◆ To prevent bitumen burns it will be compulsory for the workers handling hot bitumen to wear full – body protection.
 - ◆ All transportation, handling and storage of bitumen will be handled by experienced personals.
 - ◆ The dust from the manufacturing processes may pose respiratory hazards, hence protective air masks will be provided to the operators of the loading and unloading of the aggregates.
 - ◆ Ear–muffs will be provided to those working at the plant.
 - ◆ First aid kit will be available on site for the workers in case of an emergency.
 - ◆ The material safety and data sheets (MSDS) for each chemical will be accessible on the site and display.
 - ◆ Safety signs will be posted throughout the site and entry and exit will be marked clearly.
 - ◆ Regular health checks will be conducted for employees and staff working at the asphalt plant.

12.0 PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

12.1 GENERAL

This section describes the outcomes of the stakeholder consultation process as part of the EIA report. The feedback from communities and other stakeholders, directly or indirectly affected by the project, was collected to adjust and improve the project's design, planning, and implementation, and help the implementation agency ensuring the project's environmental and social sustainability. The consultation process was carried out in accordance with the requirements of the Punjab EPA on public consultation.

The objectives of this consultation process were :

- ❖ To disseminate information on the project and expected project impact, both long-term and short-term, among primary and secondary stakeholders,
- ❖ To gather information on relevant issues so that the feedback received could be used to address these issues at an early stage,
- ❖ To determine the extent of the negative impacts of different project activities and to suggest appropriate mitigation measures.

12.2 PROPONENTS ENVIRONMENT MANAGEMENT TEAM

All possible impacts and mitigation measure related to the project were discussed with the proponent, management team and all the stake holders like

- ❖ Project Contractor
- ❖ NHA
- ❖ Service providers
- ❖ HSE
- ❖ Civil Workers
- ❖ Environmentalist
- ❖ Grievance Redress Committee (GRC)

Proponent assured to take all suggested mitigation measures to control any discrepancy arose by the project and to make the protect environment friendly. The following points were discussed during the public consultations : project components, project's activities and impacts as detailed below.

- ❖ Needs, priorities and feedback of the population regarding the project.
- ❖ Employment opportunities and livelihoods of communities.
- ❖ Contractor's camps and access to them
- ❖ Potential environmental issues
- ❖ Basis for determining the rates of the land, houses, and other infrastructure

12.3 THE RESPONSIBLE AUTHORITY

(i)	Sponsoring	Ministry of Communications
(ii)	Execution	National Highway Authority
(iii)	Operation and Maintenance	National Highway Authority
(iv)	Concerned Federal Ministry	Ministry of Communications

12.4 OTHER DEPARTMENTS AND AGENCIES

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

12.5 ENVIRONMENTAL PRACTITIONERS AND EXPERTS

Project Management Unit visited the project site, had discussion with stakeholders and consulted with the local people of nearby and other villages to evaluate the project socio-economic impacts. People of the area belong to different professions like mostly belong to employment, own businesses, doctors, some in abroad, in Army, teaching, in agriculture etc. women were also consulted for their point of view regarding the betterment of the area by this project, some of them communicated but according to social value of the area they mostly hesitate to communicate comfortably and get pictured. People provide the massive information about the project and have positive remarks regarding the project development. Maximum local people, responsible authorities, and other departments were consulted SDO, Canal Sub-Division, Punjab Irrigation Department, XEN, C&W. Highway Department, Assistant Executive Engineer, Pakistan Railway, Pakistan Railway, Agriculture Researcher.

12.6 IDENTIFICATION OF MAIN STAKEHOLDERS

During Environment and social impact assessment in the field, a series of consultations were carried out with a wide range of stakeholders including affected farmers, residents, departmental officials, business community along route, road users, students and general public. All these stakeholders have different types of stakes according to their stated and vested interests and involvements in various aspects in the project.

The aims of community and stakeholder consultations and information dissemination with PAPs during social impact assessment and EIA preparation were to :

- ❖ introduce project details, objectives, proposed implementation plan and strategies and potential impacts to the community members;
- ❖ identify the communal property and public infrastructure and facilities likely to be affected;
- ❖ identify the vulnerable social groups that may require special support;

- ❖ Identify various socially and culturally acceptable resettlement and other mitigation alternatives.

12.7 IDENTIFICATION OF STAKEHOLDERS

Two types of stakeholders can be distinguished : primary and secondary as detailed below :

12.7.1 Primary Stakeholders

The primary stakeholders are the ones directly affected by the project, as well as the general public residing in the project area. Accordingly, the consultations/ focus group discussions were conducted with primary stakeholders to share information about the proposed project, its expected impacts and to understand stakeholders' concerns by considering category of stakeholders.

12.7.2 Secondary Stakeholders

The secondary stakeholders are the representatives of Government Departments / Agencies involved in the planning, design, implementation and operation of the project, including various government departments such as :

- ❖ Local Government Department
- ❖ Forest and Wild Life Department
- ❖ District Coordinating Office–Additional (ADC)
- ❖ Pakistan Red Crescent Society

12.8 STAKEHOLDER CONSULTATION PROCESS

The overall strategy for stakeholder's consultation is as shown in table below :

TABLE – 12.1 : PROCESS OF STAKEHOLDER CONSULTATION

STAKEHOLDER	CONSULTATIONS		
Primary Stakeholder	❖ Information gathering and data collection. ❖ Information sharing about the project (disclosure) ❖ Opinion seeking (concerns and expectations) ❖ Grievance redress	❖ Focus Group Discussions ❖ Formal and informal Community meetings	❖ Base line Study ❖ Impact Assessment ❖ Inventory of Losses
Secondary Stakeholder	❖ Participation in the process ❖ Information gathering Authentication and validation of the process's verification of the record	❖ One on one meetings ❖ In–depth interviews ❖ Group meetings	❖ On need basis

Stakeholder consultation for this project was a planned process. The meetings were conducted to inform stakeholders about the project and how it may affect their lives / activities, and to record their concerns, whether real or perceived. Through the use of various tools the study team tried to involve the stakeholders in active decision-making. However, due to pandemic situations no large gathering was done.

12.9 PRIMARY STAKEHOLDERS CONSULTATION

Apart from gathering of quantitative data throughout project site, survey of the area of influence and survey of project's affected people and other local communities were conducted to share the information about the project and record people's concerns/ feedback associated with this project. As the proposed activities are providing better transport facilities by constructing new road, less APs are anticipated during the assessment.

12.10 TOPICS FOR DISCUSSION

The following points were discussed during the public consultations : project components, project's activities and impacts as detailed below.

- ❖ Needs, priorities and feedback of the population regarding the project.
- ❖ Employment opportunities and livelihoods of communities.
- ❖ Contractor's camps and access to them
- ❖ Potential environmental issues
- ❖ Basis for determining the rates of the land, houses, and other infrastructure, if falling in the RoW.

TABLE – 12.2 : LIST OF PRIMARY STAKEHOLDER'S CONSULTATIONS IN THE PROJECT AREA

DATE	LOCATION	NUMBER OF PARTICIPANTS	FEEDBACK	RECOMMENDATION IN EIA
17.12.2022	Chishtian	12	People were in favour of the project. People demanded the proper plan of commencement of the project and show concern of pollution during the construction.	It is recommended to implement the EMP with full spirit at site and inform the construction hours to the local to avoid any inconvenience.
17.12.2022	Chishtian	17	People were in favour of the project. People demanded the proper compensation of the damages, if any, and employment.	It is recommended to provide the maximum employment to the project area people.

DATE	LOCATION	NUMBER OF PARTICIPANTS	FEEDBACK	RECOMMENDATION IN EIA
19.12.2022	Chishtian	07	People were in favour of the project. People demanded the proper compensation of the damages, if any, and employment. They demanded early compensation against the loss of land.	It is recommended to provide the maximum employment to the project area people.
19.12.2022	Chak No 46/3R	10	Most of the people show positive response towards the project as it provides better transport and haulage facilities to the locals also.	Better management of resources will be done as it will not affect the local's property.
20.12.2022	Dahranwala	07	Most of the people were interested in project and their concerns were very much positive about project.	Proper coordination with the local people will make the project socially acceptable.
20.12.2022	Dahranwala	14	People demanded the smooth function of the business during the construction	It is recommended to implement efficiently the EMP during the project construction.

Meetings with stakeholders consisted of community consultation meetings, focus group discussions, and in–depth interviews.

TABLE – 12.3 : PUBLIC CONSULTATION SURVEY OF LOCAL PEOPLE

SR. NO.	NAME	ADDRESS	AGE (Y)	PROFESSION	EDUCATION	COMMENTS
1.	Sajid Lateef	Chishtian	38	Merchant	Primary	This project will create jobs opportunity for the local and the value of the nearby land will also increase
2.	Mian Aqib	Chishtian	40	Shopkeeper	Graduation	It is good for the economic and social life of the area. Road will provide easy access to market.
3.	Khadim Hussain	Chishtian	35	Autoshop	–	People will be able to reach big cities easily. This road will link the people of two provinces. Economy of the area will be boosted village at people will never migrated to big cities
4.	Muhammad Asif	Chishtian	31	Labour	Primary	We are thankful to the respective authority who have taken such a good step for the progress of this area we hope it would have some fruitful outcomes.
5.	Abbas Ali	Chishtian	18	Student	F.A.	The neighborhood individuals will partake in the advantages of the detour as it joins numerous provincial regions
6.	Imran Ali	Chishtian	56	–	–	Although there will be increase in traffic load and it will enhance the pollution level but in other hand this project will create jobs opportunity as well and provide the safe route to the locals.
7.	Waseem Rao	Chishtian	24	Medical Store	F.A.	We are thankful to the respective authority who have taken such a good step for the progress of this area we hope it would have some fruitful outcomes
8.	Hussain Ali	Chishtian	47	Railway	Matric	It is very good initiative taken by the authority but they should not destroy the environment and there should be green belt around the project area
9.	Sarfaraz Gondal	Chishtian	45	Shopkeeper	Middle	This project will create jobs opportunity for the local and the value of the nearby land will also increase
10.	Abdul Ghafoor	Chishtian	27	Shopkeeper	F.A.	This is acceptable advance accepted by the public authority as they are going improve the road condition and we trust this venture will create occupations opportunity for local people

SR. NO.	NAME	ADDRESS	AGE (Y)	PROFESSION	EDUCATION	COMMENTS
11.	Hammad Malik	Chishtian	22	Shopkeeper	–	I hope this a good step to improve the local area
12.	Amjad Ali	Chishtian	48	Shopkeeper	–	This project will create job opportunities for the locals
13.	Saqib Sultan	Chishtian	20	Shopkeeper	–	This project will provide job opportunity and will improve this area life style
14.	Amjad Ali	Chishtian	25	Hotel Owner	Middle	This project will create jobs opportunity for the locals and it will have positive outcomes
15.	Abdur Rehman	Chishtian	48	Shopkeeper	–	This is good step taken by the authority this project will increase the socio–economical value of the region
16.	Rana Haroon	Chishtian	42	LPG Sales Agent	Matric	The local people will enjoy the benefits of the road
17.	Rana Adnan	Chishtian	25	Shopkeeper	Matric	Although there will be increase in traffic load and it will enhance the pollution level but in other hand this project will create jobs opportunity as well
18.	Muhammad Rafiq	Chishtian	50	Butcher	–	This is good step taken by government Insha'Allah this will be beneficial for locals
19.	Naeem Ullah	Chishtian	25	Labour	–	This project will create job opportunity for the local so we believe this is good step taken by government
20.	Sheikh Jahanzaib	Chishtian	30	Food Stall	–	It is very good initiative taken by the authority but they should not destroy the environment and there should be green belt around the project area
21.	Mehboob Ahmed	Chishtian	35	Job	M.A.	This project will create jobs opportunity for the locals and it will have positive outcomes
22.	Tanveer Ahmad	Chishtian	44	Tailor	–	National Highway Authority working very good regarding Environmental and social point of view. We hope this project will create jobs opportunity as well it will not have any adverse impact on the locals.
23.	Idrees Ahmad	Chishtian	33	Shopkeeper	–	This project will create job opportunity for the local so we believe this is good step taken by government

SR. NO.	NAME	ADDRESS	AGE (Y)	PROFESSION	EDUCATION	COMMENTS
24.	Zahid Abbas	Chishtian	45	Driver	Middle	This is a good step taken by the government it will have some fruitful outcomes.
25.	Usman Sardar	Chishtian	34	Railway	–	This is good step taken by government Insha'Allah this will be beneficial for locals.
26.	Adil Jabbar	Chishtian	19	Student	–	We are glad that socio affordable worth of this space will build we demand Job inclination should given to the nearby individuals
27.	M. Ramzan	Chishtian	19	Student	1st Year	By the construction of this road safe route facilities to M–4 will be achieved that will be benefitted by locals.
28.	Abdul Rasheed	Chishtian	29	Shopkeeper	–	The local people will enjoy the benefits of the road.
29.	Shoukat Hayat	Chishtian	26	Teacher	M.A.	This is a good step taken by the government it will have some fruitful outcomes.
30.	Nawab M Akif Rao	Chishtian	26	Labour	–	We believe This project will have positive impact on the environment as well on the locals.
31.	Dr. Ahmad	Chishtian	42	Researcher	Ph.D	National Highway Authority working very good regarding Environmental and social point of view. We hope this project will create jobs opportunity as well it will not have any adverse impact on the locals.
32.	Ali Raza	Chishtian	25	Shopkeeper	F.A.	It is very good initiative taken by the authority but they should not destroy the environment and there should be green belt around the project area.
33.	Malik Faraz Ahmad	Chishtian	28	Driver	F.A.	This project will create jobs opportunity for the local and the value of the nearby land will also increase.
34.	Muhammad Aslam	Chishtian	30	Shopkeeper	–	We are happy that socio economical vale of this area is going to increase we request Job preference should given to the local people.

SR. NO.	NAME	ADDRESS	AGE (Y)	PROFESSION	EDUCATION	COMMENTS
35.	Bilal Ahmad	Chishtian	28	Shopkeeper	F.A.	During the construction and operation phase of the road SOPs should be follow strictly and they should work for the protection of environment.
36.	Muhammad Naveed	Chishtian	48	Private Job	Matric	This project will have positive impacts on this area as well trade in this area will increase due to this road.
37.	Waqar Jillani	Chak No. 46/3R	45	Police Officer	M.A.	This project will provide job opportunity and will improve this area life style as well.
38.	Ahmed Rao	Chak No. 46/3R	33	Police	B.A.	We are happy that socio economical vale of this area is going to increase we request Job preference should given to the local people.
39.	Muhammad Waqar	Chak No. 46/3R	32	Shopkeeper	Middle	This project will create job opportunities for the locals.
40.	Ejaz Hussain	Chak No. 46/3R	25	Shopkeeper	F.A.	We hope this project will have positive impact on the locals.
41.	Ijaz Altaf	Chak No. 46/3R	22	Pesticide Trader	F.A.	We believe This project will have positive impact on the environment as well on the locals.
42.	Yasir	Chak No. 46/3R	38	Motorcycle Showroom	Primary	This is a good step taken by the government it will have some fruitful outcomes.
43.	Muhammad Mushtaq	Chak No. 46/3R	35	Shopkeeper	–	We are thankful to the respective authority who have taken such a good step for the progress of this area we hope it would have some fruitful outcomes.
44.	Rizwan Khalid	Chak No. 46/3R	25	Student	Graduation	This project will provide job opportunity and will improve this area life style as well linkage with the big cities to the villages.
45.	Aamir	Chak No. 46/3R	38	Motorcycle showroom	F.A.	This is good step taken by the government as they are going construct road and we hope this project will generate jobs opportunity for the locals.
46.	Waqar Rao	Chak No. 46/3R	31	Govt Job	Graduation	I hope this a good step to improve the local area.
47.	Mahmood Ahmad	Dahranwala	32	Vegetable Merchant	–	This project will create job opportunity for the local so we believe this is good step taken by government.

SR. NO.	NAME	ADDRESS	AGE (Y)	PROFESSION	EDUCATION	COMMENTS
48.	Saeed Jutt	Dahranwala	38	Shopkeeper	Graduation	The local people will enjoy the benefits of the road.
49.	Abdul Rehman	Dahranwala	25	Shopkeeper	Intermediate	This project will create job opportunity for the local so we believe this is good step taken by government.
50.	Rohan	Dahranwala	16	Student	ICS	Better transport facility will be available better chance of employment will be available during construction and after construction roadside business will be generated.
51.	Mian Rao	Dahranwala	32	Medical Store	DAE	Although there will be increase in traffic load and it will enhance the pollution level but in other hand this project will create jobs opportunity as well.
52.	Nasir	Dahranwala	29	Job	Intermediate	This is good step taken by the authority as well local people will enjoy its benefit of the road this project will increase the socio-economical value of the region.
53.	Arif Khan	Dahranwala	35	Food Stall	Matric	This project will provide job opportunity and will improve this area life style.
54.	Shahbaz Khan	Dahranwala	26	Driver	–	This is good step taken by government Insha'Allah this will be beneficial for locals.
55.	Bilal Chaudary	Dahranwala	35	Shopkeeper	Matric	We hope this project will have positive impact on the locals.
56.	Abdul Riaz	Dahranwala	40	Shopkeeper	F.A.	During the construction and operation phase of the road SOPs should be follow strictly and they should work for the protection of environment.
57.	Iqbal Ahmad	Dahranwala	31	Fruit Stall	–	This is good step taken by the authority as they will generate jobs opportunities as well local people will enjoy its benefit of the road this project will increase the socio-economical value of the region.
58.	Muhammad Shahbaz	Dahranwala	26	Driver	Middle	This project will have positive impacts on this area as well trade in this area will increase due to this road.
59.	Kashif Gujjar	Dahranwala	25	Student	F.A.	This project will create job opportunity for the local so we believe this is good step taken by government.

SR. NO.	NAME	ADDRESS	AGE (Y)	PROFESSION	EDUCATION	COMMENTS
60.	Waqas	Dahranwala	50	Security Guard	F.A.	This is good initiative taken by the government we request for the job purpose the locals should be priorities.
61.	Murtaza Ali	Dahranwala	49	Private Business	Matric	This venture will set out positions freedom for local people and it will have positive results. Through this financial state of the space will likewise improve.
62.	Sagheer Ahmad	Dahranwala	28	Shopkeeper	Matric	We believe this project will have positive impact on the environment as well on the locals.
63.	Atif Hussain	Dahranwala	17	Student	F.A.	National Highway Authority working generally excellent with respect to Environmental and social perspective. We trust this task will set out positions freedom also it won't unfavorably affect local people.
64.	Abdul Rauf	Dahranwala	37	Fruit Stall	–	During the construction and operation phase of the road SOPs should be follow strictly and they should work for the protection of environment.
65.	Waleed Ahmad	Dahranwala	19	Student	1st Year	Better transport facilities will be available. It will connect many areas to main Highway.
66.	Muhammad Asif	Dahranwala	17	Shopkeeper	Middle	This is acceptable drive taken by the national authority we demand for the work reason local people ought to be needs.
67.	Shahbaz Chohan	Dahranwala	30	Job	B.A.	National Highway Authority working very good regarding Environmental and social point of view. We hope this project will create jobs opportunity as well it will not have any adverse impact on the locals.

12.11 CONSULTATION OUTCOMES

Overall, people expressed their wish for construction of the road and their support for the proposed project. The improvement of the roads was welcomed by the people as it will reduce traffic congestion and minimize other road hazards along the selected road section. Local communities demanded that they should be the part of a continuous consultation process, together with other stakeholders, during different stages of the project including design, construction, and operation. The concerns raised by the stakeholders / communities are described below :

- ❖ The design of the road must meet the international standards.
- ❖ The businesses of the people should not be affected due to project activities.
- ❖ Damage to any structure, if any should be properly compensated.
- ❖ The waste material should not be dumped in to the surface water body or along the road.
- ❖ Avoid undue delays in road construction and ensure that project works are carried out at a stretch rather than piecemeal.
- ❖ Avoid dumping construction material along the highway and median.
- ❖ Adopt measures to minimize dust, smoke, and noise pollution, and to control spillages from construction machinery.
- ❖ Provide proper diversions for traffic during construction to avoid traffic congestion, related hazards, and dust emissions.
- ❖ Carry out construction activities preferably at night to avoid traffic jams / hazards.
- ❖ Proper traffic management plan should be provided during construction activities.
- ❖ Job opportunities should be provided to the locals during construction activities.
- ❖ Safety of local residents along the road should be ensured.
- ❖ Erect cautionary and information signs.
- ❖ Control over–speeding, overloading, traffic disorders and violations of traffic regulations; construct speed breakers where required.
- ❖ Prohibit commercial vendors and squatters from encroaching on the ROW.
- ❖ Ensure that cross–drainage pipes and culverts are regularly cleaned.
- ❖ Regularly remove accumulated piles of rubbish from the ROW.

12.12 REDRESS OF STAKEHOLDERS CONCERNS

Most of the concerns raised by stakeholders have already been incorporated into the project's design and will be implemented through mitigation measures as described below :

SUGGESTIONS / CONCERNS OF STAKEHOLDERS	PREVENTION METHODS
Road Design	In response to stakeholders' concerns, the design at locations of social disruption may be considered by the Design Consultants that no residential and commercial entity will be affected by the project.

SUGGESTIONS / CONCERNS OF STAKEHOLDERS	PREVENTION METHODS
Road Safety	Road safety audits and improved road markings / signage and demarcation of accident-prone junctions will be made in order to improve the horizontal and vertical geometry, and reduce conflicting movement during operation, particularly along inhabited stretches of road.
	Roadside furniture and traffic control devices, including information and cautionary signs, signals, traffic diversion and flow markings will be provided, to ensure pedestrian safety during construction and operation.
	Adequate drains will be designed to cater for the road drainage
Road Construction	Construction vehicles will remain confined within their designated areas of movement.
	Good relations with local communities will be established by encouraging contractors to provide opportunities for skilled and unskilled employment to locals, as well as on-the-job training in construction for young people.
	Solid waste generated during construction and at campsites will be properly managed and safely disposed of only to demarcated waste disposal sites approved by supervision consultants.
	Contractors will be required to instruct and train their workforce in the storage and handling of materials and chemicals that can potentially cause soil contamination.
	All necessary measures will be taken to ensure the safety of traffic during construction, including barricades (including signs, pavement markings, flags, and lights) erected as required by the NHA. All such barricades will be set up as per local regulations.

The stakeholders supported the project, provided that environmental and social issues are addressed through mitigation measures.

13.0 GRIEVANCE REDRESS MECHANISM

13.1 GENERAL

The stakeholder or affected people's concerns, complaints and grievances about the project environmental performance will be received, recorded and replied in a systematic way using an understandable and transparent process that is gender responsive, culturally appropriate and readily accessible to all segments of the affected people at no cost and without retribution.

NHA will establish a Grievance Redress Committee (GRC) to facilitate resolution of complaints by Affected People (APs) and grievances about the project's environmental performance, in line with the requirement of National and provincial requirements. The GRC will be coordinated by the Deputy Director – Env of NHA. The GRC will address affected people concerns and complaints promptly, using an understandable and transparent process.

13.2 COMPOSITION OF GRC

The GRC will work directly under the supervision of Director Environment of NHA.

The following members are recommended to form a GRC to look into the environmental matters.

- ❖ DD Environment –NHA
- ❖ Representative from Affected People (APs)
- ❖ Environmentalist of Supervision Consultant / Contractor

Director Environment will nominate one Deputy Director as member of GRC and shall act as Project Environmental Grievance Officer (PEGO).

He will review the case on merit and address the problem in accordance with prevailing rules/ procedures applicable to such grievances as per Environmental Management Plan (EMP). The PEGO will then refer the case to GRC for final decision, whether to update and make necessary amendments in EMP. The GRC will deliver its decision within thirty (30) days of registration of the case. If the affected person does not receive a response from GRC within thirty (30) days of the registry of the complaint, he/she can appeal to Director Environment, who should act on the complaint/ grievance within two weeks of day of its filing. If the affected person is not satisfied with the decision of Director Environment, then it can be referred to higher authorities / relevant govt. departments for its resolution. As a last resort, he/she may submit the complaint to Punjab EPA.

13.3 RESPONSIBILITIES OF GRC

The responsibilities of GRC will include the following :

- ❖ The GRC shall review, consider and resolve grievances related to environmental issues during implementation received by the PD office – NHA.
- ❖ Environmental Specialist is responsible for conducting investigations on these grievances.
- ❖ Any grievances presented to the GRC should ideally be resolved on the first day of hearing or within a period of one week, in case of complicated issues requiring additional investigations.
- ❖ GRC is empowered to take decision which is binding on NHA and considered final.

GRC meeting will be held in the NHA, PD office or other locations agreed by the committee. If needed GRC members will conduct field visits to verify and review the issues at dispute.

13.4 PROCEDURE FOR REDRESS OF GRIEVANCES

Suggested procedures to be adopted for the redressal of the grievances are given below :

- ❖ Project Affectee will submit his/her application to the Field Implementation Unit for consideration. Within 15 days of the receipt of the complaint, action will be taken up for redressal of the grievance. Wherever policy matters are involved, the case will be referred to the appropriate authority or committee appointed by the Project to decide the matter.
- ❖ In case some response on the complaint is not received within 15 days of the receipt of the complaint, the complainant may also send a reminder to within 15 days notice to take legal remedial measures.
- ❖ All complaints received in writing or written when received verbally will be properly recorded and documented.

13.5 PROPOSED MECHANISM FOR GRIEVANCE REDRESS

Under the Project the following will be established or appointed to ensure timely and effective handling of grievances :

- ❖ A Public Complaints Unit (PCU), which will be responsible to receive, log, and resolve complaints.
- ❖ A Grievance Redress Committee (GRC), responsible to oversee the functioning of the PCU as well as the final non-judicial authority on resolving grievances that cannot be resolved by PCU.
- ❖ Grievance Focal Points (GFPs) having educated people from each community that can be approached by the community members for their grievances against the Project. The GFPs will be provided training by the Project in facilitating grievance redress.

Details of the proposed mechanism are given below :

(i) Project Management Unit (PMU)

The overall responsibility for the implementation of Environmental Management / Monitoring Plan rests with the Project Management Unit (PMU) along with the assistance of Environmental Unit (EU) of PMU. The EU consists of Director Environment & Sociology, Deputy Director Environment and Deputy Director Sociology. PMU will assume overall responsibility for ensuring :

That while executing the contract and undertaking the construction all environmental norms, regulations and requirements promulgated by Punjab Environmental Protection Act (PEPA), Punjab Protection Agency (EPA) with respect to the work site and adjacent areas are fully respected and implemented and overall responsibility for implementation of EMP. Ensure that Contractor and Construction Supervision Consultants appoint a dedicated environmental officer and allied staff. PMU will also ensure that all environmental personnel are authorized to implement the socio– environmental policies and requirements of the EMP.

(ii) Environment Unit (EU) of PMU

- ❖ The Environmental Unit (EU) within PMU will monitor Project performance.
- ❖ The EU will function in coordination with the Construction Supervision Consultants and will receive reports from them on behalf of PMU.

(iii) Head PMU / The Project Director

The Project Director shall provide or arrange the logistics including communication, transport and accommodation to all visiting persons / teams experts from any of the above monitoring units and shall coordinate with the contractor(s) to facilitate the visits/inspections.

(iv) Contractor

The contractor will be responsible for implementation of the project EMP. The contractor will ensure that EMP for the project is implemented fully and must be integrated into the Project implementation and made integral part of the contract document. For any default damages so caused will be remediated by the contractor at his own cost and expenses. In case the contractor fails to rectify the damage the employer will remediate at the risk and cost of the contractor. The amount will be determined by the Construction Supervision Consultants which will be adjusted from amount due to the contractor.

(v) PCU – Function and Structure

PCU will be set up as part of the environment, health and safety department of the Project. A senior official with experience in community and public liaison will

lead the unit. Two assistants, one male and one female will be responsible for coordinating correspondence and preparing documentation work and will assist the senior official. The senior official will be responsible to review all documentation. The PCU will be responsible to receive, log, and resolve grievances. Given that the female community members have restricted mobility outside of their homes, the female PCU staff will be required to undertake visits to the local communities. The frequency of visits will depend on the nature and magnitude of activity in an area and the frequency of grievances.

(vi) GRC – Function and Structure

The GRC will function as an independent body that will regulate PCU and the grievance redress process. It will comprise of :

- ❖ Officials of environment, health and safety of the proposed Project.
- ❖ Senior engineer that is responsible to oversee the contractors.
- ❖ Two literate representatives from the communities residing near the project site;
- ❖ Representative of the local government. If not, this would be the District Coordinating Officer (DCO) or an appointed representative;
- ❖ Senior member from the local civil society with experience in community relations;
- ❖ Female member from the local civil society.

The GRC will meet once every three months to review the performance of the PCU; the frequency can be changed depending on the nature and frequency of grievances received. The performance will be gauged in terms of the effectiveness and the timeliness with which grievances were managed. In case there are any unresolved or pending issues, the GRC will deliberate on mechanisms to resolve those and come up with solutions acceptable to everyone.

13.6 ENVIRONMENT AND SOCIAL COMPLAINTS REGISTER

The consultant's environmental team will maintain an environment & social complaint register at camp site office to document all complaints received from the local communities. The register will also record the measures taken to mitigate these concerns. The final report will be communicated to Environmental section of PMU.

14.0 CONCLUSION AND RECOMMENDATIONS

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

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

Implementation of mitigation measures during this implementation will be assigned to the contractors. The required environmental mitigation must be clearly described in the contract documents, and an environmental supervising consultant monitor implementation mechanism.

Most of the roadway passes through having a uniform ecological profile, topographic layout and geological strata. Implementation of proposed mitigation measures will not only reduce the negative impacts, rather the road environments will get significantly improved. Through institutional development, by building a better environmental perception and understanding, capacities of contractor will get enhanced for future environmental management and monitoring.

Besides an on-going development process of roadway communication links, archaeological, historical, cultural heritage assets and an exceptionally biodiversity of the area will also be preserved.

Each subsequent road will be treated as a sub-Project of the same umbrella. Besides environmental considerations, the project will also be addressing other related issues of poverty alleviation. In this way the growing communication needs of rural populace will be addressed in an organized and structured manner.

The EIA report has thoroughly assessed all the potential environmental impacts associated with the Project. The environmental impacts identified by the study are site specific and reversible, and will be mitigated through implementation of the EMP by project implementation agency at various project's stages, as suggested in the report.

ANNEXURE

ANNEX – A

ALIGNMENT STUDY PLANS