Initial Environmental Examination

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PAK: Additional Financing for Khyber Pakhtunkhwa Provincial Roads Improvement Project

Prepared by Khyber Pakhtunkhwa Highways Authority, Communications and Works Department, Government of Khyber Pakhtunkhwa with assistance of Project Preparatory Technical Assistance (PPTA) for the Asian Development Bank.

GOVERNMENT OF KHYBER PAKHTUNKHWA

PAKHTUNKHWA HIGHWAYS AUTHORITY

FEASIBILITY STUDY & DESIGN OF VARIOUS ROADS UNDER THE PKHA PORTFOLIO
SH: PROVINCIAL ROADS REHABILITATION PROJECT

INITIAL ENVIRONMENTAL EXAMINATION (IEE)

FOR

DUALIZATION OF MARDAN – SWABI ROAD,

Total Length 42 km

Final Report

JV M/S CREATIVE ENGINEERING CONSULTANTS

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ABBREVIATIONS

AD	-	Assistant Director
ADB	-	Asian Development Bank
ADP	-	Annual Development Programme
BOQ	-	Bill of Quantities
AIT	-	Asian Institute of Technology
C&WD	-	Communication & Works Department
DD	-	Deputy Director
EIA	-	Environmental Impact Assessment
EMP	-	Environment Management Plan
EMMP	-	Environment Management and Monitoring Plan
EO	-	Environmental Officer
EPA	-	Environment Protection Agency
FD	-	Forest Department
IEE	-	Initial Environment Examination
IUCN	-	International Union for Conservation of Environment
GoKP	-	Government of Khyber Pakhtunkhwa
GoP	-	Government of Pakistan
KP	-	Khyber Pakhtunkhwa (Province)
LEAD	-	Leadership for Conservation And Development
MSL	-	Mean Sea Level
NEQS	-	National Environmental Quality Standards
NESPAK	-	National Engineering Service of Pakistan (Pvt.) Ltd.
NTFP	-	Non-Timber Forest Products
PD	-	Project Director
PDD	-	Planning and Development Department
PKHA	-	Pakhtunkhwa Highways Authority
PMU	-	Project Management Unit
PRRP	-	Provincial Roads Rehabilitation Project
ROW	-	Right of Way
SFA	-	Social Framework Agreement
SOP	-	Standard Operational Procedures
SPS	-	Safeguard Policy Statement
VOC	-	Vehicle Operating Cost
WWF	-	World Wildlife Fund

WEIGHTS AND MEASURES

°C	-	degree Celsius
ha	-	hectare
km	-	kilometer
km^2	-	square kilometer
km/h	-	kilometer per hour
m	-	meter
m^3/sec	-	cubic meter per second

EXECUTIVE SUMMARY

This document presents the Initial Environmental Examination (IEE) of the Dualization of 42 km long Road from Mardan to Swabi, which connects District Mardan and Swabi, the two important districts of Khyber Pakhtunkhwa (KP) Province. Traffic count of 15,300 VPD and traffic capacity analysis of existing road revealed that the present two lane highway is insufficient for catering existing traffic flow and hence future stream of traffic due to rapid population growth coupled with economic, educational and commercial activities in the regional neighboring districts. Dualization of Mardan – Swabi road will not only improve the traffic flow but will also reduce number of accidents as both sides of the road are densely populated.

In addition to dualization, Mardan – Swabi road will also be a feeder road for vehicles going and coming from Mardan and Swabi to Swat valley through the Swat Expressway with interchange at Ismaila crossing the project road. The under construction Expressway forms part of an Economic Trade Corridor initiating from Kernal Sher Khan Interchange at M-1 Motorway and terminating at Chakdara at the junction of National Highways N-45 and N-95. Hence dualization of Mardan – Swabi Road will be a significant step towards the achievement of the goals fixed by the provincial government in providing roads communication facility. This will also help in accomplishing far reaching results in improving the livelihood of people of the area.

The proposed project includes dualization of 42 km long four-lane (2x2) road which will be completed in about three years at a total cost of Rs. 8.0 billion. For design, execution and maintenance, the project has been assigned to Pakhtunkhwa Highways Authority (PKHA), who as their Consultants has engaged JV of M/S Creative Engineering Consultants & H&B Consulting Engineers International.

As a part of this IEE study, primary as well as secondary data have been collected through field surveys, public consultation and literature research. Consultations have also been carried out with PKHA, the Environmental Protection Agency and relevant government departments. Screening and scoping of the study has been carried out before preparing the Environment Management Plan (EMP).

Included in the study is an overview of Pakistan National Conservation Strategy (NCS), Khyber Pakhtunkhwa Environmental Protection Act 2014, National Environmental Quality Standards (NEQS), numerous relevant International Guidelines and related regulations and protocols for the study.

The Mardan – Swabi road under the proposed project passes through flat lands. Climatically the project area has cold winter and hot summers. During May and June dust storms are frequent at night. The temperature reaches to its maximum in the month of June, July, August and September record quite high temperatures. Most of the rainfall occurs in the month of July. August, December and January. Towards the end of cold weather there are occasional thunder storms and hail storms. The relative humidity is quite high throughout the year while maximum humidity has been recorded in December.

Major flora of the project area include Shisham, Mulberry, Bakain, Kikar, Ber, and Eucalyptus. The important fruits are Plum, Peach, Apricot, Pear and Apple.

Main fauna include jackal, fox, porcupine, rodents and pheasant. There are no protected areas or endangered species in the project study area.

The project road is located in the Peshawar Valley famous as the best agricultural area in the country. Its land is very suitable for cultivation of wheat, maize, sugar cane, rice, tobacco and a variety of vegetables. Hence Agriculture is the main source of income.

Jirga system is still the most dependable social unit. Almost 100 percent population is Muslims. Women form a less favored section of the society. Child labor is also common.

Analysis of alternatives has shown that project as proposed in feasibility i.e. dualization with suitable readjustments where necessary, is the best option among all. Logistically, the best option is to locate all facilities of the contractor on the State land. Best alternative from labor point of view is an admixture of 100 percent unskilled local labor, 50 percent of semiskilled local labor and free choice of technical workers.

The stakeholder consultations have been carried out by meeting stakeholders to obtain an overall feedback about the project and its potential impacts. Consultations have also been carried out through elderly village leaders and also with the general public of the project area.

The present IEE has shown the possibility of mitigation of all adverse impacts. It is seen that impacts due to construction are likely to be related to contractor's work practices, cooperation between contractor and local communities, inclusion of IEE instructions in the project management and a good Social Framework Agreement (SFA). Also, potentially negative impacts are mostly short term, moderate and reversible in nature, which can be easily addressed with the help of appropriately designed and effectively implementation of the mitigation measures proposed in this report.

A comprehensive EMP has been prepared accompanied by an effective Environment Management & Monitoring Plan (EMMP) supported by an institutional arrangement. The EMP and EMMP will be made an integral part of the tender, bid and contract documents. A system of contractor's non–compliances / violations has been recommended and linked with contractor's bill payment. The total cost of managing the environmental aspects has been estimated to be about Pak Rs.6.21 million.

1. INTRODUCTION

This document presents the Initial Environmental Examination (IEE) of dualization of 42 km long Mardan – Swabi Road, which connects the two important districts of Mardan and Swabi of Khyber Pakhtunkhwa (KP) Province.

1.1. PROJECT OVERVIEW

Pakhtunkhwa Highways Authority (PKHA), the custodian of 2500 km long Provincial Highway Network, through Road Asset Management (RAM) study conducted in 2013, identified some 300km long candidate roads in the province to be rehabilitated under the **ADB ASSISTED PROVINCIAL ROADS REHABILITATION PROJECT (PRRP)**. The Government of Khyber Pakhtunkhwa approved the Concept Paper of the scheme with the condition that the PkHA will carry out the detailed design from its own resources. The completion of this ambitious project will ensure reduction in the vehicle operating costs and travel time while adequate safety considerations will avert accidents and enhance road safety. Furthermore, rehabilitation of the proposed roads will contribute a lot in the economic growth and development of Khyber Pakhtunkhwa. Under the project, the 11 candidate roads with 305 km accumulative length were proposed to be rehabilitated and improved in different district of Khyber Pakhtunkhwa. However, two road sections (Haripur – Beer & Beer – Gandaf) with total length of 57 km were neglected due to less priority. Instead, Dualization of Mardan – Swabi Road was approved by The Project Steering Committee. Though, it has to be dealt as a separate project under **Additional Financing**.

The Project Road (a section of Provincial Highway S-1), has a staggering traffic count of 15,300 VPD. The traffic capacity analysis of existing road revealed that the present two lane provincial highway is insufficient for catering existing traffic flow and hence its expansion is inevitable to accommodate future stream of traffic due to rapid population growth coupled with economic, educational and commercial activities in the regional neighboring districts. Dualization of Mardan- Swabi road will not only improve the traffic flow but will also reduce number of accidents as both sides of the road are densely populated.

In addition to dualization, Mardan-Swabi road will also serve as a feeder road for vehicles going and coming from Mardan and Swabi to Swat valley through the Swat Expressway with interchange at Ismaila crossing the project road. The under construction Expressway forms part of an Economic Trade Corridor initiating from Kernal Sher Khan Interchange at M-1 Motorway and terminating at Chakdara at the junction of National Highways N-45 and N-95. Hence dualization to four-lane (2x2) road of 42km long Mardan-Swabi Road will be a significant step towards accomplishing far reaching results in improving the livelihood of people of the area. The proposed project will be completed in about three years at a total cost of Rs. 8.0 Billion. For design, execution and maintenance, the project has been assigned to

Pakhtunkhwa Highways Authority (PKHA), who as their Consultants has engaged JV of M/s Creative Engineering Consultants & H&B Consulting Engineers International.

1.2. BASIC FEATURES OF THE PROPOSED PROJECT

The dualization of Mardan-Swabi Road project has the following major features:

- Dualization of 42 km section of Provincial Highway with 4 lanes (2x2)
- 12 No. Major Structures (Bridges)
- 2.0 million population served
- Estimated Cost, Rs. 8.0 Billion

1.3. THE STUDY OBJECTIVES

The ultimate objective of the study is to make the project environmentally sustainable and socially acceptable. The specific objectives of this study can be identified as follows:

- To carryout environmental and social assessment supporting administrative and legal framework of the proposed highway.
- To identify the potential environmental issues pertaining to the proposed highway.
- To evaluate the project's social acceptance and environmental soundness.
- To collect the baseline data on physical biological and socio–economic conditions of the project area.
- To identify preventive / remedial measures of the potential environmental impacts.
- To propose institutional responsibilities and methods of monitoring for preventive / remedial measures.
- To develop a well-resourced environmental management and monitoring plan to identify preventive strategies targeted towards avoidance, minimization and rehabilitation of the impacts.

1.4. LOCATION OF THE PROJECT

The project site is at Mardan towards Swabi criss-crossing two main districts Swabi and Mardan.

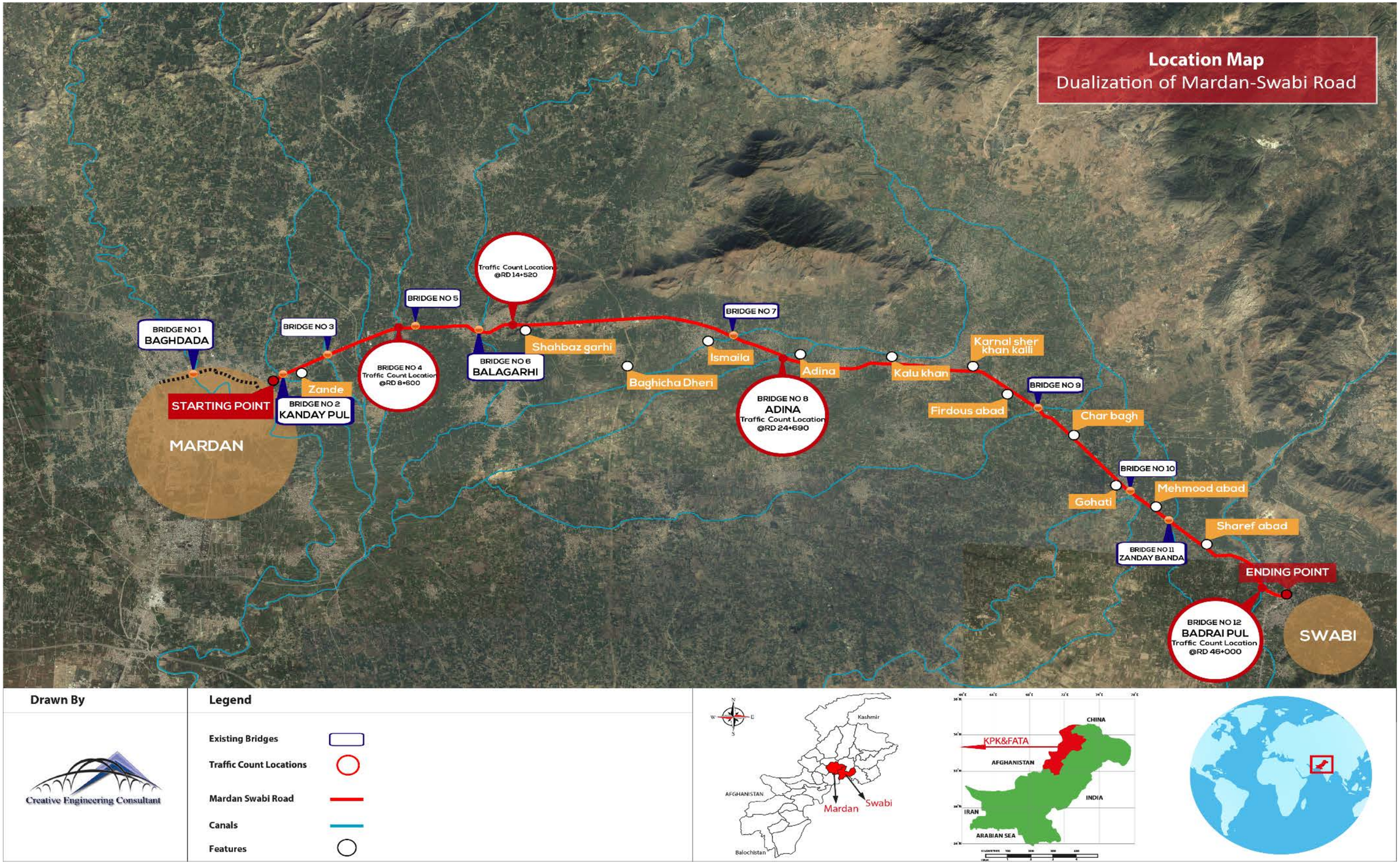


Figure - 1.1: Project Location Map

1.5. STUDY METHODOLOGY

As part of IEE Study, primary and secondary data were collected through field surveys, public consultations and library research. Consulted were the PKHA Sources, Meteorological Department, Soil Survey of Pakistan, Integrated Environment Laboratory, Statistical Survey of Pakistan, Departments of Forestry, Wildlife and Fisheries and Communication and Works Department of GoKP. Major data which became available from these sources were land use, soil and physiographic data, traffic and noise level, surface and ground water quality, and biodiversity. Above all the data on social and economic factors prevailing in Mardan and Swabi in general and in the project area in particular were obtained from Pakistan Statistical Year Book, District Gazetteer and Economic Survey of Pakistan.

For information on any resettlement issues, a separate standalone study will be carried out during which for social data of nearby communities, a structured survey was conducted. For Rapid Rural Survey of the area another questionnaire was used.

1.6. ENVIRONMENTAL ASSESSMENT PROCESS

The methodology adopted to carry out the IEE Study of the proposed project was as follows:

- Orientation
- Planning for Data Collection
- Analysis of Maps
- Literature Review
- Desk Top Research
- Site Reconnaissance
- Public Consultations
- Field Studies
- Laboratory Analysis
- Evaluation of Impacts and their analysis
- Categorization of impacts based on their potential environmental significance and prescription of preventive / mitigation measures

In addition to the evaluation and review of the available records, detailed discussions were held with the concerned members of the project management as well as other project stakeholders. Notes and proposals for measures to be taken to mitigate and compensate for any determined / detrimental environmental impacts are contained in the Environmental Management Plan (EMP) as well as a Monitoring Plan, including all

parameters that need to be measured and the frequency of monitoring. A comprehensive qualitative and quantitative methodology was adopted to conduct this study inter–alia in due compliance with the IEE requirements. The study included collection of both primary and secondary data regarding environmental status and other relevant factors. This IEE report has been accomplished after carrying out thorough visit to the proposed site and detailed investigation to identify the following environmental areas of concern:

- To achieve the desired environmental compliance standards; as per Safeguard Policy Statement (SPS) of Asian Development Bank and KP EPA as national requirements; as applicable to the project.
- Plans and activities to prevent / mitigate any potential impacts and the gaps that could probably remain after implementation.
- Any other points / steps to be taken which could be beneficial to mitigate environmental adverse impacts that may accrue both during construction and regular operation of the project.

The methodology for environmental assessment is given in **Table - 1.1**.

Table - 1.1: Environmental and Social Assessment Process

Phase	Activities	Status	Responsibility
Screening and Scoping	Reconnaissance and initial site visit and consultations, identification of environmental and social issues & applicable safeguard policy, categorization and working out an action plan.	Carried out during the present IEE	Project Management (PM) Consultants
Impact Assessment	Identification of potential environmental and social impacts through site visits, stakeholders consultations, review of drawings, alternatives etc	During the present IEE	PM Consultants
Impact categorization	The significant potential impacts were tabulated and mitigation /	During the present IEE	PM Consultants

Phase	Activities	Status	Responsibility
	preventive measures were prescribed		
EMP Preparation	Consultation	Carried out / prepared as part of the present IEE	PM Consultants
	Draft EMP		
Final EMP	Final version of EMP produced	Included in the present IEE.	PM Consultants

1.7. FIELD SURVEYS

A well trained team including environmentalist, sociologist, and ecologist carried out field survey. They undertook two–fold consultation / survey program.

Phase – I: This phase comprised of the meetings and discussions with the officials. These meetings facilitated achieving multiple and diverse objectives such as:

- Evaluation the site suitability in view of social acceptance and environmental soundness.
- Providing maximum information to stakeholders about the significant environmental impacts and the implication of the proposed project.
- Confirmation of the suitability of initial list of communities selected for consultation.

Phase – II: This phase involved the discussion with the local communities in the project area of influence. The program included both community discussion and discussion with women only by women organization.

1.8. WOMEN CONSULTATIONS

The rural society in project area is highly conservative where direct access to women for social surveys, even with a female sociologist, is not possible. The community elders and aged women in selected localities hesitated to get their names recorded during the women consultation process which was carried out according to “Gender Issue Study”, commissioned by Environmental Protection Agency (EPA) considered to be an essential part of project preparation. Accordingly, several meetings were held with women in different parts of the project, through village elders and women teachers.

1.9. TYPE AND CATEGORY OF THE PROJECT

The proposed project envisages the dualization of 42 km long Mardan – Swabi Road.

1.9.1. Category as Per ADB Safeguard Policy

The Asian Development Bank's Safeguard Policy Statement (SPS) 2009 requires that environmental considerations be incorporated into ADB's funded project to ensure that the project will have minimal environmental impacts and be environmentally sound. As the proposed project doesn't fall in any environmentally sensitive area, most of the impacts are short term and reversible, therefore, as per ADB categorization the proposed project categorized in 'category B'.

1.9.2. Category as Per KP-EPA Regulation (Regulations 2000)

In accordance with the Pakistan Environmental Protection Agency, Review of Initial Environmental Examination and Environmental Impact Assessment Regulations, 2000, SRO # 339 (1)/2000, the project for road falls in Schedule –I, based on the reconstruction and widening of road for which Initial Environmental Examination (IEE) report is required for Environmental Approval.

Therefore, to fulfill the legal requirements of the Section-13 of the Khyber Pakhtunkhwa Environmental Protection Act, 2014, the client is required to submit the IEE report in the Environmental Protection Agency, Government of the Khyber Pakhtunkhwa, Peshawar to obtain the required Environmental Approval (EA).

1.10. THE REPORT STRUCTURE

This IEE document is structured as follow:

Section – 1:

Introduction: Contains general information about the project and process of carrying out the study.

Section – 2:

Environmental Policy, Legal and Administrative Framework: Briefly discusses international environmental policy of ADB, existing national policy and resulting legislation for sustainable development and environmental protection, and then presents the legislative requirements of Khyber Pakhtunkhwa Environmental Protection Act, 2014.

Section – 3:

Project Description: Describes the proposed project including any offsite investments that may be required.

Section –4:

Description of the Environment: Describes the project area's existing physical, biological, and socioeconomic condition, including geomorphology and soils, water resources, and air quality, flora and fauna, and demography.

Chapter – 5:

Comparative Evaluation of Alternatives: presents the project alternatives that were considered, and the reasons for their acceptance or rejection.

Section – 6:

Evaluation of Impacts & Mitigation Measures: Presents an assessment of the project's impact and their required mitigation measures to the physical, biological, and socioeconomic environment.

Section – 7:

Environmental Management Plan, Environmental Mitigation Measures and Monitoring Plan: Contains comprehensive prescriptions regarding environmental impacts and their mitigation measures. This also includes institutional arrangements and Environmental Management & Monitoring Plan.

Section – 8:

Stakeholders Consultations: Record of consultation meetings, for obtaining the views of the affected people, local non-governmental organizations and regulatory agencies.

Chapter – 9:

Conclusion and Recommendation: Concludes the IEE report with some practical recommendations.

2. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

2.1. GENERAL

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

2.2. NATIONAL POLICY AND LEGAL FRAMEWORK

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

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

2.3. REGULATIONS FOR ENVIRONMENTAL ASSESSMENT, PAKISTAN EPA

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

2.4. REGULATORY CLEARANCES, KPK EPA

In accordance with provincial regulatory requirements, an IEE/EIA satisfying the requirements of the KPK Environmental Protection Act (2014) is to be submitted to KP Environmental Protection Agency (KP-EPA) for review and approval, and subsequent issuance of NOC before the commencement of construction.

2.5. GUIDELINES FOR ENVIRONMENTAL ASSESSMENT, PAKISTAN EPA

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

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

2.6. NATIONAL ENVIRONMENTAL QUALITY STANDARDS (NEQS) 2000

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

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

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

2.7. ADB's SAFEGUARD POLICY STATEMENT (SPS), 2009

The Asian Development Bank's Safeguard Policy Statement (SPS) 2009 requires that environmental considerations be incorporated into ADB's funded project to ensure that the project will have minimal environmental impacts and be environmentally sound. Occupational health & safety of the local population should also be addressed as well as the project workers as stated in SPS. A Grievance Redress Mechanism (GRM) to

receive application and facilitate resolution of affected peoples' concerns, complaints, and grievances about the project's environmental performance is also established in this assessment report. All loans and investments are subject to categorization to determine environmental assessment requirements. Categorization is to be undertaken using Rapid Environmental Assessment (REA) checklists, consisting of questions relating to (i) the sensitivity and vulnerability of environmental resources in project area, and (ii) the potential for the project to cause significant adverse environmental impacts. Projects are classified into one of the following environmental categories:

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

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

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

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

As a result of the completion of the REA checklist, provided as **Annexure-A,** the project has been classified as Category ''B'' and thus a detailed and comprehensive IEE study has been prepared including the EMP.

2.8. ADB's PUBLIC COMMUNICATION POLICY 2011 (PCP 2011)

The PCP aims to enhance stakeholders' trust in and ability to engage with ADB, and thereby increase the development impact of ADB operations. The policy promotes transparency, accountability, and participatory development. It establishes the disclosure requirements for documents ADB produces or requires to be produced.

2.9. ADB's ACCOUNTABILITY MECHANISM POLICY 2012

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

2.10. INTERACTION WITH OTHER AGENCIES

The Pakhtunkhwa Highway Authority (PkHA), GoKPK is responsible for ensuring that the project complies with the laws and regulations controlling the environmental concerns of the proposed road construction and operation and that all preconstruction requisites, such as permits and clearances are met. This section describes the nature of the relationship between the PkHA and concerned departments.

2.11. PROVINCIAL EPAS

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

2.12. PROVINCIAL DEPARTMENTS OF FORESTS AND WILDLIFE

Uprooting or clearing of trees is expected for the proposed project. However, any removed trees or vegetation under private ownership will be compensated as per provision that in case of disruption to vegetation or trees, the project contractor will be responsible for acquiring a 'No-Objection Certificate' (NOC) from the concerned forest department. The application for an NOC will need to be endorsed by the PkHA.

2.13. PROVINCIAL GOVERNMENTS

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

2.14. OTHER ENVIRONMENT RELATED LEGISLATIONS

Table - 2.1 provides a summary of other legislations, guidelines, conventions and corporate requirements.

Table - 2.1: Environmental Guidelines and Legislations

Legislation/Guideline	Description
National Environmental Policy (2005) (NEP)	NEP is the primary policy of Government of Pakistan addressing environmental issues. The broad Goal of NEP is, “to protect, conserve and restore Pakistan’s environment in order to improve the quality of life of the citizens through sustainable development”. The NEP

Legislation/Guideline	Description
	identifies a set of sectoral and cross-sectoral guidelines to achieve its goal of sustainable development. It also suggests various policy instruments to overcome the environmental problems throughout the country.
Land Acquisition Act, 1894 Including Later Amendments	The Land Acquisition Act, 1894, is a "law for the acquisition of land needed for public purposes and for companies and for determining the amount of compensation to be paid on account of such acquisition". The exercise of the power of acquisition has been limited to public purposes. The principles laid down for the determination of compensation, as clarified by judicial pronouncements made from time to time, reflect the anxiety of the law-giver to compensate those who have been deprived of property, adequately. In case any land acquisition does become necessary, the land needed for the construction of the project will be acquired under normal conditions based on prevailing market prices or negotiated prices between PkHA and owners of the land. Section 17(4) of the LAA will not be used in the absence of an emergency. Instead, the land will be purchased under willing-seller willing-buyer deal at agreed upon market rates and the seller will have the option not to sell the land, in case an acceptable deal for both the parties is not reached.
The Forest Act (1927)	The Act empowers the provincial forest departments to declare any forest area as reserved or protected. It empowers the provincial forest departments to prohibit the clearing of forest for cultivation, grazing, hunting, removing forest produce, quarrying and felling, lopping and topping of trees, branches in reserved and protected forests. The proposed project is urban in nature and thus no protected forest is situated in the Project area.

Legislation/Guideline	Description
Khyber Pakhtunkhwa Wildlife and Biodiversity Act, 2015	It empowers the government to declare certain areas reserved for the protection of wildlife and control activities within these areas. It also provides protection to endangered species of wildlife. As no activities are planned in these areas, no provision of this law is applicable to the proposed project.
The KPK Antiquities Act (2016)	It ensures the protection, preservation, development and maintenance of antiquities in the province of KPK. The Act defines "antiquities" as ancient products of human activity, historical sites, or sites of anthropological or cultural interest, national monuments, etc. The Act is designed to protect these antiquities from destruction, theft, negligence, unlawful excavation, trade, and export. The law prohibits new construction in the proximity of a protected antiquity and empowers the GoKPK to prohibit excavation in any area that may contain articles of archaeological significance. Under the Act, the subproject proponents are obligated to ensure that no activity is undertaken in the proximity of a protected antiquity, report to the Department of Archaeology, GoKPK, any archaeological discovery made during the course of the project.
Pakistan Penal Code (1860)	It authorizes fines, imprisonment or both for voluntary corruption or fouling of public springs or reservoirs so as to make them less fit for ordinary use.
NATIONAL ENVIRONMENTAL AND CONSERVATION STRATEGIES	
National Conservation Strategy	Before the approval of NEP, the National Conservation Strategy (NCS) was considered as the Government's primary policy document on national environmental issues. At the moment, this strategy just exists as a national conservation program. The NCS identifies 14 core areas including conservation of biodiversity, pollution prevention

Legislation/Guideline	Description
	and abatement, soil and water conservation and preservation of cultural heritage and recommends immediate attention to these core areas.
Biodiversity Action Plan	The plan recognizes IEE/EIA as an effective tool for identifying and assessing the effects of a proposed operation on biodiversity.
INTERNATIONAL CONVENTIONS	
The Convention on Conservation of Migratory Species of Wild Animals (1981.21)	The Convention requires countries to take action to avoid endangering migratory species. The term "migratory species" refers to the species of wild animals, a significant proportion of whose members cyclically and predictably cross one or more national jurisdictional boundaries. The parties are also required to promote or cooperate with other countries in matters of research on migratory species. The proposed project is being developed in a completely urban landscape and thus there are no endangered species of plant life or animal life in the vicinity of the Project.
Convention on International Trade in Endangered Species of Wild Fauna and Flora (1973)	The convention requires Pakistan to impose strict regulation (including penalization, confiscation of the specimen) regarding trade of all species threatened with extinction or that may become so, in order not to endanger their survival further.
International Union for Conservation of Nature and Natural Resources Red List (2000)	Lists wildlife species experiencing various levels of threats internationally. Some of the species indicated in the IUCN red list are also present in the wetlands of Pakistan.
INTERNATIONAL ENVIRONMENTAL GUIDELINES	
ADB's Safeguard Policy Statement (SPS), 2009	ADB's Safeguard Policy Statement (SPS), 2009 provides guidelines for environmental assessments of development projects. These guidelines help prospective projects identify impacts they will have on various environmental

Legislation/Guideline	Description
	receptors. The guidelines call for carrying out EIAs or IEEs of projects based on severity of their impacts.

2.15. COMPARISON OF INTERNATIONAL AND LOCAL ENVIRONMENTAL LEGISLATIONS

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

A comparison of applicable local and international guidelines for ambient air quality has been provided in **Table - 2.3** below. In the case of most pollutants, the NEQS standards for ambient air quality are more stringent in comparison to USEPA and WHO/IFC standards.

Similar to the standards for air quality, the comparison of noise standards provided in **Table - 2.4** clearly shows that NEQS standards for noise are more stringent in comparison to the WHO/IFC standards. The only exception is the daytime noise level standard for Industrial areas where the World Bank/IFC standard is more stringent (70 dB (A)) in comparison to NEQS (75 dB (A)) and so for this particular parameter, the WHO/IFC standard will be used. Apart from this one exception, the NEQS standards have been used for the proposed road construction project.

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

2.16. IMPLICATIONS OF NATIONAL POLICIES AND REGULATIONS ON PROPOSED PROJECT

The Pak-EPA formulated regulations in 2000 for 'Review of IEE and EIA' which categorize development projects under three schedules-Schedules I, II and III. Projects are classified on the basis of expected degree and magnitude of environmental impacts and the level of environmental assessment required is determined from the schedule under which the project is categorized.

The projects listed in Schedule-I include those where the range of environmental issues is comparatively narrow and the issues can be understood and managed through less extensive analysis. Schedule-I projects require an IEE to be conducted, rather than a full-fledged EIA, provided that the project is not located in an environmentally sensitive area. The proposed road project has been categorized as Schedule I and requires an IEE.

The projects listed in Schedule-II are generally major projects and have the potential to affect a large number of people in addition to significant adverse environmental impacts. The impacts of projects included in Schedule-II may be irreversible and could lead to significant changes in land use and the social, physical and biological environments.

PkHA, being the Executing Agency for the Project is responsible for management of project impacts, and has to undertake the commitments and mitigation measures proposed in this environmental report and in the subsequent review and approval conditions.

According to the regulations, no construction, preliminary or otherwise, relating to the project shall be undertaken until and unless approval of the Environmental Impact Assessment Report has been issued by the KP EPA.

The PkHA will submit the IEE Report on a prescribed application along with the processing fee to KP EPA. After submission of the IEE report the project shall be defended in the KP EPA. The assessment will be completed within a period of forty five (45) days from receipt of the complete documents, and earlier than this wherever practicable.

2.17. IMPLICATIONS OF ADB POLICIES ON PROPOSED PROJECT

The objectives of ADB's safeguards are to:

- avoid adverse impacts of projects on the environment and affected people, where possible;
- minimize, mitigate, and/or compensate for adverse project impacts on the environment and affected people when avoidance is not possible; and
- help borrowers/clients to strengthen their safeguard systems. ADB's SPS sets out the policy objectives, scope and triggers, and principles for three key safeguard areas:
- environmental safeguards,
- involuntary resettlement safeguards, and
- Indigenous Peoples safeguards.

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

Table - 2.2: ADB Policy Principles

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

	Policy principle	Summary
10.	Occupational health and safety. Community safety.	Provide workers with safe and healthy working conditions and prevent accidents, injuries, and disease. Establish preventive and emergency preparedness and response measures to avoid, and where avoidance is not possible, to minimize, adverse impacts and risks to the health and safety of local communities
11.	Physical cultural resources	Conserve physical cultural resources and avoid destroying or damaging them. Provide for the use of “chance find” procedures.

Table - 2.3: Comparison of International and local Air Quality Standards

Pollution	USEPA		WHO/IFC		Pak. NEQS	
	Avg. Time	**Standards**	**Avg. Time**	**Standards**	**Avg. Time**	**Standards**
SO_2	3 hrs 1 hr	0.5 ppm 75 ppb	24 hr 10 mins	20 ug/m^3 500 ug/m^3	Annual Mean 24 hrs	80 ug/m^3 120 ug/m^3
CO	8 hrs 1 hr	9 ppm (11 mg/m^3) 35 ppm (43 mg/m^3)	-	-	8 hrs 1 hr	5 mg/m^3 10 mg/m^3
NO_2	Annual Mean 1 hr	100 ug/m^3 (53 ppb) 100 ppb	1yr 1 hr	40 ug/m^3 200 ug/m^3	Annual Mean 24 hrs	40 ug/m^3 80 ug/m^3
O_3	8 hrs	0.07 ppm (148 ug/m^3)	8 hrs	100 ug/m^3	1 hr	130 ug/m^3
TSP	-	-	-	-	Annual Mean 24 hrs	360 ug/m^3 500 ug/m^3
PM_{10}	24 hrs	150 ug/m^3	1 yr 24 hr	20 ug/m^3 50 ug/m^3	Annual Mean 24 hrs	120 ug/m^3 150 ug/m^3
$PM_{2.5}$	Annual Mean 24 hrs	15 ug/m^3 35 ug/m^3	1 yr 24 hrs	10 ug/m^3 25 ug/m^3	Annual Average 24 hrs 1hr	15 ug/m^3 35 ug/m^3 15 ug/m^3

Table - 2.4: Comparison of International and Local Noise Standards

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

3. DESCRIPTION OF THE PROJECT

3.1. TYPE OF PROJECT

3.1.1. Location

Dualization of Mardan – Swabi Road was approved by The Project Steering Committee under the Provincial Roads Rehabilitation Project. Though, it has to be dealt as a separate project under Additional Financing.

The staggering traffic count of 15,300 VPD, the insufficiency of the present two lane existing road for catering current traffic capacity and inability to accommodate future stream of traffic due to rapid population growth coupled with economic, educational and commercial activities in the regional neighboring districts led to the decision of Dualization of Mardan-Swabi road. It will not only improve the traffic flow but will also reduce number of accidents as both sides of the road are densely populated. In addition to dualization, Mardan-Swabi road will also serve as a feeder road for vehicles going and coming from Mardan and Swabi to Swat valley through the Swat Expressway with interchange at Ismaila crossing the Project Road. The under construction Expressway forms part of an Economic Trade Corridor initiating from Kernal Sher Khan Interchange at M-1 Motorway and terminating at Chakdara at the junction of National Highways N-45 and N-95. Hence dualization to four-lane (2x2) road of 42 km long Mardan – Swabi Road will be a significant step towards accomplishing far reaching results in improving the livelihood of people of the area.

NHA estimates that road traffic on the dualized road will increase by an average of 11.45% annually over the 22 year lifecycle of the project. The tables below illustrates the predicted traffic volume increases based on the most recent traffic counts for distance weighted average of 4 counts made at Shahband Baba, Shahbaz Gari, Yar Hussain, and Gohati, and traffic count in 2018 (ADT).

Forecast ADT, 2018–2040 With and Without Project Scenario

	With Project			Without Project		
Section	**2018**	**2030**	**2040**	**2018**	**2030**	**2040**
Normal traffic	15,292	23,198	33,485	15,292	23,198	33,485
Generated traffic (10%)	0	2,320	3,349	0	0	0
Diverted traffic (5%)	0	1.160	1,674	0	0	0
Total	15,292	26,678	38,508	15,292	23,198	33,485

Source: ADB consultant estimates.

	Animal-drawn vehicles	Motor-cycles	Rick-shaws	Cars and taxis	Pick-ups, vans and jeeps	Mini-buses	Buses	Tractors +trailers	Trucks				Total motor-ized
									2-axle	3-axles	4-axle	5+ axles	
Traffic count*	79	4,796	3,404	4,249	1,463	310	52	340	372	186	20	7	15,199
Adjustment	8							34	37	19	2	1	93
Adjusted count	87	4,796	3,404	4,249	1,463	310	52	374	409	205	22	8	15,292

* Distance-weighted average of 4 counts made at Shahdand Baba, Shahbaz Gari, Yar Hussain and Gohati.
Source: KPHA consultant surveys with subsequent weighting and adjustment.

The proposed project will be completed in about three years at a total cost of Rs. 8.0 billion.

- Alignment: Existing
- Project Length: 42 km
- No of Lanes: 4 (Four)
- Shoulder Width: Outer-3m & Inner-1m
- Construction Period: 3 Years
- Tentative Cost: PKR. 8,000 million

3.1.2. Drainage Structures

Key structures included in the project are given in **Table - 3.1**.

Table 3.1: Key Project Features / Structures

Feature / Structure	Number / Length (m)
Bridges	12
Culverts	TBF
Covered Side Drain	In urban and town centers
Foot Path	-do-

3.1.3. Scope of Work

The scope of work under the construction of proposed roads is as below:

- Dualization of Mardan – Swabi Road (42 Km).
- 12 bridges
- A retaining wall for embankment heights greater than 3 m to check the erosion of embankment by the rains or failure of the slopes due to scouring or otherwise.
- A guard rail for embankment heights greater than 3 m.
- Road furniture and signage.

3.1.4. Design Criteria

Design Criteria for horizontal and vertical alignment of project is given in the **Table - 3.2**.

Table - 3.1.42: Design Criteria

Design Parameter	Unit	Plain / Hilly
Design Speed	km/h	80
Width of Carriage Way	m	2 x 7.30
Outer Shoulder Width	m	2 x (2.0 / 1.5)
Inner Shoulder Width	m	2 x (1.0 / 1.0)
Cross–slope Carriageway	%	2 / 2
Cross–slope Shoulders	%	4 / 4

The typical cross sections of project roads for built up area and rural area are given in **Figures - 3.1, 3.2 & 3.3**.

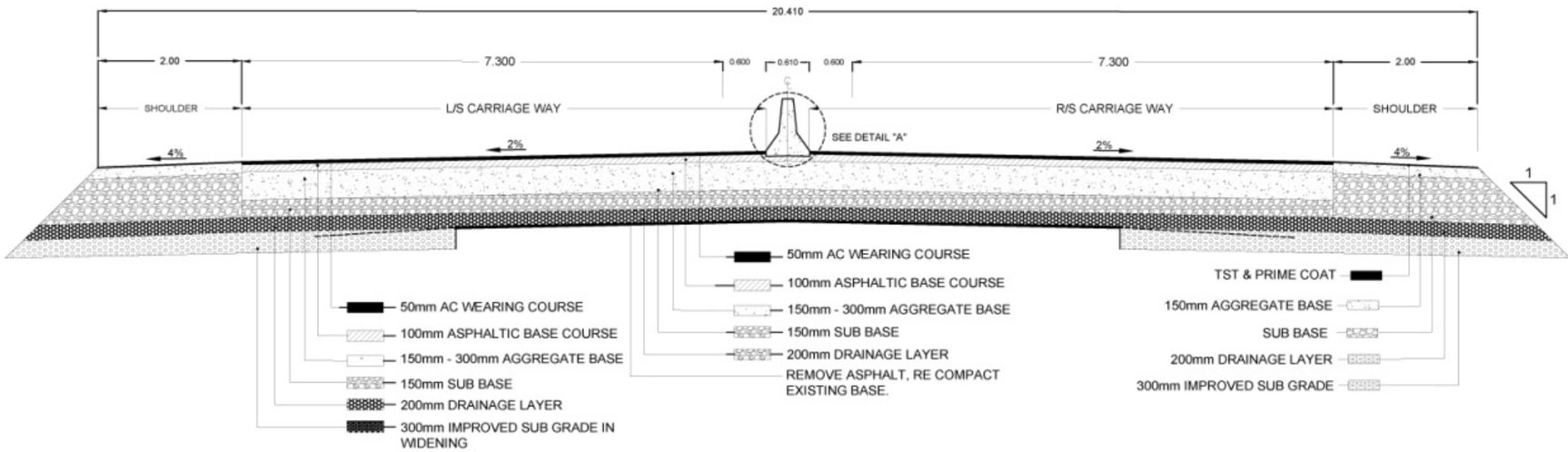
3.1.5. Works and Materials

Estimated quantum of work involved in project is given in **Table - 3.3**

Table - 3.1.53: Estimated Work

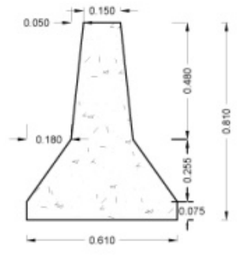
Items	Length / Height / No.
Road Length (km)	42
Average Embankment Height (m)	TBF
Culverts (No)	TBF

TYPICAL CROSS SECTION WITH NEW JERSEY BARRIER OR OPEN MEDIAN
Km 10+000 - Km 17+000 & Km 17+000 - Km 19+500



Mardan - Swabi Section
S-1
Both Bounds (Chainage from Mardan)

Sr #	Section		Length	SN calc	SN eff	SN OL	Thicknesses (cm)			Strategy
							Asphaltic Layers	Aggregate Base	Granular Sub Base	
1	00+000	03+000	3100	5.29	3.73	2.48	15	0	0	Mill (5 cm), Distress Removal & Overlay
2	03+100	10+400	7400	4.62	3.06	3.31	15	15	0	Mill (10 cm), Distress Removal & Overlay
3	10+500	17+600	7200	4.31	2.78	4.84	15	30	15	Removal of Ashpaltic Layer, Distress removal, Recompaction of Base layer upto 100% of MDD and Overlay. This section is water logged section and therefore 15 cm thick layer is provided as drainage layer (mentioned as SB)
4	17+700	19+400	1800	4.36	3.08	4.02	15	15	15	Removal of Ashpaltic Layer, Distress removal, Recompaction of Base layer upto 100% of MDD and Overlay. This section is water logged section and therefore 15 cm thick layer is provided as drainage layer (mentioned as SB)
5	19+500	23+600	4200	4.98	4.05	1.98	13	0	0	Mill (5 cm), Grooving & Overlay
6	23+700	29+000	5400	3.89	3.19	2.98	13	15	0	Mill (5 cm), Distress Removal & Overlay
7	29+100	31+400	2400	4.24	3.44	1.98	13	0	0	Mill (5 cm), Distress Removal & Overlay
8	31+500	42+000	10600	4.08	3.27	2.15	13	0	0	Mill (5 cm), Distress Removal & Overlay
			42100							
New Construction (widening) KM 00+000 - KM 10+400							15	30	20	20 cm crushed stone for drainage layer
New Construction (widening) KM 10+500 - KM 19+400							15	30	30	20 cm crushed stone for drainage layer (water logged section)
New Construction (widening) KM 19+500 - KM 42+200							13	25	20	



JERSEY BARRIER (DETAIL "A")

NOTE:
1. All Dimensions are in Meter Except Otherwise Shown.
2. Layer Thicknesses are also valid for Open Median where the Formation Width is 21.300m.
3. Standard size of the shoulder is 2m, however it maybe restricted to 1m as per site.

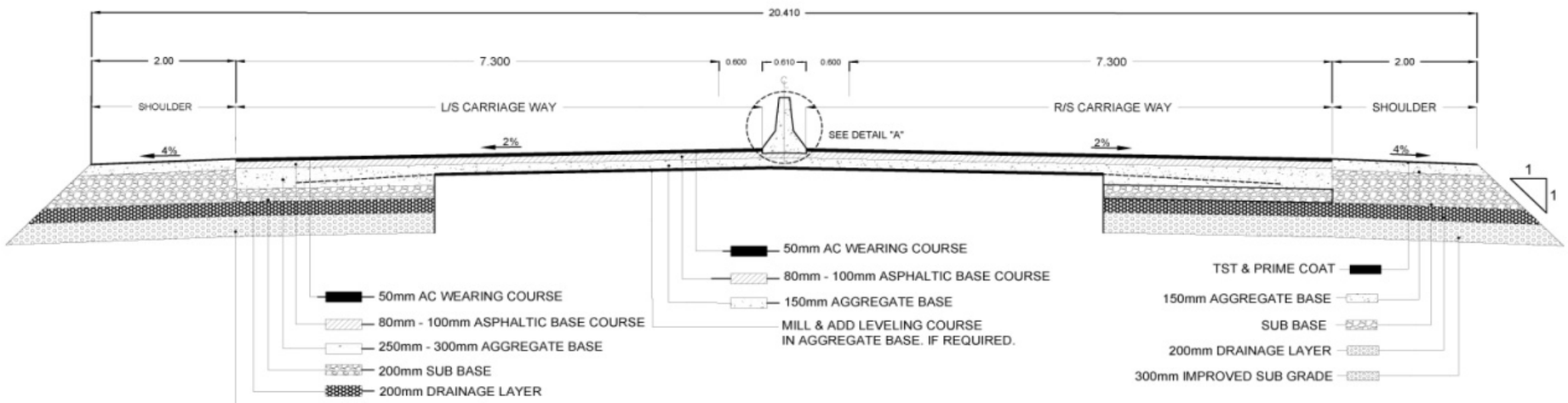
CLIENT: GOVERNMENT OF KHYBER PAKHTUNKHWA, PAKHTUNKHWA HIGHWAYS AUTHORITY (PKHA)
DESIGN CONSULTANT: (JV - CEC & H&B-CEI) CREATIVE ENGINEERING CONSULTANTS (CEC), HASAN AND BEHRAM CONSULTING ENGINEERS INTERNATIONAL (H&B CEI)

REV	DATE	DESCRIPTION
a	23-1-18	
b		
c		
d		

NAMES: DESIGNED ASIF ULLAH; DRAWN: TANZEEL; CHECKED Engr. AFZAL SHAH; APPROVED Engr. AFZAL SHAH
PROJECT: F/S & DUALIZATION OF MARDAN - SWABI ROAD, ADP NO. 1296/170521, MARDAN - SWABI ROAD
SCALE: N.T.S
SHEET CONTENT: TYPICAL CROSS SECTION WITH NEW JERSEY BARRIER OR OPEN MEDIAN
DATE: DWG NO.

Figure - 3.1: Typical Cross Section with New Jersey Barrier (km 10+00-km 19+500)

TYPICAL CROSS SECTION WITH NEW JERSEY BARRIER OR OPEN MEDIAN
Km 3+000 - Km 10+000 & Km 23+000 - Km 29+000



Mardan - Swabi Section
S-1
Both Bounds (Chainage from Mardan)

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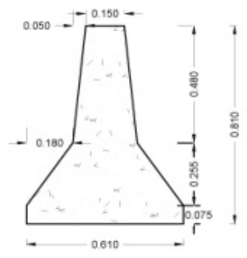
6	23+700	29+000	5400	3.89	3.19	2.98	13	15	0	Mill (5 cm), Distress Removal & Overlay
7	29+100	31+400	2400	4.24	3.44	1.98	13	0	0	Mill (5 cm), Distress Removal & Overlay
8	31+500	42+000	10600	4.08	3.27	2.15	13	0	0	Mill (5 cm), Distress Removal & Overlay
			42100							
New Construction (widening) KM 00+000 - KM 10+400							15	30	20	20 cm crushed stone for drainage layer
New Construction (widening) KM 10+500 - KM 19+400							15	30	30	20 cm crushed stone for drainage layer (water logged section)
New Construction (widening) KM 19+500 - KM 42+200							13	25	20	



JERSEY BARRIER (DETAIL "A")

NOTE:
1. All Dimensions are in Meter Except Otherwise Shown.
2. Layer Thickness are also valid for Open Median where the Formation Width is 21.300m.
3. Standard size of the shoulder is 2m, however it maybe restricted to 1m as per site.

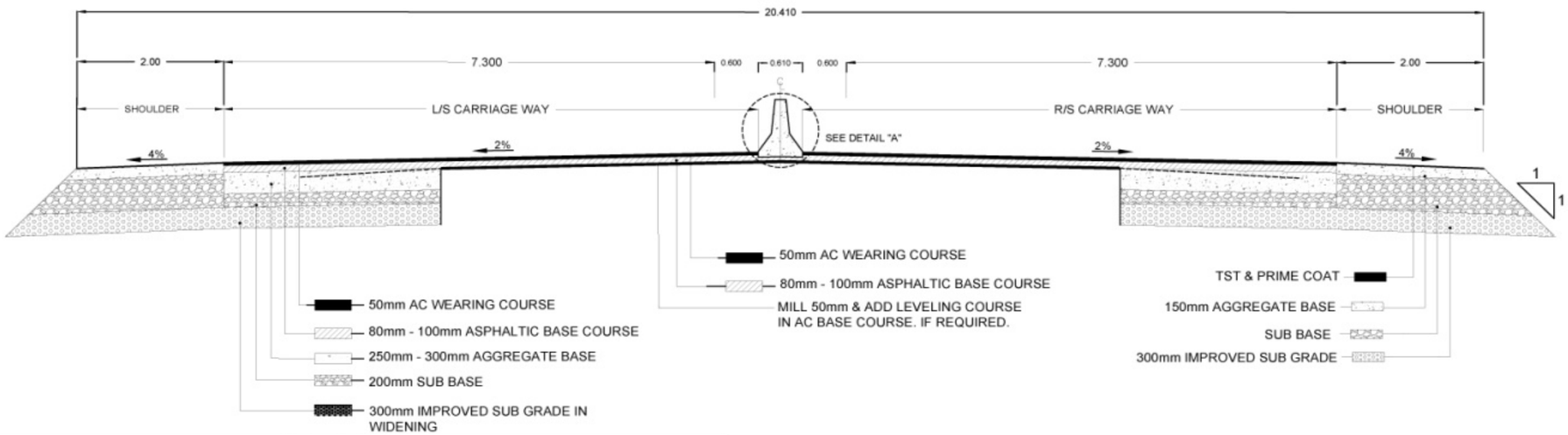
CLIENT: GOVERNMENT OF KHYBER PAKHTUNKHWA, PAKHTUNKHWA HIGHWAYS AUTHORITY (PKHA)
DESIGN CONSULTANT: (JV - CEC & H&B-CEI) CREATIVE ENGINEERING CONSULTANTS (CEC), HASAN AND BEHRAM CONSULTING ENGINEERS INTERNATIONAL (H&B CEI)

REV	DATE	DESCRIPTION
a	23-1-18	
b		
c		
d		

NAMES: DESIGNED: ASIF ULLAH; DRAWN: TANZEEL; CHECKED: Engr. AFZAL SHAH; APPROVED: Engr. AFZAL SHAH
PROJECT: F/S & DUALIZATION OF MARDAN - SWABI ROAD, ADP NO. 1296/170521, MARDAN - SWABI ROAD
SCALE: N.T.S
SHEET CONTENT: TYPICAL CROSS SECTION WITH NEW JERSEY BARRIER OR OPEN MEDIAN
DATE: DWG NO.

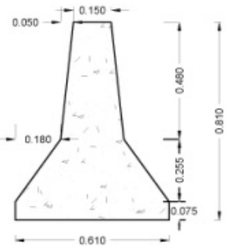
Figure - 3.2: Typical Cross Section with New Jersey Barrier (km 3+00-km 10+00 & 23+000-km 29+000)

TYPICAL CROSS SECTION WITH NEW JERSEY BARRIER OR OPEN MEDIAN
Km 0+000 - Km 3+000, Km 19+500 - Km 23+000
& Km 29+000 - Km 42+000



Mardan - Swabi Section
S-1
Both Bounds (Chainage from Mardan)

Sr #	Section		Length	SN calc	SN eff	SN OL	Thicknesses (cm)			Strategy
							Asphaltic Layers	Aggregate Base	Granular Sub Base	
1	00+000	03+000	3100	5.29	3.73	2.48	15	0	0	Mill (5 cm), Distress Removal & Overlay
2	03+100	10+400	7400	4.62	3.06	3.31	15	15	0	Mill (10 cm), Distress Removal & Overlay
3	10+500	17+600	7200	4.31	2.78	4.84	15	30	15	Removal of Ashpaltic Layer, Distress removal, Recompaction of Base layer upto 100% of MDD and Overlay. This section is water logged section and therefore 15 cm thick layer is provided as drainage layer (mentioned as SB)
4	17+700	19+400	1800	4.36	3.08	4.02	15	15	15	Removal of Ashpaltic Layer, Distress removal, Recompaction of Base layer upto 100% of MDD and Overlay. This section is water logged section and therefore 15 cm thick layer is provided as drainage layer (mentioned as SB)
5	19+500	23+600	4200	4.98	4.05	1.98	13	0	0	Mill (5 cm), Grooving & Overlay
6	23+700	29+000	5400	3.89	3.19	2.98	13	15	0	Mill (5 cm), Distress Removal & Overlay
7	29+100	31+400	2400	4.24	3.44	1.98	13	0	0	Mill (5 cm), Distress Removal & Overlay
8	31+500	42+000	10600	4.08	3.27	2.15	13	0	0	Mill (5 cm), Distress Removal & Overlay
			42100							
New Construction (widening) KM 00+000 - KM 10+400							15	30	20	20 cm crushed stone for drainage layer
New Construction (widening) KM 10+500 - KM 19+400							15	30	30	20 cm crushed stone for drainage layer (water logged section)
New Construction (widening) KM 19+500 - KM 42+200							13	25	20	



JERSEY BARRIER (DETAIL "A")

NOTE:
1. All Dimensions are in Meter Except Otherwise Shown.
2. From Km 0+000 to Km 3+000 Drainage Layer 20cm Thick in Widened Portion shall be provided over Improved Sub Grade.
3. Layer Thickness are also valid for Open Median where the Formation Width is 21.300m.
4. Standard size of the shoulder is 2m, however it maybe restricted to 1m as per site.

CLIENT:	DESIGN CONSULTANT: (JV - CEC & H&B-CEI)	REV	DATE	DESCRIPTION	NAMES:		PROJECT:	SCALE:	SHEET CONTENT:
GOVERNMENT OF KHYBER PAKHTUNKHWA PAKHTUNKHWA HIGHWAYS AUTHORITY (PKHA)	CREATIVE ENGINEERING CONSULTANTS (CEC) HASAN AND BEHRAM CONSULTING ENGINEERS INTERNATIONAL (H&B CEI)	a	23-1-18		DESIGNED	ASIF ULLAH	F/S & DUALIZATION OF MARDAN - SWABI ROAD ADP NO. 1296/170521	N.T.S	TYPICAL CROSS SECTION WITH NEW JERSEY BARRIER OR OPEN MEDIAN
		b			DRAWN	TANZEEL			
		c			CHECKED	Engr. AFZAL SHAH	MARDAN - SWABI ROAD		
		d			APPROVED	Engr. AFZAL SHAH			DATE: DWG NO.

Figure - 3.3: Typical Cross Section with New Jersey Barrier
(km 0+000-km 3+000 & 19+500-km 23+000 & km 29+000-km 42+000)

3.1.6. Raw Material Availability

Sources of different raw materials required for construction are given in the **Table - 3.4**.

Table - 3.1.64: Construction Material Availability & Quantity

Raw Material	Availability
Borrow material	Along the Road
Stones for retaining walls and rip rap.	Jamal Garhi, Risalpur Quarry, Maneri,
Stone for sub-base, aggregate base course, asphalt courses	Margala, Jamal Garhi, Risalpur Quarry, Maneri
Bitumen	Refineries in Karachi or Rawalpindi
Brick	Peshawar, Hattar
Sand	Risalpur, Nizampur, Jhari Kas
Water for compaction and sprinkling.	Various Canals
Reinforcement Steel	Canals, Water Courses
G.I. Pipes	Nearby Markets
Cement	Nearby Markets

3.1.7. Machinery to be used

The machinery likely to be use in the project are graders, batching plants, asphalt mixing plants and others as given in **Table - 3.5**.

Table - 3.1.75: Machinery Requirement

Machinery	Quantity
Graders	4-6
Tractors	8-10
Vibratory Rollers	3-5
Asphalt Mixing Plants	1
Stone Crushers	1
Batching Plants	2
Water Bowser/Sprinklers	3-4
Oil Tankers	2
Haulage Trucks	6-10
Excavators / Loaders	3-5

Machinery	Quantity
Small Vehicles	10-12
Dozers	2-3
Asphalt Plant	1

3.1.8. Construction Schedule

The total construction time is estimated about twenty five months.

3.1.9. Construction Logistics and Sources

The contractor will be contractually bound to maximize employment of the local people. The **Table - 3.6** gives an estimated requirement for the work force subject to the availability from the local area.

Table - 3.1.96: Distribution of Labor

Type of Labor	Local	Non–local
Skilled	70	30
Semiskilled	80	20
Unskilled	100	0

The daily wage rates are fixed by the local commissioner and the same will be paid in previous segments of the road. Due to dualization of the existing highway, the work access will be easy. The machinery and equipment will be accommodated in the open yard. The yard will have enough storage and haulage space with ample moving and working space. The yard will be walled and provided with sufficient security staff. The contactor will establish a workshop for repair of vehicles and other similar machinery. A first aid facility will be setup by the contractor at the work site assisted by a doctor working on a part time basis.

3.2. ESTIMATED PROJECT COST

The estimated cost of the present project is Rs. 8,000 million.

3.3. CONSTRUCTION LOGISTICS

3.3.1. Work Base

Since all are linear work, the ideal would be to set up the work base at Ismailia which make the center of the project site.

3.3.2. Labor Camps

Although a majority of the labor force will come from local sources, they will get picked up and dropped by contractor transport. Some unskilled, most semiskilled and skilled workers may have to be brought in by contractor from far off towns who will live in camps. Being located near the work base, the camps will make the work access easy to the camp dwellers. Like camp, the work base can also be 500 m away from the nearest habitation.

3.3.3. Machinery Maintenance and Equipment Yards

Near 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.

3.3.4. Material Depots

Near the work base a material depot will be required for storing construction material. It will have 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.

3.3.5. Machinery Repair Workshops & Asphalt Plant

With a large number of vehicles and other similar machinery a repair workshop is essential. The contactor may establish his own workshop. The asphalt plant shall be at least 1.5 Km away from the any population or dwellings. It is anticipated that the contractor will use the same asphalt plant as being use for the Swat Expressway.

3.3.6. Security Arrangements

Given the prevailing condition, security staff is necessary. Enough security will be required at Work Base, Labor 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.

3.3.7. Healthcare

With a large number of labor and employees working in the project of road construction, small 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.

3.3.8. Labor Reporting Office

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

3.3.9. Labor Transport

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

3.3.10. Work Uniform and Health Safety Equipment

Road construction is a special job and the labor working on such work requires special protective uniforms and special HSE measures. It will be ensured that the labor engaged in breaking of stones, handling bricks, mixing concrete or mixing and laying asphalt will have long boots, overall dresses, goggles and safety hats. As an overall HSE measure anyone going into the construction area will also wear safety hat.

3.3.11. Signage

During construction suitable signboards and traffic signs will be displayed on construction site in particular and on the entire road length in general. This will help in forestalling any possible accidents.

Figure - 3.4: Road Safety Signs

3.3.12. Lighting and Illumination

Suitable lighting arrangement will be made by the contractor over all work base, work sites, camp site, machinery yard and material depots. This can help the contractor for extended working hours as well as security. If PESCO electric supply is not available, electricity generators will have to be arranged on all spots where lighting is required.

4. DESCRIPTION OF THE ENVIRONMENT

This Chapter describes the prevailing environmental conditions along the project road. In the following sections, the relevant Physical Resources, Ecological Resources, Economic Development and Social & Cultural Resources have been briefly discussed.

4.1. PHYSICAL RESOURCES

4.1.1. Climate and Air Quality

The province of Khyber Pakhtunkhwa covers nearly six degrees of latitude from north to south and experiences diverse climate conditions. In the mountainous region in the north, summers are temperate and winters intensely cold. The project road lies in the Peshawar Valley where the climate is rather extreme. The summer season persists from May to September. May and June are extremely hot and dry months while July to September is the monsoon period. The months of July and August are hot and humid. The turn of the season comes in mid-September and up to mid-November it is cool and pleasant, though a bit dry and dusty. From December to mid-February it is cold. The spring comes somewhere around the middle of March which is undoubtedly the most pleasant period of the year.

Swabi's climate is classified as warm and temperate. In winter, there is much less rainfall in Swabi than in summer. This location is classified as Cwa by Köppen and Geiger. The average annual temperature is 22.2 °C in Swabi. About 639 mm of precipitation falls annually.

4.1.2. Precipitation

The average monthly amount of precipitation has been recorded at around 28 mm. Throughout the month you can expect to see rain or drizzle falling on 10 days of the month.

4.1.3. Wind

The average daily wind speed has been around 10 km/h, that’s the equivalent to about 6 mph, or 5 knots. In recent years the maximum sustained wind speed has reached 93 km/h, that’s the equivalent of around 58 mph, or 50 knots.

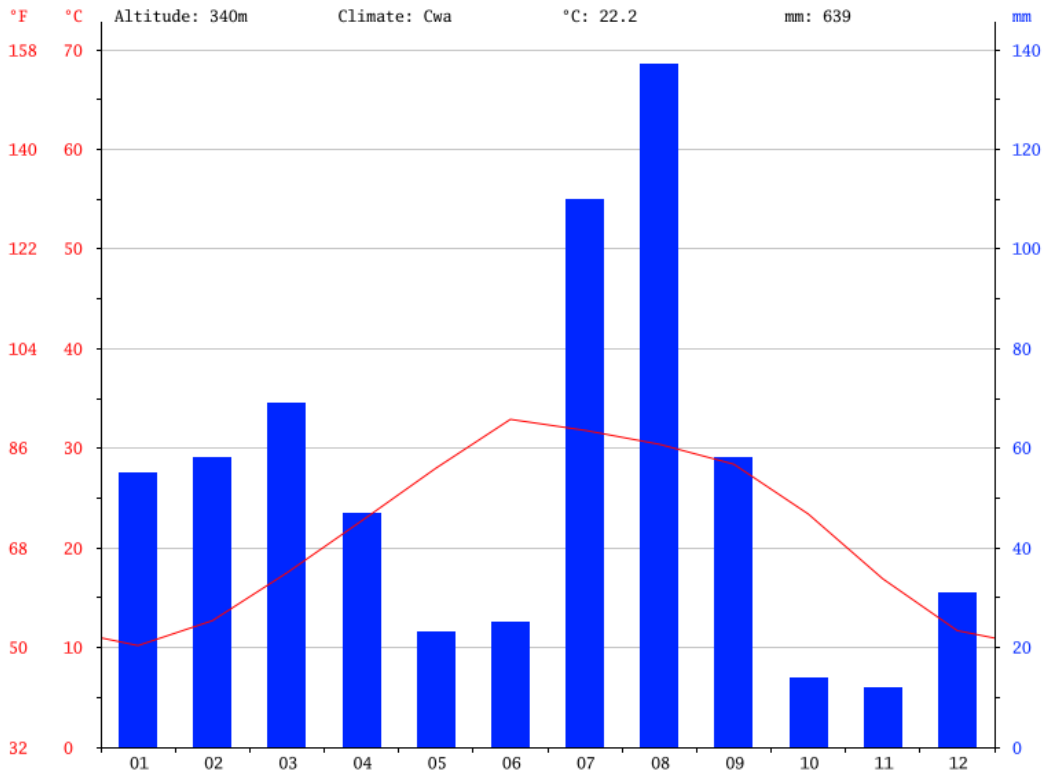


Figure - 4.1: Climatic Graph of District Swabi

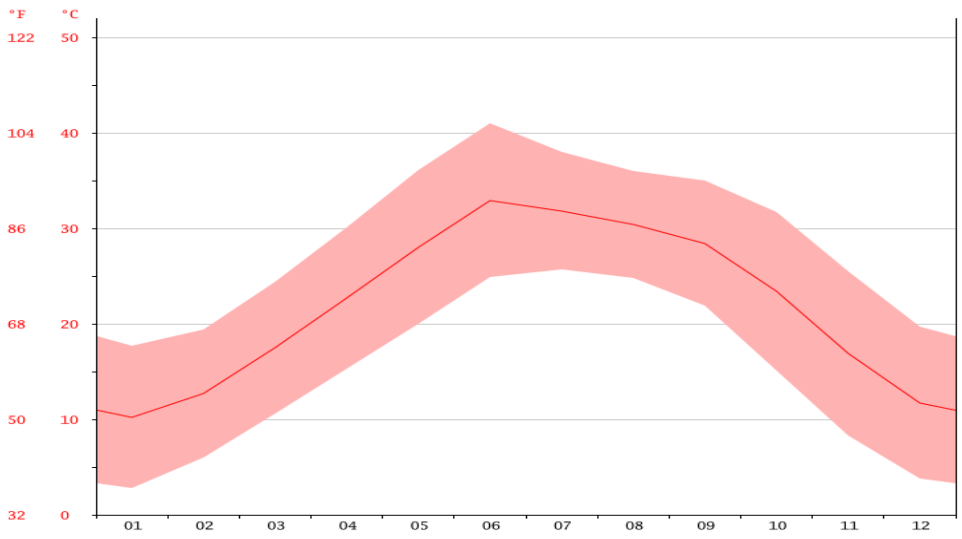


Figure - 4.2: Temperature Graph of District Swabi

The temperatures are highest on average in June, at around 32.9 °C. January has the lowest average temperature of the year. It is 10.2 °C.

Table - 4.1: Swabi Climate Table / Historical Weather Data

	January	February	March	April	May	June	July	August	September	October	November	December
Avg. Temperature (°C)	10.2	12.7	17.5	22.7	28	32.9	31.8	30.4	28.4	23.4	16.9	11.7
Min. Temperature (°C)	2.8	6	10.6	15.3	20	24.9	25.7	24.8	21.9	15.1	8.3	3.8
Max. Temperature (°C)	17.7	19.4	24.4	30.1	36.1	41	38	36	35	31.7	25.5	19.7
Avg. Temperature (°F)	50.4	54.9	63.5	72.9	82.4	91.2	89.2	86.7	83.1	74.1	62.4	53.1
Min. Temperature (°F)	37.0	42.8	51.1	59.5	68.0	76.8	78.3	76.6	71.4	59.2	46.9	38.8
Max. Temperature (°F)	63.9	66.9	75.9	86.2	97.0	105.8	100.4	96.8	95.0	89.1	77.9	67.5
Precipitation / Rainfall (mm)	55	58	69	47	23	25	110	137	58	14	12	31

The variation in the precipitation between the driest and wettest months is 125 mm. During the year, the average temperatures vary by 22.7 °C

4.1.4. Topography and Soils

It is a generally accepted theory that the valley of Peshawar formed originally the bed of a vast lake whose banks were formed by the surrounding hills and whose waters were fed by rivers which now flow through its formerly sub-aqueous bed. Supporting the theory, the valley of Peshawar is surrounded on all sides by hills, except to the east.

Mardan district may broadly be divided into two parts, north eastern hilly area and south western plain. The entire northern side of the district is bounded by the hills. In the district, the highest points in these hills are Pajja or Sakra, 2056 meters high and Garo or Pato, 1816 meters high. The south western half of the district is mostly composed of fertile plain with low hills strewn across it.

Like Mardan, The Swabi District may also be divided into two parts, the northern hilly areas and the southern plain. The major part of these hills are in Gadoon area in the north-east. These are the continuation of the Mahaban hills. The other important hills are situated in north-western corner of the district. These are locally called as the Naranji hills. The height of these hills varies between 750 to 1400 metres above sea level. There are also a few other small isolated hills, the most important of which is located south of Swabi town. Other hills are in the south, along the border with Nowshera district, which are the part of Khattak hills, north of the Kabul River. From the foot of the hills, the plain runs down at first with a steep slope, and then gently to the lower levels, towards the Kabul River. The lower southern half of the district has its slope towards the River Indus.

The project road takes off from the south-eastern corner of Mardan District and enters Swabi District at its north-western tip and runs towards south-east of the district till it reaches the town of Swabi. Hence the road passes through flat terrain barely touching the tip of Karamar Hills.

4.1.5. Geology/Seismology

The Peshawar Valley's plain itself consists of fine alluvial deposits, the composition and depth of which varies in different localities and at different distances. In most parts of the plain the soil is light and porous, and contains sand to a depth of four to twenty feet. Below this the admixture is much less, or even entirely absent, its place being taken by clay, either soft or indurated, and often combined with beds of nodular limestone or *kankar*. This formation may extend to a depth of four to sixteen feet, and is succeeded by beds of gravel and sand of greater thickness.

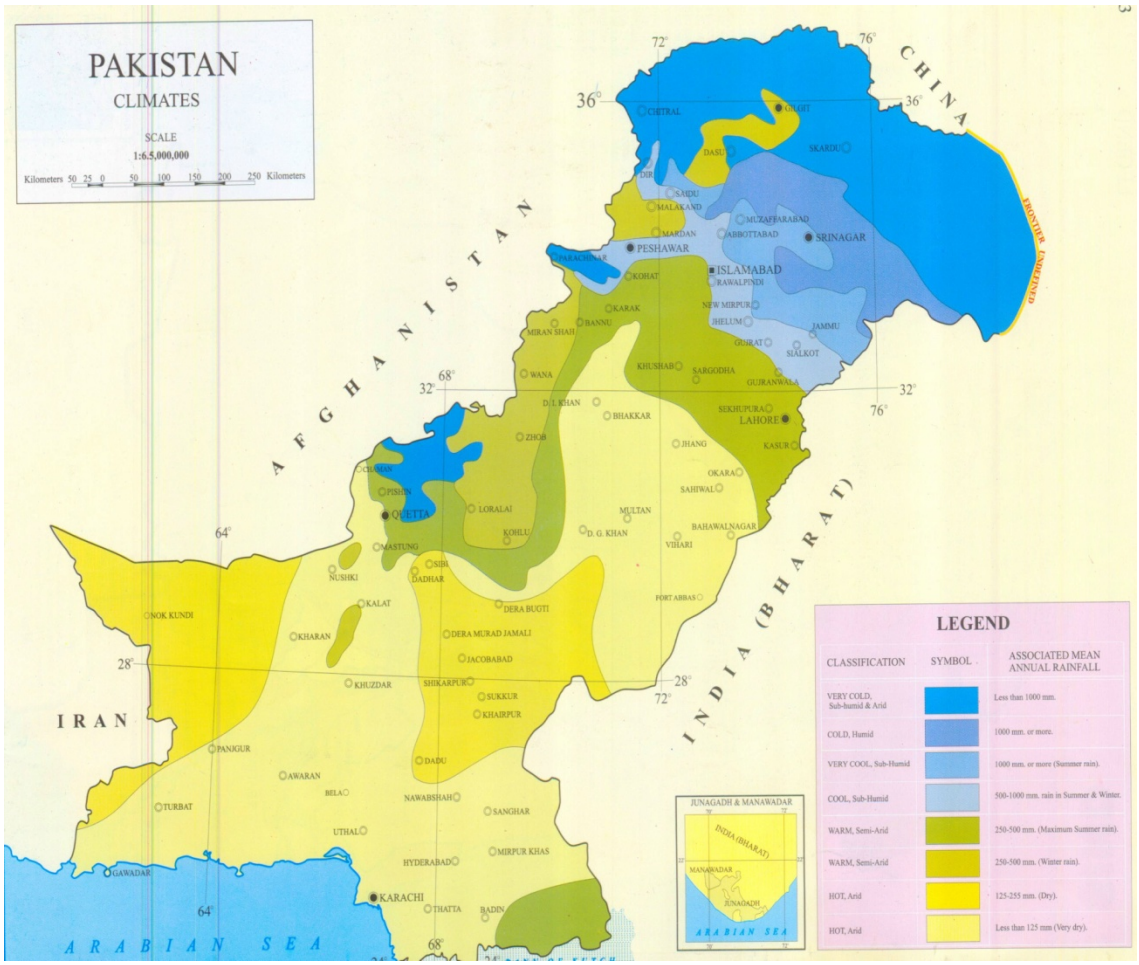
The cultivation tracts consist of a rich, light and porous soil, composed of a pretty even mixture of clay and sand.

The arable soil of Swabi district have developed either from river alluvium or loess plains. Texture of river alluvium ranges from sandy loam to loamy sand, loam

approaching clay loam. The soil of loess plains ranges in texture from silt loam to silty clay loam or silty clay.

A major earthquake shook Pakistan on Saturday, October 8, 2005, at 8:50 a.m. The epicentre of this magnitude 7.6 quake was at 34.45° N, 73.65° E about 65 miles north-northeast of Islamabad the country's capital. At least 86,000 people were killed, more than 69,000 were injured, and extensive damage resulted in much of northern Pakistan in Azad Jammu and Kashmir (AJK) and neighbouring Khyber Pakhtunkhwa (KP). Thousands were buried under the rubble. The heaviest damage occurred in the Muzaffar Abad area of Kashmir. More than three million people lost their homes.

Subsequent to the catastrophic earthquake, a seismic re-zoning was done. According to MOHW-PEC-NEPAK (2007), the project area for the road is situated in zone 2B with Peak Horizontal Ground Acceleration (PGA) in the range of 0.16 to 0.24g and is considered to be at 'Moderate' risk of a major earthquake event.



Map Showing Climatic Region of the Pakistan

4.1.6. Water Resources

Agriculture in Peshawar Valley is largely dependent on Canals. Moreover, tube well irrigation is also done in some areas. The irrigated land in the valley of

Peshawar constitutes a large percentage as compared to other areas of Khyber Pakhtunkhwa.

In Mardan, generally stream flows from north to the south. Most of the streams drain into Kabul River. Kalpani, an important stream of the district rises in the Baizai and flowing southwards join Kabul River. Other important streams which join Kalpani are Baghiari Khawar on the west and Muqam Khawar, coming from Sudham valley and Naranji Khawar from the Naranji hills on the left.

The plain area of the Swabi District is intersected by numerous streams and many smaller ravines. The important stream is the Narranji Khawar, which flows from Narranji hills in a south-western direction joining the Kalapani stream in Mardan district. Another important stream is Badri Khawar which flows from the north close to Swabi town and joins the Indus River near village Hund. The Indus River flows along the southern boundary of the district.

The project road is crisscrossed by Muqqam Khwar near Shahbaz Garhi, Branches of Naranji Khwar near Yar Hussain and Kalu Khan and Badri Khwar near Swabi besides other nullahs and canals.

Water quality was assessed at four sites from drinking water and waste water sources (Appendix–B). Results for biochemical oxygen demand (BOD) and chemical oxygen demand (COD) were showing evidence of high concentration of the pollutants from grey water. The sample of drinking water showed evidence of Coliform contents indicating that the water is not suitable for drinking.

4.2. BASELINE ENVIRONMENTAL MONITORING

A detailed environmental monitoring for air, water, waste water and noise was conducted from the various points of the project site. The detail report is attached as Appendix-B of the IEE Report.

4.2.1. Water & Waste Water

A total of six drinking water and six waste water samples were collected along the length of the road. The sites are including Near Jawad Chowk Flyover, Bala Garhi, Near Ismailia, Near Aman Chowk, Shahbaz Garhi, Swabi Bazaar (See Figure 4.3 & 4.4). The drinking water analysis revealed that water is chemically stable in its characteristic while has biologically contaminated with Coliform and E-coli contents. The waste water characteristics revealed that the effluents have high concentration of COD and $BOD_{5.}$ For detail baseline monitoring of water and waste water analysis refer to Annexure B &D of the IEE Report.

4.2.2. Air

A total of six air samples were collected along the various sites of the road including Jawad Chowk Flyover, Bala Garhi, Near Ismailia, Near Aman Chowk, Shahbaz

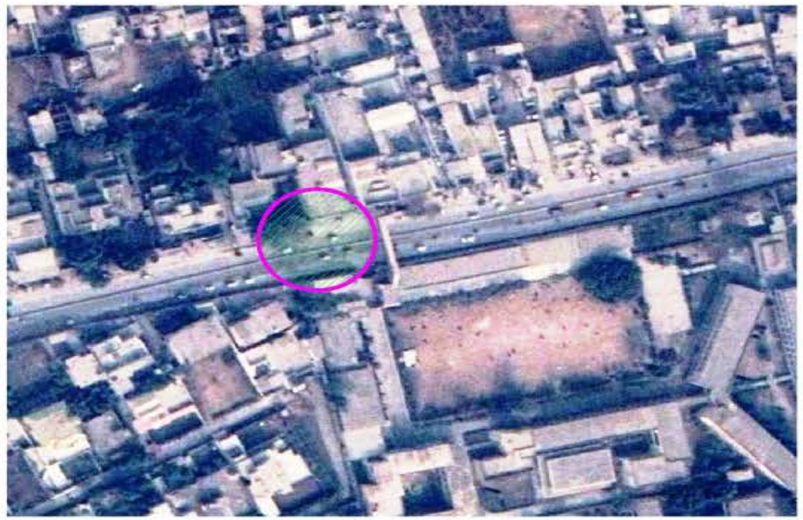
Garhi, Swabi Bazaar for ambient Particulate Matter and ambient gases (CO, NOx, SO_2). The results indicated the currently ambient air is in compliance with the National Environmental Quality Standards (NEQS) for ambient air (Annexure B&D).

CLIENT:	PROJECT:	TITLE:	SCALE : N.T.S	DWG. No.	
Pakhtunkhwa Highways Authority (PKHA) Government of Khyber Pakhtunkhwa	MARDAN SWABI ROAD	SAMPLES TAKEN FROM PROJECT AREA		MSR - 011	M/S Creative Engineering Consultants House No. 6, Sector D – 5, Phase – 1, Hayatabad Peshawar. Phone & Fax: 091-5822184 Email: cecpeshawar@gmail.com

Figure 4.3: Map Showing Sampling Locations along the Road.

4.2.3. Baseline Noise in the Project Area

Six noise levels samples were collected from the locations including Jawad Chowk Flyover, Bala Garhi, Near Ismailia, Aman Chowk, Shahbaz Garhi and Swabi Bazaar. The monitoring points were chosen to represent data from populated areas or selected sensitive receptors. The monitored data for noise levels reveled that high noise levels along these monitored points are due to traffic flow in the area for details refer to Annexure B&D.



JAWAD CHOWK NEAR FLYOVER AREA

BALA GARHI AREA

ISMAILA AREA

AMAN CHOWK AREA

CLIENT:	PROJECT:	TITLE:	SCALE : N.T.S	DWG. No.	
Pakhtunkhwa Highways Authority (PKHA) Government of Khyber Pakhtunkhwa	MARDAN SWABI ROAD	SAMPLES OF AIR, WATER & NOISE ARE TAKEN FROM CIRCLED AREAS		MSR - 012	M/S Creative Engineering Consultants House No. 8, Sector D – 5, Phase – 1, Hayatabad Peshawar. Phone & Fax: 091-5822184 Email: cecpeshawar@gmail.com

Figure 4.4: Map Showing Sampling Locations along the road.

4.2.4. Hydrology of the area

The project area is channelled with various streams. The averaged flow rates of these channel are between of 0.02 cuces to 0.035 cuces while during the moon soon season the flow increases by 0.1 cuces. However, these flow does not causes the flooding in the area.

4.2.5. Sensitive Receptors

The sensitive receptors are the areas along the road project where the occupants are more susceptible to the adverse effects of project's implementation activities. Extra care must be taken during the project construction and its regular operations in close proximity to areas recognized as sensitive receptors. The identified receptors are given in the following table and figures 4.5- 4.9.

Table - 4.2: List of Sensitive Receptors

No.	Sensitive Receptor	Chainage
1	Govt. Girls Degree College	Km 000+300
2	Soor Jumat Mosque	Km 000+700
3	Jamia Mosque	Km 04+000
4	Samon's Hospital	Km 04+200
5	Govt. Girls Higher Secondary School	Km 005+100
6	Kashmir abad Mosque	Km 006+000
7	Tehaful Quran Mosque	Km 007+600
8	Police Station and Madrassa	Km 008+400
9	Post Office and Madrassa	Km 014+600
10	Ismaila Hospital	Km 018+800
11	Shoukat memorial College of Engineering	Km 026+600
12	TB Hospital Kalu Khan	Km 027+200
13	Marwa Medical Complex	Km 030+100

No.	Sensitive Receptor	Chainage
14	Ceena Medical Centre	Km 031+ 600
15	Masjid Usman	Km 042+100
16	Swabi College of Education	Km 046+100

Figure - 4.5a: Sensitive Receptors

CLIENT:	PROJECT:	TITLE:	SCALE : N.T.S	DWG. No.	
Pakhtunkhwa Highways Authority (PKHA) Government of Khyber Pakhtunkhwa	MARDAN SWABI ROAD	SENSITIVE RECEPTORS OF PROJECT AREA		MSR - 007	M/S Creative Engineering Consultants House No. 6, Sector D – 5, Phase – 1, Hayatabad Peshawar. Phone & Fax: 091-5822184 Email: cecpeshawar@gmail.com

Figure - 4.5b: Sensitive Receptors

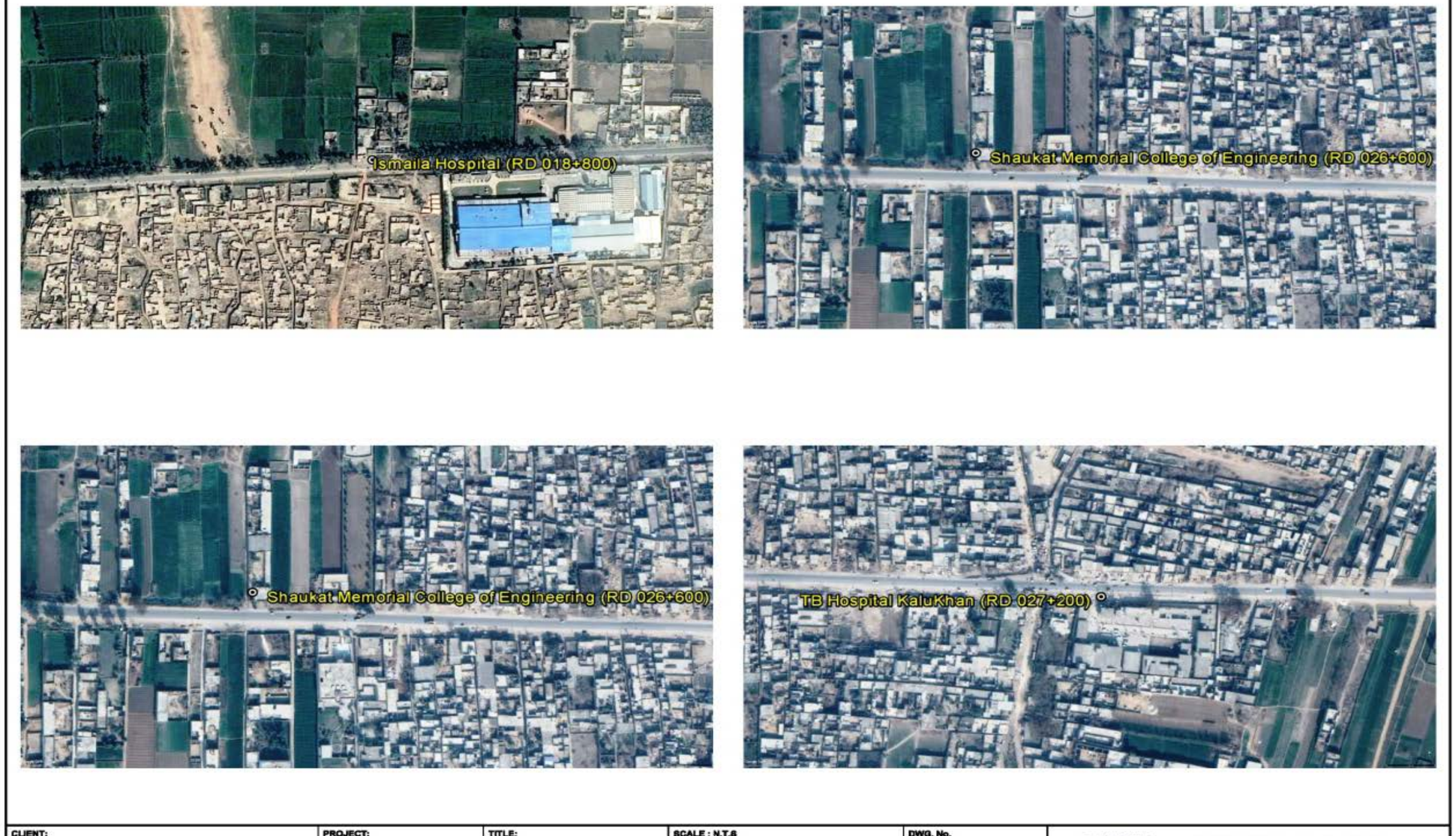


Figure - 4.5c: Sensitive Receptors

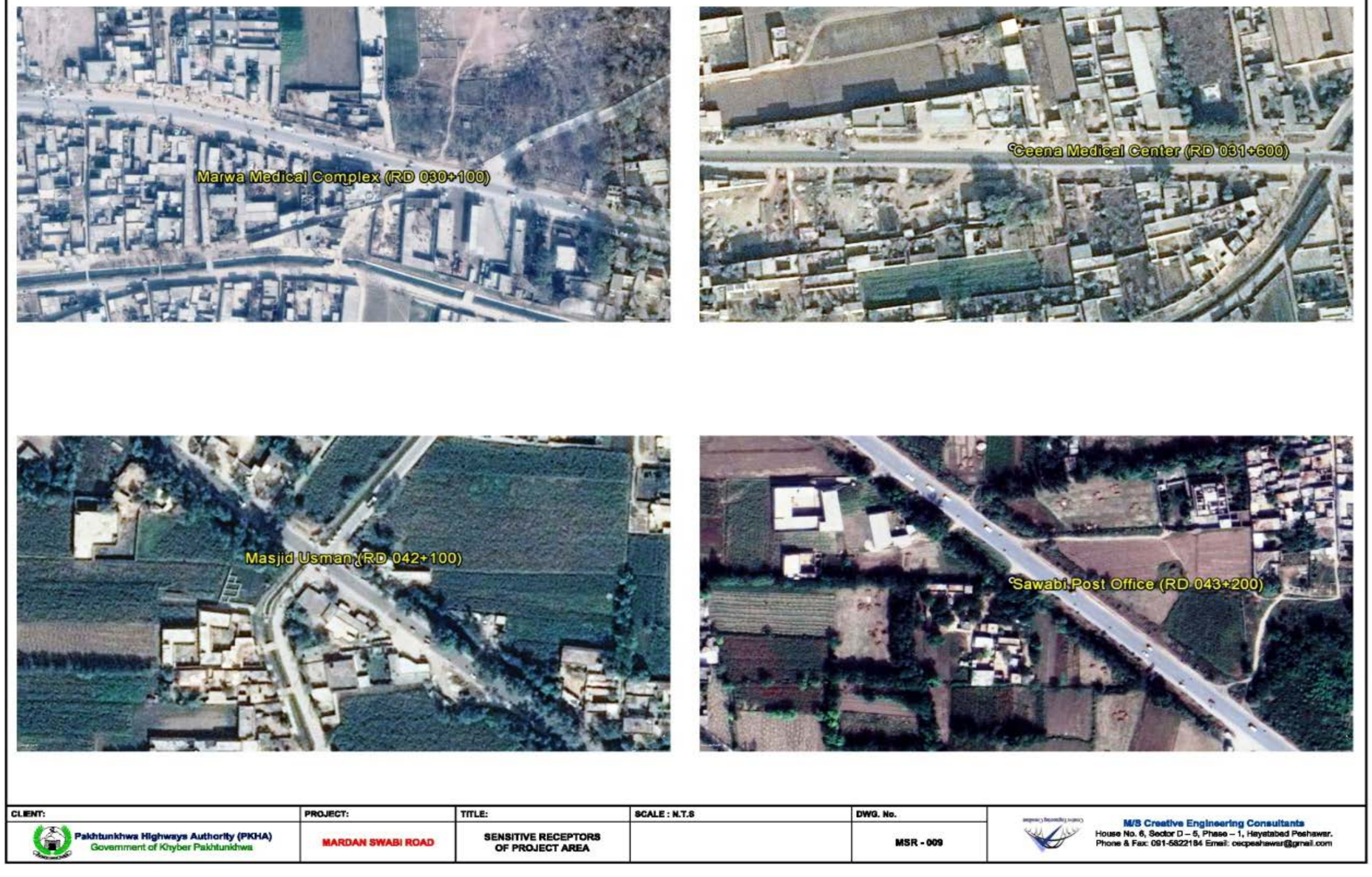


Figure - 4.5d: Sensitive Receptors

CLIENT:	PROJECT:	TITLE:	SCALE : N.T.S	DWG. No.	
Pakhtunkhwa Highways Authority (PKHA) Government of Khyber Pakhtunkhwa	MARDAN SWABI ROAD	SENSITIVE RECEPTORS OF PROJECT AREA		MSR - 010	M/S Creative Engineering Consultants House No. 6, Sector D – 5, Phase – 1, Hayatabad Peshawar. Phone & Fax: 091-5822184 Email: cecpeshawar@gmail.com

Figure - 4.5e: **Sensitive Receptors**

4.3. ECOLOGICAL RESOURCES

The common trees are Mesquite, Ber, Acacia, Jhand, Mulberry (Tut), Sissu (Shiwa), Tarmarisk (Ghaz), Poplar (Supaidar) and Eucalyptus (Lachi). The common shrubs and grasses are spynda, akk, small red poppy, spera, camel thorn, paighambari gul, drab grass, eameithorl and pohli chaulai etc.

Important mammal species found in the vicinity of the project area are Valpus valpus (Fox), Carnis aureus (Jackal), Hystrix indica (Porcupine) and Sus scrofa (Wild boar). Also found Wild Cat, Wild Rabbit, Quai and Wild Pigeon.

Similar is the case of game animals. It is due to having use of firearms of all classes and absence of forests and shrubs. The only worth mentioning game is ducks that travel from Siberia to lakes in Sind where they spend their winters. While travelling, they always find the watercourses flowing from north to south.

The predominant tree species that can be seen stretching on both sides of the project road is Eucalyptus (*Lachi*). Other species include Zizyphus jujuba (*Ber*), Acacia (*Kikar*), Mulberry (*Tut*), Sissu (*Shiwa*) and Poplar (*Supaidar*).

4.4. ECONOMIC DEVELOPMENT

4.4.1. Industry

Industrial activity in the Province is modest. According to Directorate of Industries, Commerce Khyber Pakhtunkhwa, Peshawar, there are in all 466 industrial units in the two districts of Mardan and Swabi out of which 142 are closed. Hence running industrial units are 324 for the year 2014-2015.

4.4.2. Infrastructure

According to Pakistan Social & Living Standard Measurement Survey (PSLM) 2013-14, 98% urban population and 75% rural population use safe drinking water resulting in 80% of the total population of Khyber Pakhtunkhwa using safe drinking water against the national standards of 94%, 93% and 93% respectively. Similarly, 99% urban population, 78% rural population resulting in 82% total population of Khyber Pakhtunkhwa use sanitary means of excreta disposal against the national standards of 99%, 74% and 83%.

Bustling commercial activities can be observed on both sides of the road e.g. markets, restaurants and hotels, filling pumps, banks, and workshops in addition to health and educational institutions and mosques.

World renowned tobacco companies have established their industrial units on the project road as the two districts are famous for growing the best quality Virginia Tobacco, for instance, Samson's Tobacco (Re-drying) Factory near Shahbaz Grahi,

Philip Moris Int'l (GLT) Plant and Philip Moris International Leaf Division in Ismaila, Pakistan Tobacco Company in Charbagh and Lakson Tobacco Co Ltd in Serai.

4.5. SOCIAL AND CULTURAL RESOURCES

The province is regarded as the western border of sub-continent, which has been a traditional route for invaders, merchants and travelers from Central Asia and Europe to the Indian peninsula, including Alexander The Great, Tamerlane, Babur and Ahmad Shah Abdali. It was the cradle of Buddhist Ghandara civilization in the 6th century BC.

A total of 85 monuments and archaeological sites in Khyber Pakhtunkhwa province are under the protection of the Federal Government.

There are many artifacts and historical sites in the two districts but none of them are threatened by the construction activities as they are not located within the projects' zone of influence. Despite the fact, it is important that contractors are aware of the potential for finding historical remains and that they follow appropriate procedures.

No monuments of historical significance are located on or near the project road. Chanaka Dheri, a place of historical and archaeological significance is situated about 10 km away from Shahbaz Garhi an important town located on the project road. Hence the proposed dualization will pose no threat to Chanaka Dheri.

4.6. Population

The population of Swabi district, according to the 2017 census, is 1,624,616. The population of the district over the years is shown in the table below.

Table - 4.2: District Swabi Population

Census Year	Population	Rural Area	Urban Area
1951	272,279	272,279	None
1961	332,543	307,862	24,681
1972	507,631	440,213	67,418
1981	625,035	566,734	58,301
1998	1,026,804	847,590	179,214
2017	1,624,616	N/A	N/A

5. ANALYSIS OF ALTERNATIVES

The alternatives for the proposed project and their relative potential impacts on the environment were considered to evaluate the best project option. The following alternatives were considered for the project:

A. Road Alternatives

- No project option / worst scenario option.
- Altogether a new route
- Dualization with improvement of curves where necessary.

B. Logistic Sites

- Siting of Contractor's facilities e.g. labor camp site, and machinery yard on state land.
- Siting the Contractor's facilities on private lands.
- Siting Contractor's facilities at most appropriate site be in public land or private land.

C. Labor Options

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

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

5.1. ROAD ALTERNATIVES

5.1.1. 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 Districts Mardan and Swabi. 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 maintenance of the existing 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.

5.1.2. A New Route Altogether is Surveyed on another Site

Analysis

- **Strengths and Opportunities**

  In addition to the existing highway, another double lane road will become available. The capacity to handle inter–district traffic will enhance manifolds. The new alignment will also give an opportunity to modify and improve existing 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 double 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 new alignment may take the new double lane road close to or pass through any of the sensitive areas causing problems.

- **Conclusion**

  Because of prohibitive cost, high environmental impacts and social problems, this option of a new highway on an altogether new site is not recommendable.

5.1.3. Project as Proposed with Dualization and Improvements where Necessary

Analysis

- **Strengths and Opportunities**

  As per well considered feasibility, the proposed project responds to the need of the time. Dualization induces traffic ability, safety, speed, efficiency and thus better trade on inter–district level. A dualized road will help in reducing the number of accidents and reduce the vehicle operating cost. All along the proposed project, during construction and after construction there will be ample job opportunities for local population. This will result in better education, health and social welfare opportunities. The project area will experience definite poverty alleviation. Dualization will also help to improve all sharp curves, widen congested points, and solve the problems associated with floods and waterlogging.

  In the long run, the project is financially viable, socially acceptable, environmentally preventable, generally neutral and poverty alleviation. The reversible construction and social impacts during construction are manageable.

- **Conclusion**

  The opportunity of dualization of road from Mardan to Swabi is recommendable and it should be availed for larger benefit of all stakeholders.

5.2. LOGISTIC SITES

5.2.1. Sitting of Contractor's Facilities on State Land

Analysis

- **Strengths and Opportunities**

  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 labor 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.

- **Weaknesses and Threats**

  Best suitable sites of required size and descriptions may not be available within ROW and the standard. 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 labor camp, machinery yard and work bases. This is an acceptable option and is recommended.

5.2.2. Sitting of Contractor's Facilities on Private Lands

Analysis

- **Strengths and Opportunities**

  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.

- **Weaknesses and Threats**

  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 IEE.

- **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 labor camp on hired private land then PkHA will bear no responsibility for his costs and commitments.

5.2.3. Sitting the Contractor's Facilities at Appropriate Site, Be it Public Land or Private Land

Analysis

- **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 PkHA Engineer and can plan his operations according to 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**

  After settling the contractor on state land, this is the 2nd best option. But for contractors activities on private lands, PkHA holds no responsibility for contractor's cost and commitments.

5.3. LABOR

5.3.1. All Labor Local

Analysis

- **Strengths and Opportunities**

  All labor will be local and their employment will fulfill 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 labor will be that most of them will come from and go to their homes daily and there will be very little pressure on labor camps.

- **Weaknesses and Threats**

Three types of labor will be required; unskilled, semiskilled and skilled. All types of labor cannot be available locally. So binding contractor to employ all labor locally can put limitation on contractor.

- **Conclusion**

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

5.3.2. All Labor from Outside

Analysis

- **Strengths and Opportunities**

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

- **Weaknesses and Threats**

  Bringing outside labor 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 labor 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.

5.3.3. An Admixture of Local and Outside Labor as per Skill Required

Analysis

- **Strengths and Opportunities**

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

- **Weaknesses and Threats**

  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 labor. This option also presents an opportunity of transfer of skills from outside technicians to local workers.

5.4. CONCLUSION

In the light of above discussions in respect of other means of transportation like railway, air and navigation, it is concluded that construction of road rout is the only viable option from socioeconomic considerations. The project will be accommodating within the available COI at built up areas.

6. SCREENING OF POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

6.1. INTRODUCTION

This section of the IEE describes in detail the project's potential impacts and proposes mitigation measures to limit negative impacts identified. The first items discuss the types and phases of the impacts. The report then presents the impacts and mitigation in detail as follows:

- **Physical Resources**
  - Air quality & Climate Change
  - Topography
  - Soils
  - Hydrology
  - Geology & Seismicity
- **Ecological Resources**
  - Flora
  - Fauna
  - Forests & Protected areas (if any)
- **Economic Development**
  - Industries
  - Infrastructure & Transportation Facilities
  - Land use
  - Waste Management
- **Social and Cultural Resources**
  - Population and communities
  - Health & Education
  - Socio-economic conditions
  - Physical and Cultural Resources
  - Noise

6.2. IMPACT PHASES

This impact assessment and mitigating measures cover the entire cycle of the project activities, from pre-construction to construction, operation and maintenance. The coverage of each of project phases is defined as follows:

- Design Phase, or the Pre-construction Phase
- Construction Phase
- Operation Phase

6.3. TYPES OF IMPACTS

The types of impacts that may arise during Project works can be classified as follows:

- Direct Impacts - i.e., those directly due to the Project itself such as the impacts to air quality resulting from construction activities, equipment and vehicles. Direct impacts also include the impact of construction expenditures in the local economy.
- Indirect Impacts - i.e., those resulting from activities prompted by the Project, but not directly attributable to it. The use of rock and other construction materials, for example, has an indirect impact of increasing the demand for these materials.
- Cumulative Impacts - i.e., impacts in conjunction with other activities. A single road improvement may not exert a significant environmental impact, but if some roads are developed in the same area developing a road network the cumulative or additive effect could be more significant. For this project road (Swat expressway) under construction (km18+10).

Impacts in all three categories may be either:

- Short-term – i.e., impacts which occur during construction and affect land use, air quality and other factors. Many of these impacts, however, will be short-lived and without long lasting effects. Even the effects of some relatively significant impacts such as borrow pits, for example, may be eventually erased if appropriate mitigation actions are taken.
  Many potential short-term negative impacts can be avoided or otherwise mitigated through proper engineering designs and by requiring Contractors to apply environmentally appropriate construction methods. Or;
- Long-term – i.e., construction impacts that could, for example, affect regional community health and safety if poor design practices are used.

  Both short-term and long-term impacts may be either beneficial or adverse. Short term Positive impacts will include, for example, the generation of employment opportunities during construction period. Long-term benefits will include enhanced development opportunities, improved transport services, easier access to commercial and service facilities; faster communications and commodity transport; improved access to markets and growth centers and increased services and commercial facilities.

6.4. MITIGATION ASPECTS

Mitigation is recommended through strategic avoidance combined with construction and monitoring. Bid and contract documents are recommended to specify that a Site Specific EMP (SSEMP) shall be required for this project. The Contractor shall ensure that the SSEMP is submitted to the PkHA (Deputy Director Environment) or the designated person for review at least 10 days before taking possession of any work site. No access to the site will be allowed until the SSEMP is reviewed and approved by the PkHA (Deputy Director Environment) or the designated person.

6.5. PHYSICAL RESOURCES

6.5.1. Air quality & Climate Change

Potential Impacts

The potential impacts of the Project to air quality and climate change are described as follows:

Construction Phase

During construction of the road, air quality is likely to be degraded by a range of operational activities including:

- Exhaust emissions from the operation of construction machinery and the combustion of fuel for furnaces and boilers (e.g. Nitrogen Oxides (NOx), Sulphur Oxides (Sox) and Carbon Monoxide (CO));
- Dust (Particulate Matter (PM)) generated from quarries, borrow pits, haul roads, unpaved roads, exposed soils and material stock-piles. Dust is the major air quality problem from construction sites. Dust is a problem for a variety of reasons, as outlined below:
- Inconvenience to local people. For example, people may have to re-wash laundry that has been put outdoors to dry, and wash windows, curtains and vehicles. Dust can contaminate meat hanging up in open-air butchers and other food that is exposed to it in homes, shops and open-air little shops in the project area.
- Health and safety problems. Dust may affect health by irritating eyes and worsening the health of people with asthma. Dust can reduce visibility for drivers on roads. It can also be blown for long distances by the wind.
- Impact on ecology. Dust blowing onto watercourses may damage ecology by increasing sedimentation, reducing sunlight etc. It may also affect plant growth and change the species of plants growing in an area. Dust may also damage trees and other vegetation planted as part of the construction contract.
- Damage to plant and equipment. Within the construction site, dust can cause mechanical or electrical problems in sensitive equipment such as computers. It can also increase abrasion of moving parts in equipment and clogging of air filters. However, the road rehabilitation works associated with the Project are generally intermittent and not permanent in a specific site, the works move along the Project road as work progresses and as such air quality impacts will be short term in specific locations. Fugitive emissions will be emitted on a longer-term basis from stationary sources such as quarries, borrow pits and asphalt plants. These sites can however be selected and be placed in an area where it can cause the least impact on human and ecologic receptors.

Operational Phase

According to the road traffic assessment, traffic is anticipated to increase due to improvement in Vehicle Operating Cost once the Project becomes operational. The main source of air pollution during the operational phase will be vehicles moving on this road. The main pollutants are:

- Carbon monoxide (CO),
- Nitrogen oxides (NOx),
- Hydrocarbons (HC),
- Sulphur dioxide (SO_2),
- Lead (Pb),
- Carbon dioxide (CO_2),
- Polycyclic aromatic hydrocarbons (PAH),
- Particulate matter (PM) and
- Trace metals.

Some of these compounds can damage health and/or the environment. The concentration of pollutants generated by vehicles depends on factors such as the number, type and speed of vehicles. The effect of air pollution on local people depends on the distance between them and the road, wind direction, topography and other factors. The main direct effects are in the area closest to the road as the rapid dispersion and dilution of exhaust gases quickly reduces their concentrations to levels at which risks are minimal. However, given the relatively low population levels within Project corridor, it is unlikely that increased traffic volumes will have significant impacts to residents health in terms of NOx, CO and PAH pollution. In addition, once completed, current levels of PM in areas where the road condition is poor will be substantially reduced. Improved vehicle performance on a new better road surface will also serve to alleviate potential air pollution levels to a modest degree. Even though traffic will increase on the Project road, vehicle emissions are unlikely to contribute in any significant way to regional or global greenhouse gas levels.

A Climate Change Risk Assessment for the Project and indicates the following potential issues and risks:

i- <u>Change in Temperature</u>:

a. Potential deterioration of pavement integrity, such as softening, traffic-related rutting, and migration of liquid asphalt due to increase in temperature (potentially by 4.6 degrees Celsius by 2085).

b. Potential corrosion of steel reinforcements in concrete structures due to increase in surface salt levels in some locations resulting from increased evaporation due to increased temperatures.

ii- <u>Change in precipitation levels</u>:

a. Damage to roads and drainage systems due to flooding - more frequent as well as intense and heavy precipitation events can cause immediate damages, undermine road structural integrity, affect the maintenance of roads, bridges and drainage systems.

b. Increases in heavy precipitation events/floods will also cause more weather related accidents due to vehicle and road damages and poor visibility, delays, and traffic disruptions. However, embankments heights are being reduced to limit fatalities and serious injuries caused when vehicles roll off the road.

c. Increase in scouring of roads, bridges, and support structures.

d. Damage to infrastructure due to increased susceptibility to wildfires.

Mitigation Actions

Pre-construction Phase

To adequately manage air quality impacts, the Contractor shall be responsible for the preparation of an Air Quality Plan, submitted to the Deputy Director Environment or designated person as part of the SSEMP. The plan will detail the action to be taken to minimize dust generation (e.g. spraying unsurfaced roads with water, covering stock-piles, and blasting with use of small charges etc) and will identify the type, age and standard of equipment to be used and will also provide details of the air quality monitoring program for routine monitoring. The Plan shall also include contingencies for the accidental release of toxic air pollutants (or shall make reference to the Emergency Response Plan). More specifically, the plan will include the following provisions:

- Exhaust emissions - No furnaces, boilers or other similar plant or equipment using any fuel that may produce air pollutants will be installed without prior written consent of the Deputy Director Environment or designated person. Construction equipment shall be maintained to a good standard and fitted with pollution control devices regularly monitored by the Contractor.
- *Open burning of waste materials* - No burning of debris or other materials will occur on the Site without permission of the Deputy Director Environment or designated person.
- *Dust generated from haul roads, unpaved roads, material stock piles, etc* – The Contractor shall ensure and that material stockpiles shall be located in sheltered areas and be covered with tarpaulins or other such suitable covering to prevent material becoming airborne. All trucks used for transporting materials to and from the site will be covered with canvas tarpaulins, or other acceptable type cover (which shall be properly secured) to prevent debris and/or materials from falling from or being blown off the vehicle(s). Hard surfaces will be required in construction areas with regular movements of vehicles. Effective use of water sprays will be implemented (e.g., all roads within the construction areas of the Site shall be sprayed at least twice each day during days of no rainfall, and more if necessary to control dust to the satisfaction level).
- *Construction Camp* – The Contractor shall ensure that all dust creating activities, such as rock crushing, concrete batching, etc should be sited downwind of any urban area and also downwind of site offices and accommodation at the Contractors camp. In addition to the above plan, the following assessments associated with potential climate changes should be undertaken by the designers during the design stage of the Project:
- *Deterioration of pavement integrity* – Assessment should be undertaken to determine if a potential change in temperature of 5°C will require adaption of pavement design (e.g. change in the asphalt binder or in mineral aggregate).
- *Corrosion of steel reinforcements in concrete structures* – Assess if the use of Advanced concrete materials and structures will help improve the durability of concrete infrastructure and their adaptation to climate change

- *Damage to roads and drainage systems due to flooding* – Assessment of 1/50 year flood return period for all bridges and roads embankment and recommend measures to mitigate the flood risks of all planned project roads. Increase capacity of side and cross drains to accommodate more intense floods.
- *Increase in scouring of roads, bridges, and support structures* – Assess designs of piers, abutments and embankments to determine if protection methods are required to cope with additional water volumes and increased flow intensity.

Construction Phase

Locations for quarry sites, borrow pits and asphalt plants shall require approval from the Deputy Director Environment or designated person during the Construction phase. Efforts should be made to ensure that these facilities are as near to the Project road as practical to avoid unnecessary journeys and potential dust issues from vehicle movements during construction works. In addition, no quarry or asphalt plant shall be located within one kilometer of any urban area or sensitive receptor. The locations of these facilities shall be indicated within the Contractors SSEMP.

Operational Phase

Warning systems should be put in place to ensure the affected road section is closed during extreme wildfire events.

6.5.2. Topography

Potential Impacts

Pre-construction Phase

The Project location in this instance has been determined by the existing RoW to be rehabilitated. No significant alteration in realignment is included in the Project. However, given that road section is located on relatively flat area no impacts to topography are anticipated.

Construction Phase

Potential impacts to area topography are most likely to occur in this phase due to quarry operations. Crushed rock material will be needed for construction purposes. Operation of quarries can have significant environmental problems if not managed correctly, more specifically uncontrolled excavation of rock material can leave unsightly scars on mountain sides and can also potentially make slopes unstable.

Mitigation Actions

Construction Phase

It is most likely that quarried material will be procured from existing, licensed quarries. If this is the case, the Contractor must provide copies of agreements with the quarry operator for the procurement of aggregates and the quarries operational license to the DD-Environment prior to the commencement of construction. However, the Contractor may decide to open and operate his own quarry. In this instance potential adverse impacts to topography in the Project Area resulting from quarry operations shall be avoided or otherwise mitigated by ensuring the Contractor complies with the following:

- Quarry sites must obtain the required permits prior to commencement of works, this shall include approval from the EPA and the DD-Environment –PkHA. Efforts should

be made to ensure that quarries selected area is near to the site as practical to avoid unnecessary journeys. However, no quarry shall be located within one kilometer of any urban area or sensitive receptor. The locations of the quarries shall be indicated within the Contractors SSEMP. In addition, Contractors should ensure that quarries and crusher plants are located at least one kilometer from urban areas to prevent noise and dust impacts and where possible located on government owned lands.

6.5.3. Soils

Potential Impacts

Construction Phase

The decision to restrict the Project road to within the existing RoW and carriageway, will keep soils related construction impacts to a minimum. Potential impacts to this component may however include:

- Borrow Pits – Opening and operating of borrow pits can result in multiple environmental and social impacts, including degradation of production soils, flora and habitat, impacts to air quality, elevated noise levels, etc. The Contractor shall make the final decisions on the borrow pits and will get it approved from the EPA and DD-Environment of PkHA.
- Contamination Due to Spills or Hazardous Materials - Potential soil contamination is a possibility resulting from poorly managed fuels, oils and other hazardous liquids used during the project works.
- Erosion – It is possible, that without adequate protection measures soil erosion could occur on road embankments and bridge embankments. It is also possible, that stockpiles of soil located close to surface waters and could infiltrate the water courses during heavy rainfall and cause siltation of the rivers. However, given limited precipitation levels in the Project area, this last point is unlikely to be a significant.

Operational Phase

- Induced Changes - Induced changes in the Project Area leading to industrial and commercial development are conceivable. However, due to the limited agricultural activity in the project area any impacts to productive soils due to induced growth will be minimal.

Mitigation Actions

Construction Phase

Mitigation related to the potential soil-related impacts is recommended as follows:

- Borrow Pits. For borrow pits a due diligence will be carried out by the Environmentalist to confirm that those sites identified for use by the Contractor are indeed operable in an appropriate manner. This will include review of the borrow pits license.
- If the Contractor intends to open any new borrow pits they will require approval from a range of local government institutions including EPA, Mines and Minerals Department, KPK. An IEE will need to be prepared by consultants for the owner/operator (the Contractor). In addition, for any new borrow pit to be operated by the Contractor, the Contractor will be responsible for the preparation of a Borrow Pit Action Plan (BAP). The BAP will be submitted to the DD-Environment prior to the start of construction.

The plan will identify the locations of all proposed borrow pits which will also be approved by both the DD-Environment-KPK and EPA-KPK. The plan shall ensure that:

- Pit restoration will follow the completion of works in full compliance all applicable standards and specifications.
- Arrangements for opening and using material borrow pits will contain enforceable provisions.
- The excavation and restoration of the borrow areas and their surroundings, in an environmentally sound manner to the satisfaction of PkHA will be required before final acceptance and payment under the terms of contracts.
- Additional borrow pits will not be opened without the restoration of those areas no longer in use.

- Erosion - During construction, the Contractor will be responsible for ensuring material that is less susceptible to erosion will be selected for placement around bridges and culverts. In addition he shall ensure re-vegetation of exposed areas including; (i) selection of fast growing and grazing resistant species of local grasses and shrubs; (ii) immediate re-vegetation of all slopes and embankments; (iii) placement of fiber mats to encourage vegetation growth. The PkHA and the Contractor will both be responsible for ensuing that embankments are monitored during continuously during construction for signs of erosion.
- Contamination Due to Spills or Hazardous Materials. The Contractor, with oversight, shall ensure that:
  - All fuel and chemical storage (if any) shall be sited on an impervious base within a bund and secured by fencing. The storage area shall be located away from any watercourse. The base and bund walls shall be impermeable and of sufficient capacity to contain 110 percent of the volume of tanks.
  - The construction camp maintenance yard shall be constructed on impervious hard standing with adequate drainage to collect spills, there shall be no vehicle maintenance activities on open ground.
  - Filling and refueling shall be strictly controlled and subject to formal procedures. Drip pans shall be placed under all filling and fueling areas. Waste oils shall be stored and disposed of by a licensed contractor.
  - All valves and trigger guns shall be resistant to unauthorized interference and vandalism and be turned off and securely locked when not in use.
  - The contents of any tank or drum shall be clearly marked. Measures shall be taken to ensure that no contaminated discharges enter any soils.
  - No bitumen drums or containers, full or used, shall be stored on open ground. They shall only be stored on impervious hard standing.
  - Areas using bitumen shall be constructed on impervious hard standing to prevent seepage of oils into the soils.

  In addition to the above, the Contractor will be responsible for preparation of an Emergency Response Plan (ERP) which will cover containment of hazardous materials, oil spills, and work-site accidents. The plan will detail the process for handling, and subsequently reporting, emergencies, and specify the organizational structure (including responsibilities of nominated personnel). The plan will be submitted to the Engineer for approval. Implementation of the plan will be monitored by the PMU. Any emergencies, and how they were handled, will be reported in monthly progress reports by the Contractor to the PMU

6.5.4. Hydrology – Surface Water

Potential Impacts

Construction Phase

- Construction Camps – Improper siting and design of construction camps can have negative impacts to hydrology through improper disposal of liquid waste and spills of hazardous liquids. Poor management of sanitary waste and accidental spills of hazardous liquids from construction camps can also have negative impacts on ground and surface water.
- Bridge Construction - Bridge construction activities may increase silt load in the surface water during construction at bridge sites and may result in accidental spillage of concrete and liquid waste into the surface water. This may impact upon the ecology of surface water including fish species.

Mitigation Actions

Construction Phase

Potential adverse impacts in the Project Area will be avoided or otherwise mitigated by ensuring the Contractor complies with the following:

- Construction Camps – The Contractor shall be responsible for the preparation of a Construction Camp Site Plan which will form part of the SSEMP. The Plan shall indicate the system proposed and the locations of related facilities in the site, including latrines, holding areas, etc. The Contractor shall ensure the following conditions are met within the Plan:

  1. Rain-water run-off arising on the site shall be collected, removed from the site via a suitable and properly designed temporary drainage system and disposed of at a location and in a manner that will cause neither pollution nor nuisance. The drainage system should be fitted with oil and grease interceptors.
  2. There shall be no direct discharge of sanitary or wash water to surface water. Septic tanks shall be provided at construction camps for sewage water. The septic tanks on regular basis shall be cleaned.
  3. Disposal of materials such as, but not limited to, lubricating oil and onto the ground or water bodies shall be prohibited.
  4. Liquid material storage containment areas shall not drain directly to surface water.
  5. Lubricating and fuel oil spills shall be cleaned up immediately and spill clean-up shall be materials be maintained at the storage area.
  6. Construction and work sites will be equipped with sanitary latrines that do not pollute surface waters and are connected to septic tanks, or waste water treatment facilities.
  7. Discharge of sediment-laden construction water directly into surface watercourses will be forbidden. Sediment laden construction water will be discharged into settling lagoons or tanks prior to final discharge.
  8. Washing out concrete trucks at construction sites shall be prohibited unless specific concrete washout areas are provided for this purpose at the construction site (e.g. a bridge site). The washouts should be impermeable and emptied when 75% full.
  9. Spill clean up equipment will be maintained on site (including at the site maintenance yard and vehicle fueling areas). The following conditions to avoid adverse impacts due to improper fuel and chemical storage:

  - Fueling operations shall occur only within containment areas.
  - All fuel and chemical storage (if any) shall be sited on an impervious base within a bund and secured by fencing. The storage area shall be located away from any

watercourse or wetlands. The base and bund walls shall be impermeable and of sufficient capacity to contain 110 percent of the volume of tanks.
- Filling and refueling shall be strictly controlled and subject to formal procedures and will take place within areas surrounded by bunds to contain spills / leaks of potentially contaminating liquids.
- All valves and trigger guns shall be resistant to unauthorized interference and vandalism and be turned off and securely locked when not in use.
- The contents of any tank or drum shall be clearly marked. Measures shall be taken to ensure that no contaminated discharges enter any drain or watercourses.
- Disposal of lubricating oil and other potentially hazardous liquids onto the ground or water bodies will be prohibited.
- Should any accidental spills occur immediate clean up will be undertaken and all cleanup materials stored in a secure area for disposal to a site authorized to dispose of hazardous waste.

Site plans shall be devised to ensure that, insofar as possible, all temporary construction facilities are locate at least 50 meters away from a water course, stream, or canal. If determined warranted by the PkHA, the Contractor shall provide a wash pit or a wheel washing and/or vehicle cleaning facility at the exits from the sites. If so requested, the Contractor shall ensure that all vehicle are properly cleaned (bodies and tires are free of sand and mud) prior to leaving the site areas. The Contractor shall provide necessary cleaning facilities on site and ensure that no water or debris from such cleaning operations is deposited off-site.

- Bridge Construction- The Contractor shall ensure that all works are undertaken in periods least likely to affect the fish spawning period. In addition, concerning bridge construction works, the Contractor shall:

1. Divert the water flow near the bridge piers.
2. Coffer dams, silt fences, sediment barriers or other devices will be provided to prevent migration of silt during construction within streams.
3. Dewatering and cleaning of cofferdams will be performed to prevent siltation by pumping from cofferdams to a settling basin or a containment unit.
4. Carry out bridge construction works without interrupting the traffic on the Project Road.
5. Ensure no waste materials are dumped in the river, including re-enforced concrete debris.

6.5.5. Hydrology – Groundwater

Potential Impacts
Construction Phase

Project works have the potential to impact subsurface hydrology in a variety of ways. The most significant being groundwater pollution form construction works (including impacts resulting from construction camps) and extraction of limited groundwater resources for construction activities. In addition, uncontrolled extraction of groundwater for construction use and for potable water supplies via boreholes can have negative environmental and social consequences.

Mitigation Actions

The mitigation measures outlined in "Hydrology – Surface water", should prevent impacts to groundwater as well as surface water. For example, the conditions relating to accidental spills will also prevent impacts to groundwater (and also to soils). Regarding extraction of groundwater; it is unlikely that groundwater will be required for construction activities with the exception of use as potable drinking water at the construction camps (and perhaps for activities such as use in laboratories). If boreholes are constructed at construction camps it is likely that the water will also be used for other activities such as water for washing, cooking, cleaning of the site and vehicles. This may result in a significant consumption over the construction period. As such, the Contractor is required to obtain all necessary permits for the drilling and operating of a borehole during the construction period and will ensure that all appropriate permits are in place before excavation of boreholes can begin.

6.5.6. Geology & Seismicity

Potential Impacts

Rock materials will be obtained from quarries and hauled by road to the sites as needed. Existing sources (already in use of Swat Expressway), if in active operation, are expected to be used in most cases although Contractors may elect to use other supply options provided they are cost competitive and provide rock meeting established quality standards. Issues relating to quarried materials are discussed above under Topography. The Project corridor is not located within a seismically active area.

Mitigation Actions

Actions to ensure the use of proper sources of rock have been noted above to the degree warranted by the nature of the Project. Other than the actions as noted and adherence to good engineering practice, no mitigation actions related geological characteristics are warranted.

6.6. ECOLOGICAL RESOURCES

6.6.1. Flora

Potential Impacts

Impacts upon habitats and flora in the project area are expected as a result of the road works. Rehabilitation work will cause minor degradation of local ecology through the clearance of areas of vegetation – mostly ground cover - at work sites and ancillary sites. However, a number of trees will need to be cut as part of the Project and no special status flora have been identified within the vicinity of the Project Road that maybe adversely affected. About 716 tree most of Eucalyptus are required to cut. This specie is exotic in nature and have no ecological importance in the area.

Mitigation Actions

Review of the typical road cross sections indicates that road embankments will not be steep, and in fact will have a lower gradient than at present for safety purposes (due to the fact that the road is long, flat and straight many accidents occur when drivers fall asleep at the wheel and the vehicles roll off the road and down the embankments.

A comprehensive tree plantation shall be carried out by contractor as compensatory trees in consultation with the PkHA and Forest department.

6.6.2. Fauna

Potential Impacts

Consideration has been given to potential direct and indirect impact to wildlife in the Project corridor due to:

- Rare and Endangered Species – no rare and endangered species found in the project area
- Accidents Involving Cattle. Increased traffic movements during the operational phase of the Project may result in increased traffic accidents with cattle.

Mitigation Actions

- Accidents Involving Cattle. Cattle underpasses have been recommended at the settlements within the Project corridor.
- Overpasses – Overpasses are effective, but costly. This suggestion should also be considered in the project cost.

6.6.3. Forests and Protected areas

Potential Impacts

- No protected areas are within the vicinity of the Project area.

Mitigation Actions

- None required

6.7. ECONOMIC DEVELOPMENT

6.7.1. Industries

Potential Impacts

Limited industrial activity is present within the project areas apart from some tobacco unit and some marble shops. Significant negative impacts to industrial activities are therefore not anticipated. However, rehabilitation of the road has the potential to increase economic activity in the region and thus will stimulate industrial activity within the area.

Mitigation Actions

No mitigation required.

6.7.2. Infrastructure & Transportation Facilities

Potential Impacts

Infrastructure

Construction activities will include the demolition or rehabilitation of existing drainage structures and construction of new drainage structures along the alignment. Design errors could lead to portions of the drainage network operating below the required standard and lead to erosion of embankments, road washout, flooding, (due to inadequate flow of water through culverts) and dangerous driving conditions.

Transportation

The main impacts resulting from Project works will be road diversions and some temporary blocking of access routes. Road closure may occur for periods between one and two hours and as such is not a significant issue as long as the local population are given notice of the delays. Blocking of access routes will be temporary while structures, such as side drains and culverts, are constructed. Notwithstanding the above, the potential beneficial impacts to transport are significant. The road, when complete, will offer reduced travel times, smoother ride (resulting in less vehicle maintenance and less damage to perishable goods) and safer driving conditions.

Utilities

Medium and low voltage power lines and gas pipes are located within the Project corridor. Although unlikely, it is possible that transmission lines and gas/telephone pipes close road maybe impacted during construction.

Mitigation Actions

Infrastructure

Detailed designs will ensure that all drainage structures for Project road are sized and located correctly. During the construction phase the supervision consultants will ensure that the Contractor follows the design documents with respect to the required infrastructure facilities.

Transportation

To mitigate the potential impacts the Contractor should:

- Submit a Traffic Management Plan to local traffic authorities prior to mobilization and include the plan as part of his SSEMP;
- Provide information to the public about the scope and schedule of construction activities and expected disruptions and access restrictions;
- Allow for adequate traffic flow around construction areas;
- Provide adequate signalization, appropriate lighting, well-designed traffic safety signs, barriers and flag persons for traffic control; and
- Provide temporary access where accessibility is temporarily restricted due to civil works.

Should the Contractor use any areas for borrow materials, any access roads should be maintained during the construction phase and rehabilitated at the end of construction by the contractor himself to the satisfaction of the local authorities and in

compliance with the contract. Compliance shall be monitored throughout the construction period.

Utilities

During construction all power lines and telephone poles in the Project Corridor shall be kept operational, especially during the winter months. Temporary transmission lines may be required while existing poles and lines are moved.

6.7.3. Land use

Potential Impacts

Pre-construction Phase

As the road involves reconstruction and rehabilitation of an established road, the Project impact on the land acquisition is reduced to a minimum. The geometric design of the road will be prepared in such a way that no land acquisition is required in consequence of the design.

Construction Phase

Potential impacts to land uses outside of the RoW during the construction stage are limited to the creation of Construction Camps and other ancillary facilities such as quarries. Construction workers camps constitute a temporary land use change and raise issues related to activities such as poaching of edible animals and birds of the locality in spite of prohibitions; poor sanitation arrangement and improper methods used for disposal of solid wastes and effluent; and transmission of communicable diseases to the local people by the construction workers due to inappropriate health monitoring facilities. Issues relating to quarries are discussed under the heading of Topography above.

Mitigation Actions

Pre-construction Phase

Under the terms of the agreement with the ADB, before the commencement of the construction works at any part of the Project, The Employer must prepare the Land Acquisition and Resettlement Plan (the LARP), obtain the approval of ADB and then implement the plan and acquire the land.

Construction Phase.

Contractors will be required to coordinate all construction camp activities with neighboring land uses. Contracts for the Project activities will also require construction operators to maintain and cleanup campsites and respect the rights of local landowners. If located outside the RoW, written agreements with local landowners for temporary use of the property will be required and sites must be restored to a level acceptable to the owner within a predetermined time period.

6.7.4. Waste Management

Potential Impacts

Road construction will inevitably generate solid and liquid waste products potentially including:

- Inert waste – for example, uncontaminated roads and soil, concrete, masonry and bricks, wood and plastics.
- Hazardous waste – acids and alkaline solutions, waste oils and oily sludge, batteries, asbestos, and bitumen.

In addition, uncontrolled discharges of sewage and 'grey water' (e.g. from washrooms and canteens) from construction sites and worker's camps may also cause odors and pollute local water resources. As well as being a cause of complaints by the local population, this may lead to contravention of local regulations and fines being imposed on the Contractor.

The main construction waste produced will be Asphalt.

Mitigation Actions

Where possible, surplus materials will be reused or recycled. Oils, fuels and chemicals (including bitumen, bridge deck waterproofing agents and concrete) are substances which are hazardous to human health. They need to be stored properly in correctly labeled containers, both within the construction camp and also at construction sites (e.g. bridges, culverts, etc). Bitumen, oil and fuel should be stored in tanks with lined bunds to contain spillage. Proper storage and handling of hazardous materials reduces wastage and reduces the risk of spillage which could cause temporary or long-term contamination of the underlying soil and possibly to pollution of groundwater and/or watercourses; some (e.g. concrete) may have serious impacts on freshwater fauna. As well as being a cause of complaints by the local population, this may lead to contravention of local regulations and fines being imposed on the Contractor. Proper storage and management reduces the risk of vandalism and theft. Disposal of waste materials shall be undertaken by a waste management company contracted by the Contractor. The waste management company must have the required licenses to transport and dispose of both inert and hazardous waste (including medical) before any such waste is removed from the site. The Contractor will keep copies of the waste management company's licenses and provide waste transfer manifests at his camp site for routine inspection. The Contractor will also keep a record of the types and volumes of waste removed from the site on a weekly basis

To ensure all of the above conditions are met, the Contractor shall be responsible for the preparation of a Waste Management and Recycling Plan. The Plan shall include items relating to the safe handling and management of:

The Plan shall be approved by the DD-Environment of PkHA as part of the SSEMP approval process.

6.8. SOCIAL AND CULTURAL RESOURCES

6.8.1. Population and communities

Potential Impacts

In as much as the project is rehabilitation of the existing roads only, it does not have the social, economic and community life concerns that are associated with new road

construction, this road improvement project is generally aimed at bringing benefits to surrounding communities through lower transport costs and better access to market places, jobs, and services such as health and education. Road construction and rehabilitation projects can lead to changes in the community or social environment around the road, influencing various aspects of lifestyles, travel patterns, social and economic activities.

Mitigation Actions

Road construction works will have short-term negative impacts to the population of the road corridors, such as air quality and noise impacts and potential social impacts resulting from imported labor. However, in general the impacts to population and communities will be overwhelmingly beneficial from all project activities. Imported labor can however, also lead to a spread of sexually transmitted disease.

6.8.2. Health & Education

Potential Impacts

Potential impacts due to the proposed construction can be identified as follows:

- Easier access to health care facilities. Positive health impacts may result due to quicker response time in emergency situations and improved access to health care facilities for those living in remote areas.
- Air quality. Potential air quality issues are discussed above under– Air Quality and Climate.
- Contamination of local water supplies during construction. Potential impacts to local water supplies include the possibility of temporary labor camps and the water supply and wastewater disposal associated with them during the construction period, these issues are discussed above under Item– Hydrology.
- Noise levels with health consequences. Potential noise issues are discussed in Item

Noise and Vibration below.

- Safety. Construction of the road may result in an increase in the total number of road traffic accidents between vehicles, pedestrians and vehicles and livestock and vehicles.
- Worker Safety. Accidents are common during a project of this size and scale. Accidents can occur if workers are not adequately trained or qualified for the job or if they have incorrect safety equipment and clothing.

Mitigation Actions

Construction of the road may result in an increase in the total number of road traffic accidents between vehicles, pedestrians and vehicles and livestock and vehicles. However, given that the traffic volumes are also anticipated to rise once construction is complete, the percentage of those affected by road accidents may actually decrease as a result of traffic safety measures, and improvements to the road condition. Traffic safety issues shall be accounted for during the design phase of the Project, they shall include:

- Safety barriers
- Traffic signs
- Road Crossings
- Speed Bumps

- Speed limits

A Health and Safety Plan shall be prepared by the Contractors to manage worker safety. The Plan shall include the following items:

1. Safety Training Program. A Safety Training Program is required and shall consist of:
2. Initial Safety Induction Course. All workmen shall be required to attend a safety induction course within their first week on Site.
3. Periodic Safety Training Courses. Period safety course shall be conducted not less than once every six months. All Subcontractor employees will be required to participate in relevant training courses appropriate to the nature, scale and duration of the subcontract works. Training courses for all workmen on the Site and at all levels of supervision and management.
4. Safety Meetings. Regular safety meetings will be conducted on a monthly basis and shall require attendance by the safety representatives of Sub/contractors unless otherwise agreed.
5. Safety Inspections. The Contractor shall regularly inspect, test and maintain all safety equipment, scaffolds, guardrails, working platforms, hoists, ladders and other means of access, lifting, lighting, signing and guarding equipment. Lights and signs shall be kept clear of obstructions and legible to read. Equipment, which is damaged, dirty, incorrectly positioned or not in working order, shall be repaired or replaced immediately.
6. Safety Equipment and Clothing. Safety equipment and protective clothing are required to be available on the Site at all material times and measures for the effective enforcement of proper utilization and necessary replacement of such equipment and clothing, and all construction plant and equipment used on or around the Site shall be fitted with appropriate safety devices. These shall include but not be limited to:
   - Effective safety catches for crane hooks and other lifting devices, and
   - Functioning automatic warning devices and, where applicable, an up-to-date test certificate, for cranes and hoists.

6.8.3. Socio-economic conditions Potential Impacts

The Project is expected to have significant beneficial impacts to the economy of the project area. The key benefits include:

- Improved access to health and education facilities – Improved road conditions will most likely result in increased traffic on the roads including mini-bus and taxi services, this will enable people to access health care and educational facilities more easily.
- Creation of Jobs -The community along the alignment of sub-project will have opportunities for temporary employment during construction. Although, this opportunity is temporary in nature, this will be beneficial.

Mitigation Actions

None required.

6.9. PHYSICAL AND CULTURAL RESOURCES

Potential Impacts

One of the issues that must be considered during the construction of the road is the preservation of physical cultural resources (PCR) such as historic and cultural

monuments and including structures, memorials, cemeteries and burial sites, and other objects associated with historical events in the life of the community.

Mitigation Actions

Contractor shall bound to work within the RoW.

6.9.1. Noise & Vibration

Potential Impacts

Construction Phase

The various mechanical processes during the construction of roads are a source of intense noise, which can adversely affect humans. The intensity of the ambient noise of road machinery depends on the type of machinery and equipment and the distance from the workplace to sensitive and residential development. Especially problematic is the noise created by the work of bulldozers, vibrators, compressors, excavators, and Diesel Trucks.

Noise attenuation based on the doubling distance rule shows that residents living next to the road will occasionally be exposed to high noise levels if no mitigation measures are implemented.

It should be noted that the project road is sparsely populated, and as such and short term localized construction noise is unlikely to have significant impacts. It is considered most likely that any significant impacts would result from long-term exposure to noise that may result from construction facilities such as rock crushing plants and quarries where operational activities may last for the entire construction period.

Operational Phase

The traffic forecast predicts more than doubling of traffic between 2018 and 2040 for Mardan – Swabi road with the project (from 15,292 to 38,508). The increase will consequence of only a better road but largely the natural growth in traffic volume and private vehicle ownership. Only by 2035 will the increase in noise be perceptible (>3dBa) to people[1]. Traffic calming measures and speed limit signage will be provided to reduce the impact of the traffic through populated areas. Crossing areas will be marked and amber-flashing lights installed in urban areas, when full traffic signals are not warranted. Noise increases because of project improvements will be minor until approximately 2035 (traffic count increase by approximately 30,500) when traffic noise will become noticeably louder and noise barriers should be considered.

Mitigation Actions

Cooperation between the Contractor, the EPA and the local residents within the Project corridor is essential and it is the responsibility of proponent to arrange meetings between these parties and arrange such matters as work schedules (hours of equipment operation, traffic lanes to be kept open, diversion roads, etc.), locations of work camps and material storage areas, and siting of rock crushers and batch plants. In addition, the Contractor shall be responsible for ensuring the use of:

[1] This conclusion is based on the rule that doubling traffic volumes will increase noise levels by only 3 dB.

- Source Controls, i.e., requirements that all exhaust systems will be maintained in good working order; properly designed engine enclosures and intake silencers will be employed; and regular equipment maintenance will be undertaken;
- Site Controls, i.e., requirements that stationary equipment will be placed as far from sensitive land uses as practical; selected to minimize objectionable noise impacts; and provided with shielding mechanisms where possible;
- Work near Sensitive Receptors shall be limited to short term activities. No asphalt plants, rock crushing plants or any long term generators of significant noise shall be allowed within 300 meters of sensitive receptors;
- Time and Activity Constraints, i.e., operations will be scheduled to coincide with periods when people would least likely be affected; work hours and work days will be limited to less noise-sensitive times. Hours-of-work will be approved by the site engineer having due regard for possible noise disturbance to the local residents or other activities. Construction activities will be strictly prohibited between non peak hours in the residential areas. When operating close to sensitive areas such as residential, nursery, or medical facilities, the Contractor's hours of working shall be limited to 8 AM to 6 PM.

6.10. ADDITIONAL CONSIDERATIONS

As an additional measure, following steps will further enhance roadways environments where its related dividends will continued to be received for a very long time far beyond the project life;

- **Tree Plantations:** Tree plantations on top of embankments and in ROW will serve as small forests and wood lots for the local residents, having tangible benefits in the shape of timber, fuel wood and fodder. Besides soil retention, erosion control and biotic improvements, such plantations will also provide aesthetic and visual screens against sound, dust, wind, toxic emissions, vibrations, night glare and pollution of waterways.
- **Environmental Training:** Capacity building can be achieved through on-the-job training, short-courses, training workshops, lectures, educational visits and seminars. Such interactions include leading team members of PKHA, EPA, consultants, construction managers/supervisors and other related agencies on road related environmental issues.
- **Awareness Raising:** Awareness about roads related current and potential environmental threats for the public at large and roadside dwellers, in particular, requires due attention; the aspect neglected in the past. Enhanced education in road related environmental issues and awareness raising can be achieved through campaigns by; Visual graphics, Print media, Seminars & workshops.
- **Community Participation and Initiatives:** Wherever possible, PKHA officials must involve local communities, for contractors' camp locations, resource sharing with construction workers and their choice of tree species. In this way a sense of ownership will be inculcated in local residents who will

also protect core roads and its related resources. The past practices of isolated working methodology must transform into a participatory mode.

6.11. ENVIRONMENTAL MONITORING AND EVALUATION

6.11.1. General

Importance of "monitoring & evaluation" cannot be over-emphasized since both provide timely and useful information not only to the project management/ implementation agencies but also provide feed-back to the policy decision makers. Conceptually, "monitoring" means to check and asses on a regular basis: implementation status during construction; and realization of various development targets during operation and maintenance. It helps in timely identification/ analysis and removal of the bottle-necks and expediting actions. In fact, project planners, executors and operation management, as they share the common concern for timely corrective measures.

6.11.2. Objectives

6.11.2.1. General Objectives

The general objectives of environmental monitoring and evaluation are to:

- Identify and assess environmental status and trend continuously;
- Act as an early warning system, by identifying any sudden environmental deterioration that needs to be countered.
- Afford effective environmental surveillance and to provide reliable information upon which continued environmental management of the project can be updated and refined.
- Assess effectiveness of the mitigation or benefit enhancement measures; and to take prompt decisions on any additional measures;
- Ascertain the nature and extent of impacts, which were uncertain at the time of IEE study and to allow suitable mitigation measures to be formulated.

6.11.2.2. Objectives during Pre-Construction and Construction Stages

These are to:

- Monitor actual impacts on physical, biological and socio-economic & human resources.
- Provide early warning to the project management whether intensity of an impact is severer than the one predicted.

- Suggest mitigation measures for the impacts which had not been anticipated in the IEE.
- Suggest mitigation measures for the impacts whose intensity is severer than those predicted during the IEE.
- Furnish feedbacks for correction of any deficiencies / improper situations.
- Ensure compliance with the administrative and legal framework.
- Ensure fulfillment of the obligations required under National Environmental Quality Standards (NEQS).
- Restore/rehabilitate construction camps and workshop sites.
- Ensure proper disposal of excavated soil and excess construction materials.
- Monitor rehabilitation of the borrow areas/pits.
- Ensure specified construction of project infrastructure.
- Monitor a-forestation along roads.

6.11.2.3. Objectives during Operation and Maintenance (O&M) Stage

These are to:

- Monitor effectiveness of mitigation measures.
- Evaluate effectiveness of the IEE in the backdrop of projected levels of impacts.
- Suggest modifications/ improvements in construction procedures.
- Determine survival rate of tree plantation along the roads.

6.11.3. Environmental Monitoring Plan

At a pre-construction stage, PKHA has to comply with a number of environmental requirements, such as obtaining clearance from EPA, coordination with Archeology and Forest/Wildlife Departments and securing tree removal permits etc. PKHA will also need to confirm that contractors have appropriate and valid permits to use and operate plants such as hot mix plants and batching and rock crushing facilities, vis-à-vis their locations.

The EMP had been tailored taking into considerations the current capacities and capabilities within PKHA. The PMU directorate does have considerable degree of limitations for complete implementation and management of EMP, at least within timeframe of this Project. At present bulk of their work has to be delegated to other agencies, such as appointed consultants. To effectively provide quality control and oversight for the EMP implementation, PKHA staff needs more training in a wide

ranging spheres, air/noise pollution management and ecological impact mitigation being in the lead. The supervising consultants will also have an environmental specialist, as member of the team. This environmental specialist will help and facilitate PKHA in implementation of the Project EMP.

The overall implementation responsibilities of the EMP will always rest with PKHA. Other parties to be involved in the implementing of EMP are as follows:

- **Contractors:** responsible for implementing all measures required to mitigate environmental impacts during construction; and
- **Environmental Protection Agency:** who are responsible for environmental clearance and periodic monitoring inspections of the Project, ensuring that EMP is being followed and the environmental safeguards are working or otherwise; and
- **Forest Department:** who will take into consideration all aspects pertaining to trees, grasses, herbs, shrubs and green foliage; and
- **Wildlife Department:** who will their inputs in specific areas endowed with wildlife, which are likely to have any threat to wildlife species; and
- **Other agencies:** such as NGOs, CBOs, police, local residents, transport sector organizations and motor vehicle departments, who will be responsible for monitoring the implementation of environmental conditions related to their areas.

Considering the number of different agencies that need to be involved in implementing the EMP, coordination workshops should be conducted twice a year throughout the Project period. Such broad-based discussion forums will be used for coordination amongst various stakeholders, sharing of experiences, apportioning various responsibilities and chalking out future implementation program of the EMP. At the same time, besides environmental sensitization, these forums will also be conducting environmental audit of already implemented steps and hands-on-training for many young professionals. During the course of workshop deliberations will also be made for any unexpected environmental impacts where suitable remedial measures will be decided.

6.11.4. Performance Indicators

Following are the performance indicators:

- Decreased Vehicle Operating Costs.
- Control of air and noise pollution.
- Improved flow of traffic.

- Alleviation of poverty.

6.11.5. Community and Occupational Health & Safety

The objective of environmental health and safety is to provide workers with safe and healthy working conditions and prevent accidents, injuries, and disease. It also covers the establishment of preventive and emergency preparedness and response measures to avoid, and where avoidance is not possible, to minimize, adverse impacts and risks to the health and safety of local communities. It is therefore a combination of occupational health and safety of staff/workers at the subcomponent facilities and community health and safety of people living nearby or potentially affected by failures or poor operation of facilities.

Safety risks are mainly related to the construction phase. Residents, particularly children, are at risk during project construction. In linear construction activities such as road construction and pipe network construction which typically occur in areas frequented by the public, physical and educational measures to protect residents from risks are needed.

Safety measures for construction staff and public will include the following responsibilities of the contractor:

(i) providing safe and convenient passages for the public;

(ii) Providing construction workers sufficient personal protection equipment such as hard hats, earpiece, safety shoes, and others;

(iii) Providing seminars on safety issues to local public, particularly school students;

(iv) Installing warning signs where potential dangers are present;

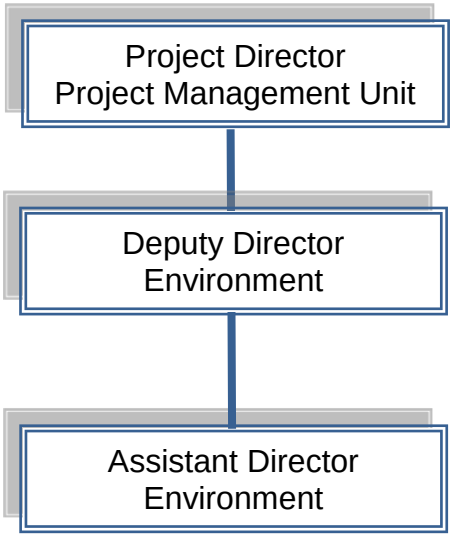
Ensuring construction staff are on duty on or near heavy movement of construction vehicles, or heavy construction vehicle traffic through the villages to ensure safety; and Setting up traffic signs at and near construction sites. Health risks are primarily related to increased transit population during construction (construction workers) and operation (visitors) in the regions. The increased mobile population could potentially bring and spread infectious diseases in the Project area. Workers could spread diseases such as hepatitis to residents as well as among themselves. Measures for protecting community health include: (i) providing disease prevention and control training to construction workers, epidemic diseases such as hepatitis B prior to the start of construction. Leaflets, education seminars will be organized, in association with the local government and communities, to increase the awareness and knowledge; (ii) Providing posters in and around the construction sites for disease control, for not only construction workers but also villagers and others in the areas; (iii)

Providing periodical health checks to construction workers to ensure their health and wellbeing.

6.11.6. Institutional Monitoring Arrangements

6.11.6.1. Establishment of Environmental Monitoring Cell

The monitoring and evaluation will be carried out during construction and operation of the Project. There is thus a need of establishing a well-structured Environmental Monitoring Cell (EMC) for the Project. Keeping in mind the financial constraints, the EMC personnel will be taken from the existing establishment. Suggested setup of the proposed EMC is shown below:



Composition of the Proposed Environmental Monitoring Cell

As an alternative, the environmental monitoring responsibility can be given to 3rd party environmental consultants who will regularly monitor and report to the Client & Donors as well as the competent regulator. It can be further Strengthened by appointing a Senior Environmental Consultant who can plan, guide and advice on environmental activities.

6.11.6.2. Training of Monitoring Team

For capacity building of PKHA staff, there is a dire necessity of environmental training, where a general training vacuum has been felt at all levels. Without appropriate trainings there are apprehensions that EMP cannot be implemented in letter and spirit. In view of past experiences, KP requires far greater environmental sensitization than any other province. Such a vacuum had amply been accepted and acknowledged by PKHA. It is in this backdrop that following training activities have been proposed for wider dissemination of benefits to larger number of stakeholders:

a. Environmental Training of PKHA

An in-country environmental training for 2 - 3 weeks in road related environmental issues have been proposed for DD and AD. Potential institutions could be

(i) EPA

(ii) IUCN

(iii) WWF

(iv) LEAD Pakistan etc.

b. Training Workshops

Following three different types of training workshops are proposed, each having its own function, level of participants and a particular segment of stakeholders, including their sensitization in environmental affairs of roads.

(i) Advanced Environmental Training Workshops:

(ii) Environmental Mitigation Workshops

(iii) Community Consultative Workshops

6.11.6.3. Charter of Duties of PKHA Staff

a. Project Director, PMU

(i) In addition to other technical duties he will be responsible for the overall performance of EMC.

(ii) He will coordinate activities of EMC with Provincial EPA.

(iii) He will supervise working of EMC through D.D.

b. Deputy Director (Environment)

(i) He will keep close liaison with institutions and other agencies/ departments directly or indirectly related to the project.

(ii) He will be responsible for the activities of EMC to PD (PMU) In charge.

(iii) He will keep constant and close liaison with Provincial EPA and other related departments.

(iv) He will ensure training of the staff during pre-construction period as well as afterwards.

(v) He will guide and help the A.D. in performance of his duties.

c. Assistant Director (Environment)

(i) He will continuously monitor that the NEQS are followed at all stages of the project.

(ii) He will plan and supervise taking samples of soil, water, air and other materials and arrange their testing from a recognized laboratory.

(iii) He will watch and monitor any negative impact on air, water and soil and he will immediately report occurrence of any major adverse impact to the D.D.

(iv) He will monitor the progress of flora, fauna and wildlife.

(v) He will oversee if plantation of trees is progressing as planned.

6.11.6.4. Budget for Training of Monitoring Team and Tree/Plant Plantation.

Budget for the training activities has been shown as follows;

Table - 6.1: Cost Estimate for Implementation of Environmental Management, Monitoring Plan & Training

Items	Annual Unit Cost	No of Units/Road	No. of Years	Road Section 42 km	Remarks
Training Workshops of the projects for KPHA, PIU, CSC, contractor & others.	300,000	1	2	600,000	
Consultation, Reporting & Communication	100,000	1	2	400,000	
Noise Monitoring Meter for PIU/CSC	50,000	1	NA	50,000	Noise meter scale will be determined later.
Drinking Water Quality Monitoring: During construction period.	20,000	6*2	2	480,000	6*samples, twice a year for the 02 years construction period.
Effluent & Surface Water Quality Monitoring: During construction period.	25,000	6*2	2	600,000	6*samples, twice a year for the 02 years construction period.
Ambient Air Quality Monitoring	30,000	6*2	2	720,000	6*samples, twice a year for the 02 years construction period.
Workers Communicable Disease Screening Test	0	0	2	0	Contractors' responsibility, who is bound to provide proof of lab test results to PIU/CSC.
Personal Protective Equipment (for 120 persons approx., replaced annually)	0	0	2	0	Contractors' responsibility, which will be verified physically by PIU/CSC throughout construction phase.

Health & Hygiene (Testing and workshops)	0	0	2	0	Contractors' responsibility, which will be verified physically by PIU/CSC throughout construction phase.
Roadside tree plantations of endemic/local species @ of 3 saplings/in replace of each tree cutting (3116x3 = 9348)	300	NA	NA	2,804,400	Local Species like *Morus alba*, *Dalbergia sissoo*, *Accacia Modesta* etc.
Subtotal				5,654,400	
Contingency 10%				565,440	
Grand Total PKR				6,219,840	
USD (1USD=114 PKR)				**54,560**	
Sum Total for 6*Roads (PKR)	**6,219,840**				
Sum Total for 6*Roads (USD)	**54,560**				

Note: Cost for land acquisition, compensation for structures and relocation of public amenities will be covered under Land Acquisition and Resettlement Plan (LARP).

6.12. Environmental Management and Monitoring Plan

Environmentalissue/ component	Remedial Measure	Location	Monitoring indicators	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
						Implementation	Supervision
A- Pre-construction and DesignStage							
1- Alignment (Physical Impacts)							
A1.1 Protection of historical sites (if) present within corridor of impact of the project	• Stop excavation work immediately if any artifact of historical importance is discovered. • Inform immediately the Department of Archaeology	• Along project corridor wherever excavation will be conducted	•Chance find of object of archaelogical importance	Observation	Included in construction cost	Contractor	Supervision Consultant / PKHA / Department of Archaeology
A1.2 Protection of road embankment in Flood prone Areas	•Raise embankment height above the HFL levels in the flood prone areas. •Improvement in existing culverts /Bridges to increase their carrying capacity. •Provision of adequate balancing culverts	• Along project corridor in the vicinity of rivers and nullahs	•Design of embankment/ road profile, •Design of cross & side drains, • No. of CD structures & their spans	Observation	Included in construction cost	Design Consultant	Supervision Consultant / PKHA
A1.3 Bulldozing & Excavations	•Maximum use of excavated earth in embankments & fill areas. •Safe disposal at pre-selected sites through haulage trucks.	•Along project corridor	•Damages to lands, property & irrigation channels.	Observation	Included in construction cost	Design Consultant	Supervision Consultant / PKHA
Biological Impacts Due to Road Alignment							
A1.4 Water stagnation due to irrigation.	•Hydrological studies prior to design of cross drainage structures.	•Along project corridor near irrigated lands	•Waterlogging and ponding	Observation	Included in construction cost	Design Consultant	Supervision Consultant / PKHA
A1.5 Borrow materials for embankment raising.	Borrow areas well away from visual distance. •Refilling of excavated areas. Landscaping.	•Along project corridor	Marred landscape. Water stagnation in ponds.	Observation	Included in construction cost	Design Consultant	Supervision Consultant / PKHA
A1.6 Removal of tree & other foliage.	• Restricting tree cutting within construction limit. Avoiding tree cutting at ancillary sites • Providing and maintaining compensatory tree plantation @ 1:5 ratio.	•In suburban stretches and between irrigated lands	No. oftrees to be cut	Observation	Included in construction cost	Design Consultant	Supervision Consultant / PKHA
Road Saftey Impacts							
A1.7 Safety along the proposed alignment	Provision of retro-reflective warning sign boards nears school,hospital, religious places, and other areas, speed restriction sign in built-ups, forests areas etc. Improving substandard curves, grading & other geometric features as per AASHTO Standards Provision of metal beam crash barriers/guard stones at high embankment locations. Provision of slope stabilization measures in high embankment/cutting to prevent any land slide situation.	Places where height ofembankment is more than 3.00 m	No. of accident & Vehicle collisions	Field observation • interview of locals	Included in construction cost	Design Consultant	Supervision Consultant / PKHA
Land Relate Impacts							
A1.8 Land Acquisition & Resettlement	Properly addressing all concerns of affected persons through dialogue. 2. The new shops and houses allocated to affected persons must be based on a fair and transparent criterion.	Along project corridor wherever shifting of shops and/or houses needs to be done	Review of Plans. Field visits Interaction with locals.	Interaction With Revenue Staff and and locals	Included in SIA & RAP Report	Resettlement Expert	Supervision Consultant / PKHA
A1.9 Shifting of utility services	All telephone and electrical poles/wires and underground cables should be shifted before start of construction. Necessary permission and payments should be made to relevant utility service agencies to allow quick shifting and restoration of utility services.	Along project corridor	Utility shifting plan Complaints from local people Status of loca utility services	Interaction With concerned utility authorities and locals	Included in Construction cost	Resettlement Expert	Supervision Consultant / PKHA
2. Design & Specifications							
A2.1 Contractor camps.	• Pre-identification of campsites in degraded & wastelands well away from habitats, marked on drawings. • Respect for local culture & traditions, social & cohesion. • Employment for locals. • Civic & hygienic facilities. • Recreational facilities. • Waste disposal facilities.	Along project corridor	Social disputes. Conflicts with locals. Communicable diseases.	Observation Interaction With local public	Included in construction cost	Design Consultant	Supervision Consultant / PKHA

Environmentalissue/ component	Remedial Measure	Location	Monitoring indicators	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
						Implementation	Supervision
	• Resource sharing code.						
• A2.2 Machinery parking yards, repair areas & storage of chemicals.	• Pre-identification of machinery parking yards, repair areas & storage of chemicals, in degraded & waste lands well away from habitats, marked on drawings.	• Along project corridor	• Social dispute • Contamination of water & food chains. • Marred landscape.	• Observation • Interaction With local public	Included in construction cost	Design Consultant	Supervision Consultant / PKHA
• A2.3 Other construction materials, such as stones, crush & sand etc.	• Potential sites may be marked or indicated on drawings. • Least delineation from road edge.	• Along project corridor	• Marred landscape. • Water stagnation in ponds	• Observation • Interaction With local public	Included in construction co	Design Consultant	Supervision Consultant / PKHA
• A2.4 Rest/repair areas, bus stops, parking / turning spaces & crossing ramps.	• Provisions may be made for: • Rest/repair areas. • Bust stops. • Parking/turning spaces • Petrol pumps. • Zebra crossings • Over-heads • Under passes.	• In areas of population centers & towns, at specific locations.	• Road safety & social amenities.	• Review • of detail design documents & drawings	Included in construction cost	Design Consultant	Supervision Consultant / PKHA
B. Construction Stage (Physical Impacts)							
Air Quality & Noise							
• B1.1 Dust generation due to To construction activities & transport, storage and handling of construction materials	Transport, loading and unloading of loose and fine materials through covered vehicles. Paved approach roads. Storage areas to be located downwind of the habitation area. • Water spraying on earthworks, unpaved haulage roads and other dust prone areas. • Provision of PPEs to workers.	Throughout the project corridor.	PM_{10} level measurement, Dust pollution or complaintsof locals	• Standard methods • Public consultation	Included in project cost	Contractor	Supervision Consultant / PKHA
B1.2 Emission of air • pollutants (HC, SO_2, NO_X, CO etc) from vehicles due to traffic congestion & use of equipment and machinery	• □ Regular maintenance of machinery and equipment. Batching, asphalt mixing plants and Crushers at downwind (1km) direction from the nearest settlement. Only crushers licensed by the EPA shall be used. □ Ambient air quality monitoring.	□ Asphalt mixing plants, • Crushers etc. locations	• □ Monitoring of • ambient air quality & • checking	• Standards • methods	• Included in project cost	• Contractor	• Supervision Consultant / PKHA
B1.3 Noise from • Construction vehicle, equipment and machinery.	• All equipment to be timely serviced and • properly maintained. Construction equipment and machinery to be fitted with silencers and maintained. • Only approved equipment shall be used • for construction activities in compliance with the national and local regulations. • Timing of noisy construction activities shall be done during night time and weekends near schools and selected suitable times near mosques when there are no prayers • if possible, re-route traffic during construction to keep the accumulation of noise within NEQS limits. • Provision of temporary noise barrier at sensitive locations or near sources. • Time regulation near residential, built up areas construction shall be restricted to daylight hours.residential, built up and • forest areas construction shall be restricted to daylight hours.	• Throughout project corridor • especially at construction sites, residential and identified sensitive locations.	• Complaints from locals	• Noise levels measurements	Included in project cost	Contractor	Supervision Consultant / PKHA
Land and Soil							
• B2.1 Land use Change and Loss • of productive/top	• Non-agricultural areas to be used as borrow areas to the extent possible. • If using agricultural land, top soil to be preserved and laid over either on the	□ In suburban stretches and between irrigated lands	• Borrow pit Locations, Top soil storage	• Review borrow area plan	• Included in construction cost	Contractor	Supervision Consultant / PKHA

Environmentallssue/ component	Remedial Measure	Location	Monitoring indicators	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
						Implementation	Supervision
soil	• embankment slope for growing vegetation to protect soil erosion.		area	• Site visits			
B2.2 Slope failure • And soil erosion due to construction activities, • earthwork, and cut and fill, • stockpiles etc.	• Bio-turfing of embankments to protect slopes. • Slope protection by providing dry stone pitching, masonry retaining walls, planting of grass and trees. • The side slopes of all cut and fill areas • will be graded and covered with stone pitching, grass and shrub as per design • specifications. • Care should be taken that the slope gradient shall not be greater than 2:1.	Throughout the entire project corridor especially with excessive filling	Occurrence of slope failure or erosion issues	Review of Design documents and site observation	• Included in Construction cost	Design consultant and Contractor,	Supervision Consultant / PKHA
B2.3 Borrow site • locations	• Non-productive, barren lands, upland shall be used for borrowing earth with the necessary permissions/consents. • Depths of borrow pits to be regulated and sides not steeper than 25%. • Topsoil to be stockpiled and protected for use at the rehabilitation stage. • Transportation of earth materials through covered vehicles. • To the extent borrow areas shall be sited away from habitation areas and • shall be levelled with salvaged material or other filling materials which do not pose contamination of soil.	Throughout the project corridor.	. Existence of • borrow areas in inappropriate unauthorized • locations. Poor borrow Area management practices. Incidents of Accidents • Complaints from local people.	Review of Design documents and site observation	Included in Construction cost	Design consultant and Contractor	Supervision Consultant / PKHA
• B2.4 Quarry operations	Aggregates will be sourced from existing licensed quarries. • Copies of consent/ approval / rehabilitation plan for a new quarry or • use of existing source will be submitted to SC, PKHA, Mineral Deptt. & EPA. The contractor will develop a Quarry • Redevelopment plan, as per the Mineral Deptt. Rules of and submit a copy of the approval to EPA.	Quarry area locations	Existence of licenses for all quarry areas from which materials are being sourced Complaints from locals	Review of design documents, contractor documents and site observation	Included in Construction cost	Contractor	Supervision Consultant / PKH
B2.5 Contamination • of soil due to leakage /spillage of oil, bituminous and non-bituminous debris • generated from demolition and road construction	Construction vehicles and equipment will be maintained and refuelled in such a fashion that oil/diesel spillage does not contaminate the soil. Fuelstorage and refuelling sites to be kept away from drainage channels. • Unusable debris shall be dumped in ditches and low lying areas. To avoid soil contamination Oil-Interceptors shall be provided at wash down and refuelling areas. Waste oil and oil soaked cotton/ cloth shall be stored in containers labelled 'Waste Oil' and 'Hazardous' and properly disposed off. Non-bituminous wastes to be dumped in borrow pits with the concurrence of landowner and covered with a layer of topsoil conserved from opening the pit. Bituminous wastes will be disposed off in an identified dumping site approved by the SC.	• Fuelling station,construction sites, and construction camps and disposal location.	Quality of soil near storagearea Presence of spilled oil or bitumen in project area	Site observation	Included in Construction cost.	Contractor	Supervision Consultant / PKH
WaterResources							

Environmentallssue/ component	Remedial Measure	Location	Monitoring indicators	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
						Implementation	Supervision
B3.1 Sourcing of water during construction	Requisite permission shall be obtained for abstraction of groundwater from local adminstration. Arrangements shall be made by contractor that the water availability and supply to nearby communities remain unaffected.	Throughout the project corridor.	Approval from competent authority complaints from local people on water availability	• Checking of Documenta-tion • Talk to locals	Included in construction cost	Contractor	Supervision Consultant / PKH
B3.2 Disposal of water during construction	Provisions shall be made to connect road Side drains with exiting nearby ponds otherwise make provision of water harvesting pits intermittently.	• Throughout the project corridor.	Design of road side drains Existence of Proper drainage system for disposal of waste water	• Review of documents • Site observation	Included in construction cost	Contractor	Supervision Consultant / PKH
B3.3 Deterioration in Surface water quality due Leakage from vehicles and equipment's and Waste from construction camps.	No vehicles or equipment should be parked or refuelled near water- bodies, so as to avoid contamination from fuel and lubricants. Oil and grease traps and fuelling Platforms to be provided at re-fuelling locations. All chemicals and oil shall be stored Away from water and concreted Platform with catch pit for spills collection. All equipment operators, drivers, and warehouse personnel will be trained in immediate response for spill containment and eventual clean-up. Construction camp to be sited away from water bodies. Wastes must be collected, stored and taken to approve disposal site only. Water quality shall be monitored periodically	Water bodies, Refuelling stations, construction camps.	Deterioation of water quality of ponds, streams, rivers and other water bodies in project area Presence of oil floating in water bodies in project area	• Conduction of water quality tests as per monitoring plan • Field observation	Included in construction cost	Contractor	Supervision Consultant / PKH
Biological Impacts							
Flora Fauna							
B4.1 Vegetation Loss due to site preparation and construction activities	Minimize tree cutting to the extent possible. Roadside trees to be removed with prior approval of competent authority. Compensatory plantation at 1:5 basis and additional plantation as per Forest Guidelines in consultation with Forest Department. Regular maintenance of all trees planted. Provision of LPG in construction camp as fuel source to avoid tree cutting, wherever possible. Plantation of trees on both sides of the road. • In the event of design changes during the construction stages additional assessments including the possibility to save trees shall be made by the EA. Road side Plantation Strategy as per specifications including maturing.	Throughout the project corridor	ROW width, Number of trees for felling Compensatory plantation plan Number of trees replanted	• Review of Relevant documents • Compensa-tory plantation plan, • Field observation	Road side plantation cost is included in project costs.	Relevant agency specialized in afforestation	Supervision Consultant / PKH

Environmentallssue/ component	Remedial Measure	Location	Monitoring indicators	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
						Implementation	Supervision
ConstructionCamps							
B5.1 Impact associated with location	All camps should maintain minimum distance from following: 1)500 m from habitation, 2)500 m from forest areas where possible 3)500 m from water bodies where possible 4)500 m from through traffic route where possible.	All construction camps	• Location of camp sites and distance from habitation / forest /water bodies	• On site Observation • Interaction with workers and local community	• Included in construction cost	Contractor and EO	Supervision Consultant / PKH
B5.2 Worker's Health in construction camp	The location, layout and basic facility provision of each labour camp will be submitted to SC prior to their construction. The construction shall commence only after approval of SC. The contractor will maintain necessary living accommodation and ancillary facilities in functional and hygienic manner as approved by the EA. Adequate water and sanitary latrines with septic tanks attached to soak pits shall be provided. Preventive medical care to be provided to workers including a FirstAid kit that must be available in the camp. Waste disposal facilities such as dust bins must be provided in the camps and regular disposal of waste must be carried out. The Contractor will take all precautions to protect the workers from insect and pest to reduce the risk to health. This includes the use of insecticides which should comply with local regulations. No alcoholic liquor or prohibited drugswill be imported to sell, give, and barter to the workers of host community. Awareness raising to immigrant Workers / local community on communicable and sexually transmitted diseases.	All construction camps	Camp health records, Existence of proper first aid kit in camp site Complaints from local people	• Camp records, • Regular EHS audits of the site • Consultation with local people living nearby	Part of the Contractors costs	Contractor	Supervision Consultant / PKHA
. Management of Construction Waste/Debris							
B6.1 Construction Waste Disposal	• Waste management plan to be submitted to the CSC and approved one month prior to starting works. • Estimating the amounts and types of construction waste to be generated by the project. • Investigating whether the waste can be reused in the project or by other interested parties. • Identifying potential safe disposal sites close to the project or those designated sites in the contract. • Investigating the environmental conditions of the disposal sites and recommendation of most suitable and safest sites. • Piling up of loose material in segregated areas to arrest washing out of soil. • Debris shall not be left where it may be carried by water to downstream flood plains, dams, lagoons etc. • Used oil and lubricants shall be recovered and reused or removed from the site in full compliance with the national and local regulations. • Oily wastes must not be burned. Disposal location to be agreed with local authorities/EPA. • Machinery should be properly maintained to minimize oil spill during the construction. • Solid waste should be disposed at an approved solid waste facility, open burning is illegal and contrary to good environmental practice.	Throughout the project Corridor. The temporary stockpiling areas and more permanent dumping areas to be marked on drawings and approved before work commencement.	Ground water contamination & aesthetic hazards.	• Review of detail design documents & drawings	Included in project cost	Contractor	Supervision Consultant / PKHA
B6.2 Reuse and disposal of construction and dismantled waste	• The existing bitumen surface shall be utilized for paving of cross roads, access roads, and paving works in construction sites and camps, temporary traffic diversions, and haulage routes. All excavated materials from roadway, shoulders, verges, drains, cross drainage will be used for backfilling embankments, filling pits, and landscaping.	Throughout the project Corridor	• Percentage of reuse of existing surface material	• Contractor Records, • Field observation, • Interaction with locals	Included in Construction cost.	Contractor	Supervision Consultant / PKHA

Environmentallssue/ component	Remedial Measure	Location	Monitoring indicators	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
						Implementation	Supervision
	Unusable and non-bituminous debris materials should be suitably disposed off as discussed.						
.	**Traffic Management and Safety**						
B7.1 Management of existing traffic and safety	Temporary traffic diversion shall be planned by the contractor and approved by the Engineer. The traffic control plans shall contain details of diversions; traffic safety arrangements during construction; safety measures for night time traffic and precautions for transportation of hazardous materials. The Contractor will ensure that the diversion is always maintained in running condition, particularly during the monsoon to avoid disruption to traffic flow. • On stretches where it is not possible to pass the traffic on the part width of existing carriageway, temporary paved diversions will be constructed. Restriction of construction activity to only one side of the existing road. The contractor shall inform local community of changes to traffic routes, and pedestrian access arrangements with assistance from "Engineer". Use of adequate signage's to ensure traffic management and safety. Conduct of regular safety audit on safety measures.	Throughout the project corridor Especially at intersections.	• Traffic management plan • Safety signs on site, • Number of traffic accidents	• Review traffic management plan • Field observation of traffic management and safety system • Interaction with people in vehicles using the road	Included in construction cost.	Contractor	Supervision Consultant / PKH
B7.2 Pedestrians, animal movement	Temporary access and diversion, with proper drainage facilities. Access to the schools, mosques and other public places must be maintained when construction takes place near them. Fencing wherever cattle movement is expected. To avoid the need for cattle underpasses, some of the proposed culverts near habitations may be widened to facilitate cattle movement.	• Near habitation on both sides of schools, mosques, hospitals, graveyards, construction sites, haulage roads, diversion sites.	• Road signage & drainage • Complaints from local people	• Field Observation • Interaction with local people	Included in construction cost.	Contractor	Supervision Consultant / PKH
B7.3 Safety of Workers and accident risk from construction activities	Contractors to adopt and maintain safe working practices. Usage of fluorescent and retro- reflectory signage, in local language at the construction sites Training to workers on safety procedures and precautions. Mandatory appointment of safety officer. All regulations regarding safe scaffolding, ladders, working platforms, gangway, stairwells, excavations, trenches and safe means of entry and egress shall be complied With Provision of PPEs to workers. Provision of a readily available first aid unit including an adequate supply of dressing materials. The contractor will not employ any person below the age of 18 years for any work. Use of hazardous material should be minimized and/or restricted. Emergency plan (to be approved by engineer) shall be prepared to respond to any accidents or emergencies. Accident Prevention Officer must be appointed by the contractor.	• Construction sites	• Availability of safety gears to workers, • Safety signage, • Training records on safety, • Number of Safety related accidents	• Site observatin • Review records on safety training and accidents, • Interact with workers	Included in construction cost.	Contractor	Supervision Consultant / PKH
Site restoration and rehabilitation							
B8.1 Clean-up Operations, Restoration And Rehabilitation	Contractor will prepare site restoration plans, which will be approved by the 'Engineer'. The clean-up and restoration operations are to be implemented by the contractor prior to demobilization. All construction zones including river-beds, culverts, roadside areas, camps, hot mix plant sites, crushers, batching plant sites and any other area used / affected by the project will be left clean and tidy, at the contractor's expense, to the satisfaction of the Environmental officer.	• Throughout the project corridor, construction camp sites and borrow areas	• Clean and restored camp sites • Presence /absence of construction material/ debris after completion of construction works on construction site	• Site observation • Interaction with locals, • Issue completion certificate after restoration of all sites are found	Included in construction cost.	Contractor	Supervision Consultant / PKH

Environmentallssue/ component	Remedial Measure	Location	Monitoring indicators	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
						Implementation	Supervision
				satisfactory			
			•	•			

7. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

7.1. GENERAL

This section describes the outcomes of the stakeholder consultation process as part of the IEE. The feedback from communities and other stakeholders directly or indirectly affected by the project is collected so that it may be used to adjust and improve the project's design, planning, implementation and help the implementation structure ensuring that the project is both environmentally and socially sound. The consultation process was carried out in accordance with the requirements of the Asian Development Bank on public consultation.

The objectives of this process were

- To disseminate information on the project and its expected impact, long-term as well as 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 suggest appropriate mitigation measures.

7.2. IDENTIFICATION OF STAKEHOLDERS

There are two types of stakeholders; i.e.

7.2.1. Primary Stakeholders

The primary stakeholders are the initial stakeholders, such as affected persons, general public residing in the project area. Accordingly, the consultations/ focus group discussions were made with all above primary stakeholders for sharing of information about the proposed project and expected impacts and understanding about the concerns by category of stakeholders.

7.2.2. 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 District Administration, WAPDA, Wildlife, Forestry & Environment, Agriculture including the Horticulture wing, Irrigation, PkHA and other relevant departments.

7.3. STAKEHOLDER CONSULTATION PROCESS

The overall strategy for stakeholder's consultation is as shown in **Table - 7.1**.

Table - 7.1: Process of Stakeholder Consultation

Stakeholders	Purpose of consultations	Methodology	Stage
Primary Stakeholder	• Information gathering and data collection. • Information sharing about the project (disclosure) • Opinion seeking (concerns and • expectations) • Grievance redress • Involvement of PAPs	• Focus Group Discussions • Formal and informal • Community meetings	• Base line Study • Impact Assessment • Inventory of Losses • Price fixation Discloser
Secondary Stakeholder	• Participation in the process • Information gathering • Authentication and validation of the processes verification of the record	• One on one meetings • In-depth interviews • Group meetings	• On need basis

Stakeholder consultation for this project was 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.

7.4. PRIMARY STAKEHOLDERS CONSULTATION

Apart from gathering of quantitative data through household survey of the area of influence of the project and survey of project affected people and other local community to share the information about the project and record their concerns/ feedback associated with this project. In this context, APs shared their view point regarding the assessment especially price assessment, method of payment of compensation and procedure for entering their concerns/ grievances.

7.5. TOPICS FOR DISCUSSION

The following points were discussed during the public consultations: Project components, its activities and impacts.

- Needs, priorities and reactions of the population regarding the proposed project.

- Land acquisition and resettlement issues.
- Employment and livelihoods of communities.
- Gender and women issues
- Contractor's camp and access
- Environmental issues
- Role of the affectees in implementation of the project
- Basis for determining the rates of the land, houses, and other infrastructures.

Table - 7.2: List of Primary Stakeholder's Consultations in the Project Area

Date	Location	Number of Participants	Feedback	Recommendation in IEE
4.12.2017	Jawad Chowk	39	People were in favor 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.
4.12.2017	Shahbaz Garhi & Bala Garhi	31	People were in favor 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.
5.12.2017	Ismaila & Aman Chowk	34	Most of the people were interested in project and their concern were very much positive about project.	Proper coordination with the local people will make the project socially acceptable.
6-12-2017	Swabi Bazar	32	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 with community.

A view during General Public Consultation

Public Consultation Process

Public Consultation Process

7.6. OUTCOME OF STAKEHOLDERS CONSULTATION

Generally, people were found to be aware of the need to upgrade the roads, and expressed their support for the project. The proposed improvement / rehabilitation of the road was welcomed by the people since it will reduce traffic congestion and other road hazards near settlements along the project selected road corridors. Local communities demanded that they should be the part of a continuous consultation process with other stakeholders at different stages of the project including the design, construction, and operation periods. The concerns raised by the stakeholders / communities are described as follows:

7.6.1. Highway Design

- Improve general standards of construction.
- The business of the people should not be affected due to project activities.
- PAPs should be compensated according to the market rates.
- Properly compensate owners of demolished structures.
- Protection walls should be constructed where needed.
- The waste material should not be dumped in to the surface water body or along the road.
- Avoid constructing sharp road curves and grades.

- Build bus bays, passenger shelters, and parking areas where required and applicable.
- Plant trees along the road that could be entrusted to the care of local communities.
- Avoid shifting graves that may fall within the ROW.
- Avoid relocating/dismantling mosques and other permanent structures.
- Provide drainage on both sides of the road.

7.6.2. Highway Construction

- Avoid undue delays in road construction and ensure that project works are carried out in one stretch rather than piecemeal.
- Ensure that contractors do not use private land for parking construction machinery.
- 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 particularly due to land sliding and stones rolling.

7.6.3. Highway Operation

- Provide medical aid centers along the highway to treat road accident emergencies.
- 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.
- Increase tree plantation along the highway.

- Ensure that cross–drainage pipes and culverts are regularly cleaned.
- Regularly remove accumulated piles of rubbish from the ROW.

7.7. REDRESS OF STAKEHOLDERS CONCERNS

Most of the concerns raised by stakeholders have been incorporated into the project's environmental and social assessment as described below:

Suggestions / Concerns of Stakeholders	Prevention Methods
Highway Design	In response to stakeholders' concerns, the design at locations of social disruption may be revised by the Design Consultants and if avoidable; no residential and commercial entity will be affected by the Project.
Highway 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.
	Improved intersections on side roads and village tracks will be provided in order to eliminate bottlenecks
	Roadside furniture and traffic control devices, including information and cautionary signs, signals, traffic diversion and flow markings, to ensure pedestrian safety during construction and operation.
	A drain will be designed to cater for the road drainage
Highway Construction	Construction vehicles will remain confined within their designated areas of movement.
	Sensitivity towards local customs and traditions will be encouraged to minimize social friction; good relations with local communities will be promoted by encouraging contractors to provide opportunities for skilled and unskilled employment to locals, as well as on–the–job training in construction for young people.
	Land sliding will be minimized by constructing retaining walls
	The loss of privately owned land or built–up property will be compensated on a replacement–cost basis
	Solid waste generated during construction and at campsites will be properly treated and safely disposed of only in demarcated waste disposal sites approved by the supervision consultant
	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 PKHA. All such barricades will be set up as per local regulations.
Highway Operation	Highway operation plan has been provided in the IEE Report for proper operation and maintenance of road and to ensure quick rescue operations during land sliding.

The stakeholders supported the project, provided that environmental and social issues are addressed through mitigation measures. To address the issues, Summary IEE are to be developed and shared with stakeholders for their feedback and suggestions.

8. GRIEVANCE REDRESSAL MECHANISM

The social and resettlement issues relating to the implementation of the Project works and their mitigation shall be identified in the RAP document. However, in spite of best efforts, there is every chance that the individuals / communities affected by the project are dissatisfied with the measures adopted to address the adverse social impacts of the project. In this situation an effective Grievance Redressal Mechanism (GRM) is established to ensure timely and successful implementation of the project. It will also provide a public forum to the aggrieved to raise their objections and through conflict resolution, address these issues adequately.

The main objective of the GRM is to investigate charges of irregularities and complaints received from the any affected person and provide an early, transparent and fair resolution. Keeping in view the findings of the baseline study, it is anticipated that the nature of such complaints will relate to compensation matters by the project functionaries. Some of the grievances that may arise are listed as follows:

- Name of the AP may be missing from the list,
- Improper distribution of compensation in case of joint ownership
- Problems in the relocation of infrastructure
- Delays in the payment of compensation,
- Any disruption by the civil works contractors
- Non-observance of project principles as laid down in the RAP by different parties.
- Any other issue arising during the project implementation.

8.1 GRIEVANCE REDRESS COMMITTEE (GRC)

Under the GRM, a Grievance Redress Committee (GRC) will be established at project site, which will look into all the grievance cases related to social, resettlement and rehabilitation. The GRC will include:

- Deputy Director (Environment), PkHA, (Chair of the Committee)
- Assistant Director (Resettlement), PkHA (Member of the Committee)
- Resident Engineer of Supervision Consultants (Member of the Committee)
- A representative of Supervision Consultants (Member of the Committee)
- Resettlement Specialist (consultant)
- Two representatives of the Affected Person Committees (APCs) (Members of the Committee), one from each APC.

- Two elected representatives of local Jirga (council of elders)

AD (Resettlement) will act as Secretary of the Committee. The Committee will meet at least twice a month and provide decision to resolve the issues at the end of the meeting. The non–official members will provide logistics for the committee meetings. The committee may request the complainant to attend and present his case. However, any aggrieved person will have the right to register her/his case for resolution by the court, in case s/he is not satisfied with the decision of GRC.

8.2 COMPLAINTS MANAGEMENT REGISTER (CMR)

The Assistant Director (Resettlement) will maintain a CMR to record grievances brought forward by affected persons and communities and ensure that these are appropriately addressed. The complaint register will provide for: the date and particulars of the complaint; description of the grievance; follow–up action required; name of person responsible for implementing the action; a target date for redressal and up-dated status/final action with date. The AD will be supported by the Resettlement Specialist of the Construction Supervision Consultant for this purpose. The actual measures taken to mitigate the concerns will also be recorded in the register. The complainant's views on the remedial action taken will also be documented in the Register. All complaints received verbally or in writing will be properly documented and recorded/written in the CMR.

8.3 CONFLICT RESOLUTION PROCEDURE

The AD (Resettlement will be the initiating authority to address the issues. He will be bound to forward the compliant to the DD (Environment) within 3 days. The DD (Environment) will take a decision on the compliant within 3 days on receipt of compliant to him and will inform the complainant through AD (Resettlement). If complainant is not satisfied with his decision / action, the DD (Environment) will refer the case to GRC. The Committee will review the matter keeping in view its nature and suggest a remedial action within 4 days. If considered necessary, the Committee will consult the complainant as well. Once the Committee decides the remedial action, the AD (Resettlement) with the support of Resettlement Specialist will implement it within a week.

In case some response on the complaint is not received within 15 days of the lodging of the complaint, the complainant may also send a reminder to the GRC with 07 days notice to take legal remedial measures.

In case of complainant's disagreement with the decision of the GRC, the DD (Resettlement), as Chair of the Committee, will send the case to the PD, PkHA. The PD will respond within 07 days. The PD can involve the local Jirga, keeping in view the nature and severity of the matter. If the complainant is not satisfied, the complaint will have the option to go to the court of law. In case of such eventualities,

all affected persons will be exempted from legal and administrative fees made / paid / incurred pursuant to the grievance redressal procedures. The conflict resolution process at project level is provided in **Table - 8.1**.

Table - 8.1: Conflict Resolution Process at Project Level

Stage	Action	Location	Responsible Body	Complaint Resolution Period
1.	Complaint is received and registered	DD (Environment) Office / Project Site Office	AD (Resettlement)	03 days from the date of registration (if not settled then Stage–2)
2.	Passed on to Grievance Redressal Committee	At project site	GRC	Within 4 days (if not settled then Stage–3)
3.	Referred to PD, PkHA by the DD	PD Office	PD through DD (Environment)	07 days from the date of receipt of complaint in PD's office
4	If not acceptable to the PAP	Court of law		

9. CONCLUSION AND RECOMMENDATIONS

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

The roadway is mostly following the existing 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.

Bulk of environmental impacts will take place during construction phase.

Implementation of mitigation measures during this period will be assigned to the contractors. However, traditionally contractors have little perception and understanding of environmental problems. Hence, the required environmental mitigation must be clearly described in the contract documents, and an environmental supervising consultant must monitor implementation mechanism.

This report, including the EMP, should be used as a basis for an environmental compliance program.

Most of the roadway passes through the urban and agricultural area with no cultivation, 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 PkHA will get enhanced for future environmental management and monitoring. The suggested training initiatives at different tiers will further reinforce PkHA and other related agencies.

Additional cost for environmental adjustments in design, specifications, tender and contract documents will be taken care of by the engineering consultants. Similarly, it is expected that the potential contractor who will include it in his bid document will address the costs for mitigation measures during/after construction.

The ecological resources of the area will not only be conserved, but also developed for the benefits of all the stakeholders. Besides an on-going development process of roadway communication links, archeological, 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 sub-Project will also be addressing other related

issues of poverty alleviation and resettlement. In this way the growing communication needs of rural populace will be addressed in an organized and structured manner.

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

Therefore, No further EIA is needed for the Project, in accordance to ADB Safeguard Policy Statement 2009 and GoP's EPA Act 1997 and lEE and EIA Gazette Notification, 2000.

ANNEXURE – A

RAPID ASSESSMENT CHECKLIST

Rapid Environmental Assessment (REA) Checklist

ROADS AND HIGHWAYS

Instructions:

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

Country/Project Title: PROVINCIAL ROADS REHABILITATION PROJECT Dualization of Mardan– Swabi Road

Sector Division: Road

SCREENING QUESTIONS	Yes	No	REMARKS
A. Project Siting Is the Project area adjacent to or within any of the following environmentally sensitive areas?			
• Cultural heritage site	☐	■	Project road doesn't pass through or near **Cultural heritage site**
• Protected Area	☐	■	Project road doesn't pass through or near **Protected Area**
• Wetland	☐	■	Project road doesn't pass through or near **Wetland**
• Mangrove	☐	■	Not Applicable
• Estuarine	☐	■	Not Applicable
• Buffer zone of protected area	☐	■	Project road doesn't pass through or near **Buffer zone of protected area**
• Special area for protecting biodiversity	☐	■	Project road doesn't pass through or near **Special area for protecting biodiversity**
• Bay	☐	■	Not Applicable
B. Potential Environmental Impacts ▪ Will the Project cause…			

SCREENING QUESTIONS	Yes	No	REMARKS
encroachment on historical/cultural areas; disfiguration of landscape by road embankments, cuts, fills, and quarries?	☐	■	No encroachment of historical places. However, some places of religious importance existing along the project road may get partially impacted. Disfiguration of landscape is not foreseen since it is dualization of the existing road. Quarry material will be procured from existing licensed quarries.
▪ encroachment on precious ecology (e.g. sensitive or protected areas)?	☐	■	No National Parks, wildlife sanctuaries or similar eco-sensitive areas exist along the project road
▪ alteration of surface water hydrology of waterways crossed by roads, resulting in increased sediment in streams affected by increased soil erosion at construction site?	☐	■	Project area is drained by a No. of rivers/Nallah and also intersecting the project road. Bridge construction on perennial rivers will be done during lean flow period. In some cases minor channels may be diverted for a very short period and will be bring back to its original course immediately after construction.
▪ deterioration of surface water quality due to silt runoff and sanitary wastes from worker-based camps and chemicals used in construction?	☐	■	Proper drainage and sewerage facilities in the workers camps will help to avoid this prospect. As the construction activity in this project will not contain any harmful ingredients, no impact on surface water quality is anticipated.
▪ increased local air pollution due to rock crushing, cutting and filling works, and chemicals from asphalt processing?	■	☐	Air pollution level is likely to be increased for short duration during construction period. Appropriate distance from settlement area and wind direction may be taken into account to locate air polluting facility like stone crushing unit etc. Use of environment friendly equipment / machineries will help reduce air pollution.
▪ noise and vibration due to blasting and other civil works?	■	☐	Blasting is not involved. Ambient noise level is expected to increase due to various construction activities. Although the level of noise may exceed national standards, their occurrence will only be during the project construction. All stationary noise making equipment will be installed with acoustic enclosures. Timings of noise construction activities will be regulated near sensitive receptors.
▪ dislocation or involuntary resettlement of people	☐	■	Extent of impact being assessed in a separate report.
▪ other social concerns relating to inconveniences in living conditions in the project areas that may trigger cases of upper respiratory problems and stress?	■	☐	Deterioration in ambient air quality will be localized and temporarily during construction activity. The project area is located in open areas. Extensive plantation along the highway and improved road conditions will improve the air quality of the area.

SCREENING QUESTIONS	Yes	No	REMARKS
▪ hazardous driving conditions where construction interferes with pre-existing roads?	☐	■	Proper traffic management plan will be implemented by the contractor to prevent any such condition.
▪ poor sanitation and solid waste disposal in construction camps and work sites, and possible transmission of communicable diseases from workers to local populations?	■	☐	Contractor will be bound contractually to provide sanitation, health care and solid waste disposal facilities Workers will be made aware about communicable diseases
▪ creation of temporary breeding habitats for mosquito vectors of disease?	☐	■	No such condition is foreseen.
▪ dislocation and compulsory resettlement of people living in right-of-way?	☐	■	Extent of impact being assessed in a separate report.
▪ accident risks associated with increased vehicular traffic, leading to accidental spills of toxic materials and loss of life?	☐	■	Dualization of project road will help in reducing the number of accidents. However, adequate safety measures will be adopted to avoid such conditions.
▪ increased noise and air pollution resulting from traffic volume?	■	☐	Increase in noise and air pollution expected during construction phase will be minimized by adoption of adequate mitigation measures. During operation phase, the main source of noise and air will be traffic. Road dualization and extensive plantation will help reduce the noise and air impact. As the alignment mostly passes through open agricultural land which will provide adequate dispersion of gaseous emission. If measures suggested for noise sensitive receptors prove inadequate, solid noise barrier will be placed.
▪ increased risk of water pollution from oil, grease and fuel spills, and other materials from vehicles using the road?	☐	■	This is expected from accidental spillage. With provision of adequate safety measures such situations can be avoided.

ANNEXURE – B

MONITORING OF NOISE, AIR AND DRINKING, WASTE & SURFACE WATER

Section - 1
Ambient Air Monitoring for Particulate Matter

1.1 General

This section deals with the ambient particulate matter monitoring that was carried out for assessment of PM_{10}, Carbon Monoxide (CO), Sulphur Dioxide (SO_2) and Oxides of Nitrogen (NO_x) concentration at various point of road under consideration of present environmental assessment. The monitoring was carried out from ambient condition of the area during the normalized ambient conditions.

1.2 Methodology for Particulate Matter

Casella, Serial # 1310, Gravimetric Dust Sampler Type 113 A, BS 1259-1958 was used for the monitoring of ambient particulate matter monitoring. Special filter media, having mesh size <10 µ was used as the surface on which PM_{10} was retained quantitatively during a definite interval of time. The filter media was placed in the special port with leak proof assembly. This prevented escaping of fugitive particulate matter being monitored.

1.3 Methodology

Mid-get impingers/absorption columns assembly was used for the monitoring of NO_x and SO_2 in the ambient air. The air was drawn through pump into the glass impingers and absorbed in the solution contained inside the absorption towers. The instrument sucked ambient air at rate monitored by a calibrated volume measuring standard gauge. The volume of air drawn was indicated on the scale calibrated in liters and fractions thereof. One hundred milliliters of absorbents were poured in each of the impingers. The fourth impinger was filled with two hundred grams silica. Standard procedures were used separately for the sampling of both NO_x and SO_2. Sample solutions were preserved and then transferred to the Laboratory for analysis. The Gries-Saltmann Reaction was carried for the analysis of NO_2 and Pararosaniline method was used for SO_2 testing. Monitoring results were presented after data generation in micro gram per cubic meter ($\mu g/m^3$).

Drager Miniwarn, the monitoring equipment, was used for CO measurements.

AMBIENT AIR MONITORING REPORT

Client Name: Creative Engineering Consultants
Address: Creative Engineering Pvt, Ltd, Hayatabad, Phase-I Khyber Pakhtunkhwa Peshawar
Monitoring Date: 02-12-2017
Reporting Date: 20-12-2017
Source: Ambient of Various Locations
Monitoring Instrument: Iso-Kinetic Casella & ASTM Standard Methods

Parameter		Carbon Monoxide (CO)	Nitrogen Dioxide (NO_2)	Sulfur Dioxide (SO_2)	Particulate Matter (PM_{10})
Unit		mg/m^3	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$
Duration		08 Hours	24 Hours	24 Hours	24 Hours
Lowest Detection Limit		0.01	5	5	2
National Environmental Quality Standards		5	80	120	150
Average Obtained Conc.	Near Jawad Chowk Flyover	1.01	3.9	4.9	68.94
	Bala Garhi	1.23	6.3	7.1	56.41
	Near Ismailia	1.37	8.1	8.6	69.33
	Aman Chowk	0.98	9.1	8.7	68.72

NEQS: National Environmental Quality Standards for Air

Note:

- Selected measurement units were dB(A) otherwise stated.
- Quality was assured through self calibration of the instrument.
- The values were representing of monitoring conditions prevailing during the monitoring hours.
- The measurements were carried out on client request. The client is responsible lawful usage of reported data in future.
- The report is not valid for court.

SECTION-2
NOISE LEVELS MONITORING

2.1 General

This section deals with the measurements of noise levels at main passing road of the proposed project. The measurements were carried out during the full operational conditions of the facility.

2.2 Methodology

Digital Sound level meter with the following specifications was employed during the noise levels measurements.

HME® 9011 Sound Levels Meter

IEC651 Type 2 & ANISI.4TYPE2

Japan.

2.3 Features

- Accuracy: ± 1.5 dB (under reference condition)
- Frequency range: 31.5 Hz to 8.5K Hz
- Linearity range: 50 dB
- Measuring level: 30 – 130 dB(A), 35 – 130 dB(C)
- Digital display: 4 digits
- Resolution: 0.1 dB
- Display: 0.5 secretary
- Bar graph: 50 dB scale at 1 dB step for monitoring current sound pressure level display period: 50 mS.

2.4 Calibration

Instrument has an inbuilt calibration mechanism. Before each round calibration was made and also checked during measurement period.

NOISE LEVELS MONITORING REPORT

Client Name:	Creative Engineering Consultants	**Address:**	Creative Engineering Pvt, Ltd, Hayatabad, Phase-I Khyber Pakhtunkhwa Peshawar
Monitoring Date:	02-12-2017	**Reporting Date:**	20-12-2017
Source:	Ambient Conditions of Various Locations	**Monitoring Instrument:**	Noise Meter-IEC651-Type-2

Sr. No.	Location	Units	Minimum	Maximum	Leq
1	Near Jawad Chowk Flyover	dB(A)	72	88	80.0
2	Bala Garhi		49	76	62.5.0
3	Near Ismailia		78	90	84.0
4	Near Aman Chowk		59	78	68.5

NEQS: National Environmental Quality Standards for Noise

Note:

- Selected measurement units were dB(A) otherwise stated.
- Quality was assured through self calibration of the instrument.
- The values were representing of monitoring conditions prevailing during the monitoring hours.
- The measurements were carried out on client request. The client is responsible lawful usage of reported data in future.
- The report is not valid for court.

		Day Time	**Night Time**
a)	Residential Area	55	45
b)	Commercial Area	65	55
c)	Industrial Area	75	65

Signature In charge Environmental Monitoring

SECTION - 3
WATER & WASTE WATER ANALYSIS

3. General

This section deals with the sampling and analysis of the Drinking and Waste water sample from the expressway sites.

3.1 Sampling and Analysis Methodology

Drinking and waste water, samples were collected from the various locations as attached. Drinking water samples were collected from the main drinking water source of the sites while the waste water sample was collected from the final discharge point of the unit. High density sterilized polyethylene bottles were collected for the sampling. The collected samples were preserved, sealed and chilled at 4˚C as recommended. APHA standard methods used for the sampling and preservation of water and waste water.

The following standards methods were used for analysis.

- American Water Works Association (**AWWA**) and
- American Public Health Association (**APHA**)

DRINKING WATER ANALYSIS REPORT

Client Name:	Creative Engineering Consultants	**Address:**	Creative Engineering Pvt, Ltd, Hayatabad, Phase-I Khyber Pakhtunkhwa Peshawar
Monitoring Date:	02-12-2017	**Reporting Date:**	20-12-2017
Source:	Main Drinking Water	**Monitoring**	APHA/USEPA Standard
Location:	**Near Jawad Chowk**	**Instrument:**	Methods

Sr. No.	Parameters	Units	NDWQS	Results
1	pH	--	6.5-8.5	7.8
2	Taste & Odor	--	Non Objectionable	Non Objectionable
3	Color	TCU	<15	9
4	Turbidity	NTU	<5	3
5	Total Coliform	Number/100 mL	0 Number/100 mL	60
6	E-Coli	Number/100 mL	0 Number/100 mL	0
7	Total Dissolved Solids (TDS)	mg/L	<1000	220
8	Total Hardness	mg/L	<500	21
9	Chromium	mg/L	≤0.05	N.D.
10	Selenium	mg/L	≤0.5	N.D.
11	Zinc	mg/L	5	0.001
12	Boron	mg/L	0.7	N.D.
13	Mercury	mg/L	0.001	N.D.
14	Iodine	mg/L	---	0.01
15	Aluminum	mg/L	≤0.2	N.D.
16	Manganese	mg/L	≤0.5	N.D.
17	Chloride	mg/L	250	32
18	Fluoride	mg/L	<1.5	0.07
19	Antimony	mg/L	<0.005	N.D.
20	Barium	mg/L	0.7	N.D.
21	Ammonia	mg/L	---	0.001
22	Arsenic	mg/L	<0.05	N.D.
23	Nitrate	mg/L	≤50	1.01
24	Nitrite	mg/L	≤3	0.001
25	Cadmium	mg/L	0.01	N.D

Sr. No.	Parameters	Units	NDWQS	Results
26	Copper	mg/L	2	N.D
27	Cyanide	mg/L	≤ 0.05	N.D
28	Lead	mg/L	≤ 0.05	N.D
29	Nickel	mg/L	≤ 0.02	N.D
31	Pesticides	mg/L	-----	N.D
32	Phenolic Compounds	mg/L	-----	N.D
33	Alpha Emitters	bq/L	0.1	N.D
34	Beta Emitters	bq/L	1	N.D
35	Polynuclear aromatic hydrocarbons	g/L	------	N.D

NDWQS: National Drinking Water Quality Standards
N.D = Not Detected : Source = Tab Water

Note:

- *Selected measurement units were mg/L otherwise stated.*
- *Quality was assured through self calibration of the instrument.*
- *The values were representing of monitoring conditions prevailing during the monitoring hours.*
- *The measurements were carried out on client request.*
- *The client is responsible lawful usage of reported data in future.*
- *The report is not valid for court.*

Signature In charge Environmental Monitoring

DRINKING WATER ANALYSIS REPORT

Client Name:	Creative Engineering Consultants	**Address:**	Creative Engineering Pvt, Ltd, Hayatabad, Phase-I Khyber Pakhtunkhwa Peshawar
Monitoring Date:	02-12-2017	**Reporting Date:**	20-12-2017
Source:	Drinking Water	**Monitoring**	APHA/USEPA Standard
Location:	**Bala Garhi**	**Instrument:**	Methods

Sr. No.	Parameters	Units	NDWQS	Results
1	pH	--	6.5-8.5	7.3
2	Taste & Odor	--	Non Objectionable	Non Objectionable
3	Color	TCU	<15	9
4	Turbidity	NTU	<5	1
5	Total Coliform	Number/100 mL	0 Number/100 mL	20
6	E-Coli	Number/100 mL	0 Number/100 mL	0
7	Total Dissolved Solids (TDS)	mg/L	<1000	170
8	Total Hardness	mg/L	<500	09
9	Chromium	mg/L	≤0.05	N.D.
10	Selenium	mg/L	≤0.5	N.D.
11	Zinc	mg/L	5	0.003
12	Boron	mg/L	0.7	N.D.
13	Mercury	mg/L	0.001	N.D.
14	Iodine	mg/L	---	0.005
15	Aluminum	mg/L	≤0.2	N.D.
16	Manganese	mg/L	≤0.5	N.D.
17	Chloride	mg/L	250	1.03
18	Fluoride	mg/L	<1.5	0.01
19	Antimony	mg/L	<0.005	N.D.
20	Barium	mg/L	0.7	N.D.
21	Ammonia	mg/L	---	0.02
22	Arsenic	mg/L	<0.05	0.001
23	Nitrate	mg/L	≤50	1.02
24	Nitrite	mg/L	≤3	0.03
25	Cadmium	mg/L	0.01	N.D

Sr. No.	Parameters	Units	NDWQS	Results
26	Copper	mg/L	2	N.D
27	Cyanide	mg/L	≤ 0.05	N.D
28	Lead	mg/L	≤ 0.05	N.D
29	Nickel	mg/L	≤ 0.02	N.D
31	Pesticides	mg/L	-----	N.D
32	Phenolic Compounds	mg/L	-----	N.D
33	Alpha Emitters	bq/L	0.1	N.D
34	Beta Emitters	bq/L	1	N.D
35	Polynuclear aromatic hydrocarbons	g/L	------	N.D

NDWQS: National Drinking Water Quality Standards
N.D = Not Detected : Source = Hand Pump Water

Note:

- *Selected measurement units were mg/L otherwise stated.*
- *Quality was assured through self calibration of the instrument.*
- *The values were representing of monitoring conditions prevailing during the monitoring hours.*
- *The measurements were carried out on client request.*
- *The client is responsible lawful usage of reported data in future.*
- *The report is not valid for court.*

Signature In charge Environmental Monitoring

DRINKING WATER ANALYSIS REPORT

Client Name:	Creative Engineering Consultants	**Address:**	Creative Engineering Pvt, Ltd, Hayatabad, Phase-I Khyber Pakhtunkhwa Peshawar
Monitoring Date:	02-12-2017	**Reporting Date:**	20-12-2017
Source:	Drinking Water	**Monitoring**	APHA/USEPA Standard
Location:	**Near Ismailia**	**Instrument:**	Methods

Sr. No.	Parameters	Units	NDWQS	Results
1	pH	--	6.5-8.5	7.4
2	Taste & Odor	--	Non Objectionable	Non Objectionable
3	Color	TCU	<15	10
4	Turbidity	NTU	<5	4
5	Total Coliform	Number/100 mL	0 Number/100 mL	90
6	E-Coli	Number/100 mL	0 Number/100 mL	0
7	Total Dissolved Solids (TDS)	mg/L	<1000	290
8	Total Hardness	mg/L	<500	14
9	Chromium	mg/L	≤0.05	N.D.
10	Selenium	mg/L	≤0.5	N.D.
11	Zinc	mg/L	5	0.02
12	Boron	mg/L	0.7	N.D.
13	Mercury	mg/L	0.001	N.D.
14	Iodine	mg/L	---	0.001
15	Aluminum	mg/L	≤0.2	N.D.
16	Manganese	mg/L	≤0.5	N.D.
17	Chloride	mg/L	250	0.02
18	Fluoride	mg/L	<1.5	0.4
19	Antimony	mg/L	<0.005	N.D.
20	Barium	mg/L	0.7	N.D.
21	Ammonia	mg/L	---	0.004
22	Arsenic	mg/L	<0.05	0.003
23	Nitrate	mg/L	≤50	1.1
24	Nitrite	mg/L	≤3	0.006
25	Cadmium	mg/L	0.01	N.D

Sr. No.	Parameters	Units	NDWQS	Results
26	Copper	mg/L	2	N.D
27	Cyanide	mg/L	≤ 0.05	N.D
28	Lead	mg/L	≤ 0.05	N.D
29	Nickel	mg/L	≤ 0.02	N.D
31	Pesticides	mg/L	-----	N.D
32	Phenolic Compounds	mg/L	-----	N.D
33	Alpha Emitters	bq/L	0.1	N.D
34	Beta Emitters	bq/L	1	N.D
35	Polynuclear aromatic hydrocarbons	g/L	------	N.D

NDWQS: National Drinking Water Quality Standards
N.D = Not Detected

Note:

- *Selected measurement units were mg/L otherwise stated.*
- *Quality was assured through self calibration of the instrument.*
- *The values were representing of monitoring conditions prevailing during the monitoring hours.*
- *The measurements were carried out on client request.*
- *The client is responsible lawful usage of reported data in future.*
- *The report is not valid for court.*

Signature In charge Environmental Monitoring

DRINKING WATER ANALYSIS REPORT

Client Name:	Creative Engineering Consultants	**Address:**	Creative Engineering Pvt, Ltd, Hayatabad, Phase-I Khyber Pakhtunkhwa Peshawar
Monitoring Date:	02-12-2017	**Reporting Date:**	20-12-2017
Source:	Drinking Water	**Monitoring**	APHA/USEPA Standard
Location:	**Aman Chowk**	**Instrument:**	Methods

Sr. No.	Parameters	Units	NDWQS	Results
1	pH	--	6.5-8.5	7.3
2	Taste & Odor	--	Non Objectionable	Non Objectionable
3	Color	TCU	<15	8
4	Turbidity	NTU	<5	6
5	Total Coliform	Number/100 mL	0 Number/100 mL	30
6	E-Coli	Number/100 mL	0 Number/100 mL	0
7	Total Dissolved Solids (TDS)	mg/L	<1000	140
8	Total Hardness	mg/L	<500	47
9	Chromium	mg/L	≤0.05	N.D.
10	Selenium	mg/L	≤0.5	N.D.
11	Zinc	mg/L	5	0.13
12	Boron	mg/L	0.7	N.D.
13	Mercury	mg/L	0.001	N.D.
14	Iodine	mg/L	---	0.05
15	Aluminum	mg/L	≤0.2	N.D.
16	Manganese	mg/L	≤0.5	N.D.
17	Chloride	mg/L	250	0.2
18	Fluoride	mg/L	<1.5	0.001
19	Antimony	mg/L	<0.005	N.D.
20	Barium	mg/L	0.7	N.D.
21	Ammonia	mg/L	---	0.001
22	Arsenic	mg/L	<0.05	0.003
23	Nitrate	mg/L	≤50	1.02
24	Nitrite	mg/L	≤3	0.002
25	Cadmium	mg/L	0.01	N.D

Sr. No.	Parameters	Units	NDWQS	Results
26	Copper	mg/L	2	N.D
27	Cyanide	mg/L	≤ 0.05	N.D
28	Lead	mg/L	≤ 0.05	N.D
29	Nickel	mg/L	≤ 0.02	N.D
31	Pesticides	mg/L	-----	N.D
32	Phenolic Compounds	mg/L	-----	N.D
33	Alpha Emitters	bq/L	0.1	N.D
34	Beta Emitters	bq/L	1	N.D
35	Polynuclear aromatic hydrocarbons	g/L	------	N.D

NDWQS: National Drinking Water Quality Standards
N.D = Not Detected ; Source = Pipe Water

Note:

- *Selected measurement units were mg/L otherwise stated.*
- *Quality was assured through self calibration of the instrument.*
- *The values were representing of monitoring conditions prevailing during the monitoring hours.*
- *The measurements were carried out on client request.*
- *The client is responsible lawful usage of reported data in future.*
- *The report is not valid for court.*

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WASTE WATER ANALYSIS REPORT

Client Name:	Creative Engineering Consultants	**Address:**	Creative Engineering Pvt, Ltd, Hayatabad, Phase-I Khyber Pakhtunkhwa Peshawar
Monitoring Date:	02-12-2017	**Reporting Date:**	20-12-2017
Source:	Waste Water	**Monitoring**	APHA/USEPA Standard
Location:	**Near Jawad Chowk Flyover**	**Instrument:**	Methods

Sr. No.	Parameters	Units	NEQS	Results
1	pH	---	6-9	8.32
2	Total Dissolved Solids (TDS)	mg/L	3500	890
3	Total Hardness	mg/L	--	126
4	Chemical Oxygen Demand (COD)	mg/L	150	235
5	Biological Oxygen Demand (BOD_5) at 20 ^0C	mg/L	80	159.4
6	Phenolic Compounds as Phenols	mg/L	0.01	0.001
7	Chloride (Cl^-)	mg/L	1000	80
8	Copper (Cu^+)	mg/L	1.0	0.01
9	Total Iron (Fe+)	mg/L	8.0	0.22
10	Lead (Pb^+)	mg/L	1.0	N.D.
11	Magnesium (Mg^+)	mg/L	--	0.02
12	Sodium (Na^+)	mg/L	--	N.D.
13	Sulfate (SO_4)	mg/L	600	62
14	Zinc (Zn)	mg/L	5.0	0.01

NEQS: National Environment Quality Standards for Effluents
N.D = Not Detected

Note:

- *Selected measurement units were mg/L otherwise stated.*
- *Quality was assured through self calibration of the instrument.*
- *The values were representing of monitoring conditions prevailing during the monitoring hours.*
- *The measurements were carried out on client request.*
- *The client is responsible lawful usage of reported data in future.*
- *The report is not valid for court.*

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WASTE WATER ANALYSIS REPORT

Client Name:	Creative Engineering Consultants	**Address:**	Creative Engineering Pvt, Ltd, Hayatabad, Phase-I Khyber Pakhtunkhwa Peshawar
Monitoring Date:	02-12-2017	**Reporting Date:**	20-12-2017
Source:	Waste Water	**Monitoring**	APHA/USEPA Standard
Location:	**Bala Garhi**	**Instrument:**	Methods

Sr. No.	Parameters	Units	NEQS	Results
1	pH	---	6-9	7.7
2	Total Dissolved Solids (TDS)	mg/L	3500	698
3	Total Hardness	mg/L	--	39
4	Chemical Oxygen Demand (COD)	mg/L	150	99
5	Biological Oxygen Demand (BOD_5) at 20 ^0C	mg/L	80	70
6	Phenolic Compounds as Phenols	mg/L	0.01	0.001
7	Chloride (Cl^-)	mg/L	1000	61
8	Copper (Cu^+)	mg/L	1.0	0.01
9	Total Iron (Fe+)	mg/L	8.0	0.11
10	Lead (Pb^+)	mg/L	1.0	N.D.
11	Magnesium (Mg^+)	mg/L	--	0.001
12	Sodium (Na^+)	mg/L	--	N.D.
13	Sulfate (SO_4)	mg/L	600	52
14	Zinc (Zn)	mg/L	5.0	0.01

NEQS: National Environment Quality Standards for Effluents
N.D = Not Detected

Note:

- *Selected measurement units were mg/L otherwise stated.*
- *Quality was assured through self calibration of the instrument.*
- *The values were representing of monitoring conditions prevailing during the monitoring hours.*
- *The measurements were carried out on client request.*
- *The client is responsible lawful usage of reported data in future.*
- *The report is not valid for court.*

Signature In charge Environmental Monitoring

WASTE WATER ANALYSIS REPORT

Client Name:	Creative Engineering Consultants	**Address:**	Creative Engineering Pvt, Ltd, Hayatabad, Phase-I Khyber Pakhtunkhwa Peshawar
Monitoring Date:	02-12-2017	**Reporting Date:**	20-12-2017
Source:	Waste Water	**Monitoring**	APHA/USEPA Standard
Location:	**Ismailia**	**Instrument:**	Methods

Sr. No.	Parameters	Units	NEQS	Results
1	pH	---	6-9	8.4
2	Total Dissolved Solids (TDS)	mg/L	3500	1060
3	Total Hardness	mg/L	--	133
4	Chemical Oxygen Demand (COD)	mg/L	150	393
5	Biological Oxygen Demand (BOD_5) at 20 ^0C	mg/L	80	295
6	Phenolic Compounds as Phenols	mg/L	0.01	0.001
7	Chloride (Cl^-)	mg/L	1000	82
8	Copper (Cu^+)	mg/L	1.0	0.001
9	Total Iron (Fe+)	mg/L	8.0	0.11
10	Lead (Pb^+)	mg/L	1.0	N.D.
11	Magnesium (Mg^+)	mg/L	--	0.001
12	Sodium (Na^+)	mg/L	--	N.D.
13	Sulfate (SO_4)	mg/L	600	44
14	Zinc (Zn)	mg/L	5.0	0.01

NEQS: National Environment Quality Standards for Effluents
N.D = Not Detected

Note:

- *Selected measurement units were mg/L otherwise stated.*
- *Quality was assured through self calibration of the instrument.*
- *The values were representing of monitoring conditions prevailing during the monitoring hours.*
- *The measurements were carried out on client request.*
- *The client is responsible lawful usage of reported data in future.*
- *The report is not valid for court.*

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WASTE WATER ANALYSIS REPORT

Client Name:	Creative Engineering Consultants	**Address:**	Creative Engineering Pvt, Ltd, Hayatabad, Phase-I Khyber Pakhtunkhwa Peshawar
Monitoring Date:	02-12-2017	**Reporting Date:**	20-12-2017
Source:	Waste Water	**Monitoring**	APHA/USEPA Standard
Location:	**Aman Chowk**	**Instrument:**	Methods

Sr. No.	Parameters	Units	NEQS	Results
1	pH	---	6-9	7.3
2	Total Dissolved Solids (TDS)	mg/L	3500	963
3	Total Hardness	mg/L	--	61
4	Chemical Oxygen Demand (COD)	mg/L	150	121
5	Biological Oxygen Demand (BOD_5) at 20 ^0C	mg/L	80	92
6	Phenolic Compounds as Phenols	mg/L	0.01	0.001
7	Chloride (Cl^-)	mg/L	1000	89
8	Copper (Cu^+)	mg/L	1.0	0.001
9	Total Iron (Fe+)	mg/L	8.0	0.12
10	Lead (Pb^+)	mg/L	1.0	N.D.
11	Magnesium (Mg^+)	mg/L	--	0.001
12	Sodium (Na^+)	mg/L	--	N.D.
13	Sulfate (SO_4)	mg/L	600	62
14	Zinc (Zn)	mg/L	5.0	0.02

NEQS: National Environment Quality Standards for Effluents
N.D = Not Detected

Note:

- *Selected measurement units were mg/L otherwise stated.*
- *Quality was assured through self calibration of the instrument.*
- *The values were representing of monitoring conditions prevailing during the monitoring hours.*
- *The measurements were carried out on client request.*
- *The client is responsible lawful usage of reported data in future.*
- *The report is not valid for court.*

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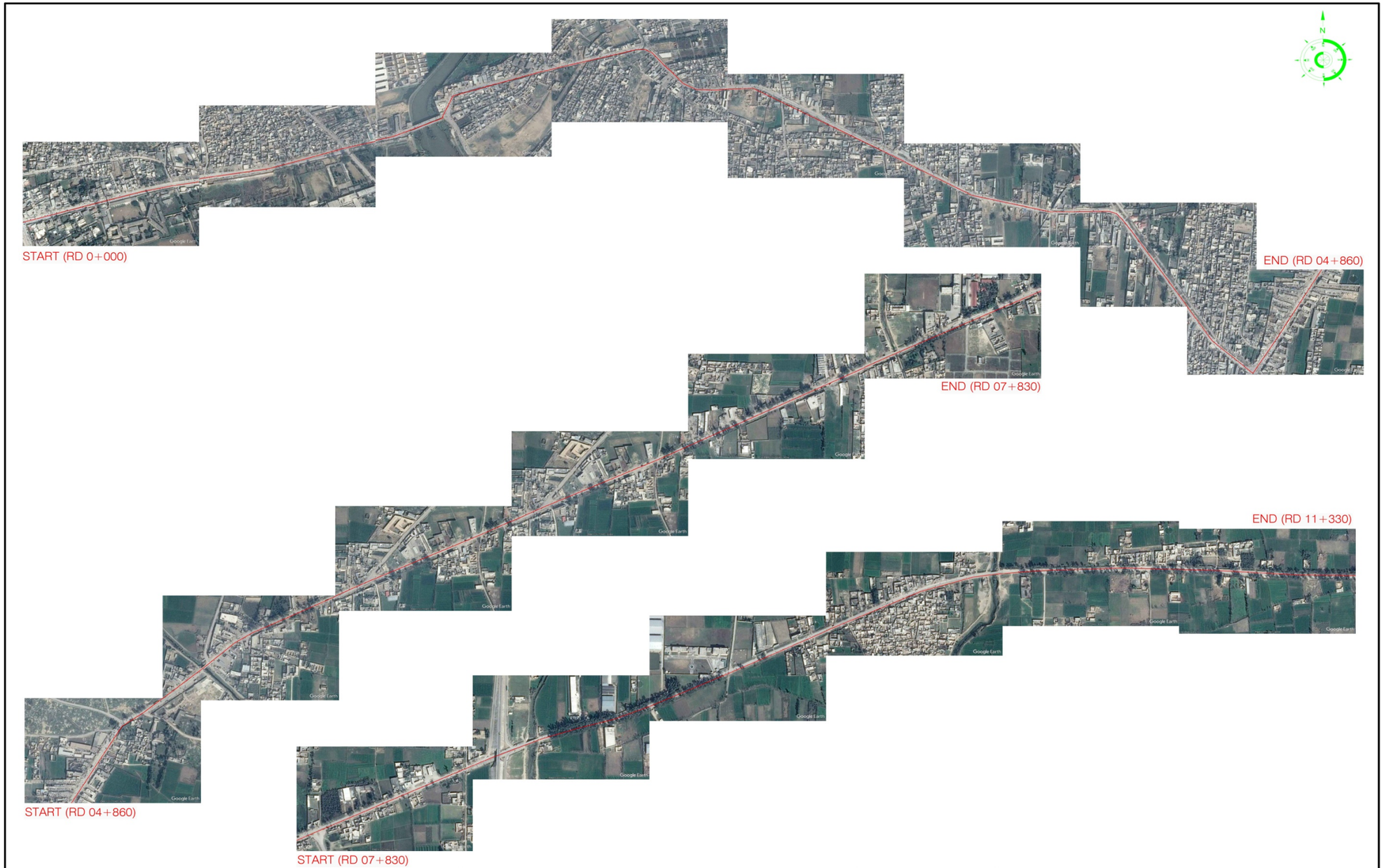
Figure Showing Views During the Baseline Noise and Water Sampling

Figure Showing Views During the Baseline Effluent and Air Sampling

ANNEXURE – C

ROW MAPS OF THE PROPOSED PROJECT



CLIENT:	PROJECT:	TITLE:	SCALE : N.T.S	DWG. No.	
Pakhtunkhwa Highways Authority (PKHA) Government of Khyber Pakhtunkhwa	MARDAN SWABI ROAD	PROJECT LAYOUT (SHEET 01 OF 05)		MSR - 002	M/S Creative Engineering Consultants House No. 6, Sector D – 5, Phase – 1, Hayatabad Peshawar. Phone & Fax: 091-5822184 Email: cecpeshawar@gmail.com

START (RD 11+330)

END (RD 15+320)

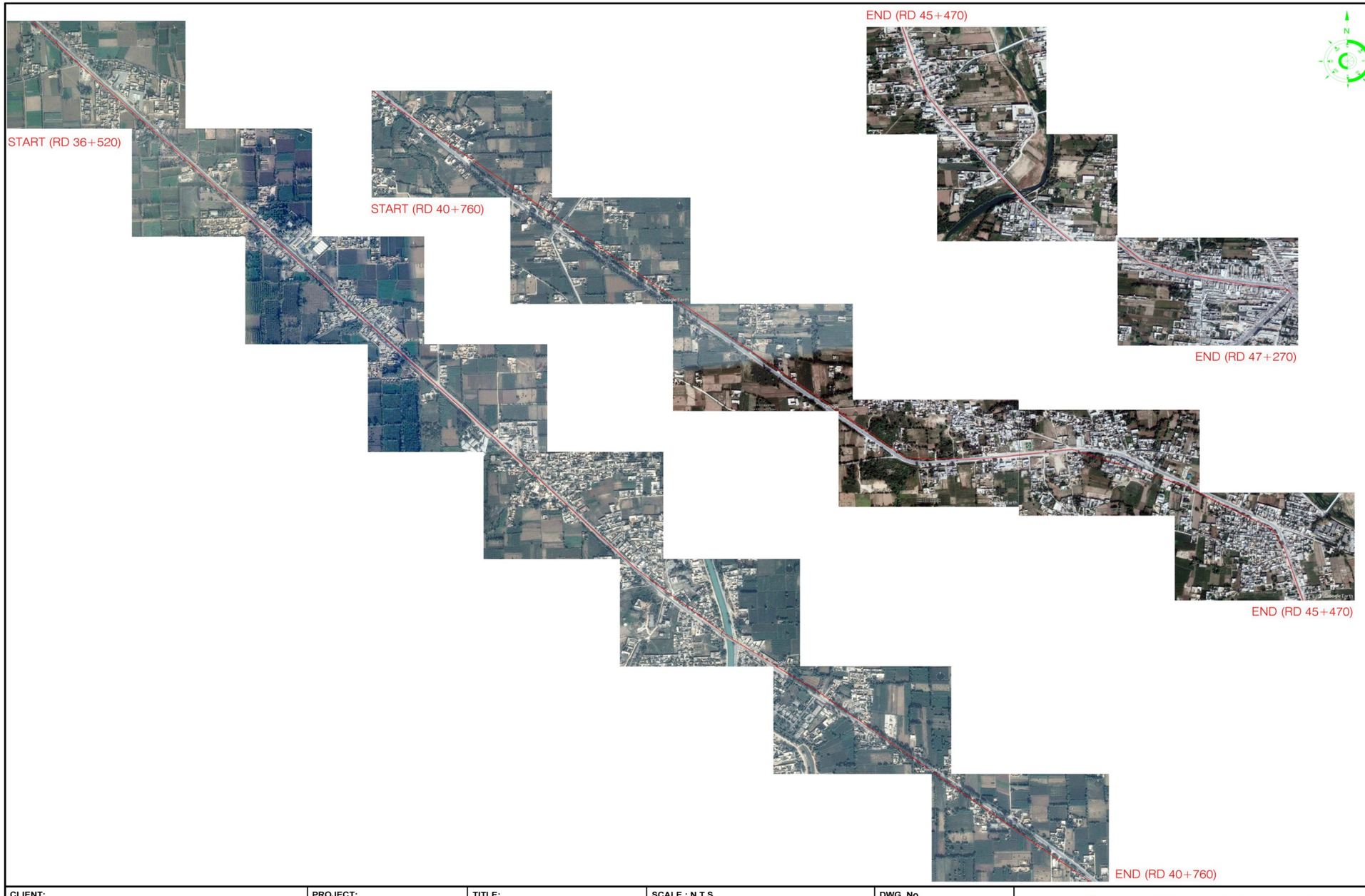
START (RD 15+320)

END (RD 19+370)

CLIENT:	PROJECT:	TITLE:	SCALE : N.T.S	DWG. No.	
Pakhtunkhwa Highways Authority (PKHA) Government of Khyber Pakhtunkhwa	MARDAN SWABI ROAD	PROJECT LAYOUT (SHEET 02 OF 05)		MSR - 003	M/S Creative Engineering Consultants House No. 6, Sector D – 5, Phase – 1, Hayatabad Peshawar. Phone & Fax: 091-5822184 Email: cecpeshawar@gmail.com

CLIENT:	PROJECT:	TITLE:	SCALE : N.T.S	DWG. No.	
Pakhtunkhwa Highways Authority (PKHA) Government of Khyber Pakhtunkhwa	MARDAN SWABI ROAD	PROJECT LAYOUT (SHEET 03 OF 05)		MSR - 004	M/S Creative Engineering Consultants House No. 6, Sector D – 5, Phase – 1, Hayatabad Peshawar. Phone & Fax: 091-5822184 Email: cecpeshawar@gmail.com

CLIENT:	PROJECT:	TITLE:	SCALE : N.T.S	DWG. No.	
Pakhtunkhwa Highways Authority (PKHA) Government of Khyber Pakhtunkhwa	MARDAN SWABI ROAD	PROJECT LAYOUT (SHEET 04 OF 05)		MSR - 005	M/S Creative Engineering Consultants House No. 6, Sector D – 5, Phase – 1, Hayatabad Peshawar. Phone & Fax: 091-5822184 Email: cecpeshawar@gmail.com



CLIENT:	PROJECT:	TITLE:	SCALE : N.T.S	DWG. No.	
Pakhtunkhwa Highways Authority (PKHA) Government of Khyber Pakhtunkhwa	MARDAN SWABI ROAD	PROJECT LAYOUT (SHEET 05 OF 05)		MSR - 005	M/S Creative Engineering Consultants House No. 6, Sector D – 5, Phase – 1, Hayatabad Peshawar. Phone & Fax: 091-5822184 Email: cecpeshawar@gmail.com

ANNEXURE – D

ADDITIONAL MONITORING OF NOISE, AIR AND DRINKING, WASTE & SURFACE WATER

Section - 1
Ambient Air Monitoring for Particulate Matter

1.4 General

This section deals with the ambient particulate matter monitoring that was carried out for assessment of PM_{10}, Carbon Monoxide (CO), Sulphur Dioxide (SO_2) and Oxides of Nitrogen (NO_x) concentration at two additional point of road under consideration of present environmental assessment. The monitoring was carried out from ambient condition of the area during the normalized ambient conditions.

1.5 Methodology for Particulate Matter

Casella, Serial # 1310, Gravimetric Dust Sampler Type 113 A, BS 1259-1958 was used for the monitoring of ambient particulate matter monitoring. Special filter media, having mesh size <10 µ was used as the surface on which PM_{10} was retained quantitatively during a definite interval of time. The filter media was placed in the special port with leak proof assembly. This prevented escaping of fugitive particulate matter being monitored.

1.6 Methodology

Mid-get impingers/absorption columns assembly was used for the monitoring of NO_x and SO_2 in the ambient air. The air was drawn through pump into the glass impingers and absorbed in the solution contained inside the absorption towers. The instrument sucked ambient air at rate monitored by a calibrated volume measuring standard gauge. The volume of air drawn was indicated on the scale calibrated in liters and fractions thereof. One hundred milliliters of absorbents were poured in each of the impingers. The fourth impinger was filled with two hundred grams silica. Standard procedures were used separately for the sampling of both NO_x and SO_2. Sample solutions were preserved and then transferred to the Laboratory for analysis. The Gries-Saltmann Reaction was carried for the analysis of NO_2 and Pararosaniline method was used for SO_2 testing. Monitoring results were presented after data generation in micro gram per cubic meter ($\mu g/m^3$).

Drager Miniwarn, the monitoring equipment, was used for CO measurements.

AMBIENT AIR MONITORING REPORT

Client Name:	Creative Engineering Consultants	**Address:**	Creative Engineering Pvt, Ltd, Hayatabad, Phase-I Khyber Pakhtunkhwa Peshawar
Monitoring Date:	05-2-2018	**Reporting Date:**	15-2-2018
Source:	Ambient of Various Locations	**Monitoring Instrument:**	Iso-Kinetic Casella & ASTM Standard Methods

Parameter		**Carbon Monoxide (CO)**	**Nitrogen Dioxide (NO_2)**	**Sulfur Dioxide (SO_2)**	**Particulate Matter (PM_{10})**
Unit		mg/m^3	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$
Duration		08 Hours	24 Hours	24 Hours	24 Hours
Lowest Detection Limit		0.01	5	5	2
National Environmental Quality Standards		**5**	**80**	**120**	**150**
Average Obtained Conc.	Shahbaz Garhi	1.14	24.4	34.2	81.41
	Swabi Bazaar	1.53	26.3	37.1	59.43

NEQS: National Environmental Quality Standards for Air

Note:

- Selected measurement units were dB(A) otherwise stated.
- Quality was assured through self calibration of the instrument.
- The values were representing of monitoring conditions prevailing during the monitoring hours.
- The measurements were carried out on client request. The client is responsible lawful usage of reported data in future.
- The report is not valid for court.

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SECTION-2
NOISE LEVELS MONITORING

2.5 General

This section deals with the measurements of noise levels at main passing road of the proposed project. The measurements were carried out during the full operational conditions of the facility.

2.6 Methodology

Digital Sound level meter with the following specifications was employed during the noise levels measurements.

HME® 9011 Sound Levels Meter

IEC651 Type 2 & ANISI.4TYPE2

Japan.

2.7 Features

- Accuracy: ± 1.5 dB (under reference condition)
- Frequency range: 31.5 Hz to 8.5K Hz
- Linearity range: 50 dB
- Measuring level: 30 – 130 dB(A), 35 – 130 dB(C)
- Digital display: 4 digits
- Resolution: 0.1 dB
- Display: 0.5 secretary
- Bar graph: 50 dB scale at 1 dB step for monitoring current sound pressure level display period: 50 mS.

2.8 Calibration

Instrument has an inbuilt calibration mechanism. Before each round calibration was made and also checked during measurement period.

NOISE LEVELS MONITORING REPORT

Client Name:	Creative Engineering Consultants	**Address:**	Creative Engineering Pvt, Ltd, Hayatabad, Phase-I Khyber Pakhtunkhwa Peshawar
Monitoring Date:	05-2-2018	**Reporting Date:**	15-2-2018
Source:	Ambient Conditions of Various Locations	**Monitoring Instrument:**	Noise Meter-IEC651-Type-2

Sr. No.	Location	Units	Minimum	Maximum
1	Shahbaz Garhi	dB(A)	79	91
2	Swabi Bazaar		74	85

NEQS: National Environmental Quality Standards for Noise

Note:

- Selected measurement units were dB(A) otherwise stated.
- Quality was assured through self calibration of the instrument.
- The values were representing of monitoring conditions prevailing during the monitoring hours.
- The measurements were carried out on client request. The client is responsible lawful usage of reported data in future.
- The report is not valid for court.

		Day Time	**Night Time**
d)	Residential Area	55	45
e)	Commercial Area	65	55
f)	Industrial Area	75	65

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SECTION - 3
WATER & WASTE WATER ANALYSIS

4. General

This section deals with the sampling and analysis of the Drinking and Waste water sample from the expressway sites.

4.1 Sampling and Analysis Methodology

Drinking and waste water, samples were collected from the various locations as attached. Drinking water samples were collected from the main drinking water source of the sites while the waste water sample was collected from the final discharge point of the unit. High density sterilized polyethylene bottles were collected for the sampling. The collected samples were preserved, sealed and chilled at 4˚C as recommended. APHA standard methods used for the sampling and preservation of water and waste water.

The following standards methods were used for analysis.

- American Water Works Association (**AWWA**) and
- American Public Health Association (**APHA**)

DRINKING WATER ANALYSIS REPORT

Client Name:	Creative Engineering Consultants	**Address:**	Creative Engineering Pvt, Ltd, Hayatabad, Phase-I Khyber Pakhtunkhwa Peshawar
Monitoring Date:	05-2-2018	**Reporting Date:**	15-2-2018
Source:	Main Drinking Water	**Monitoring**	APHA/USEPA Standard
Location:	**Swabi Bazaar**	**Instrument:**	Methods

Sr. No.	Parameters	Units	NDWQS	Results
1	pH	--	6.5-8.5	7.5
2	Taste & Odor	--	Non Objectionable	Non Objectionable
3	Color	TCU	<15	8
4	Turbidity	NTU	<5	6
5	Total Coliform	Number/100 mL	0 Number/100 mL	78
6	E-Coli	Number/100 mL	0 Number/100 mL	20
7	Total Dissolved Solids (TDS)	mg/L	<1000	310
8	Total Hardness	mg/L	<500	21
9	Chromium	mg/L	≤0.05	N.D.
10	Selenium	mg/L	≤0.5	N.D.
11	Zinc	mg/L	5	0.001
12	Boron	mg/L	0.7	N.D.
13	Mercury	mg/L	0.001	N.D.
14	Iodine	mg/L	---	0.01
15	Aluminum	mg/L	≤0.2	N.D.
16	Manganese	mg/L	≤0.5	N.D.
17	Chloride	mg/L	250	37
18	Fluoride	mg/L	<1.5	0.07
19	Antimony	mg/L	<0.005	N.D.
20	Barium	mg/L	0.7	N.D.
21	Ammonia	mg/L	---	0.001
22	Arsenic	mg/L	<0.05	N.D.
23	Nitrate	mg/L	≤50	1.01
24	Nitrite	mg/L	≤3	0.001
25	Cadmium	mg/L	0.01	N.D

Sr. No.	Parameters	Units	NDWQS	Results
26	Copper	mg/L	2	N.D
27	Cyanide	mg/L	≤ 0.05	N.D
28	Lead	mg/L	≤ 0.05	N.D
29	Nickel	mg/L	≤ 0.02	N.D
31	Pesticides	mg/L	-----	N.D
32	Phenolic Compounds	mg/L	-----	N.D
33	Alpha Emitters	bq/L	0.1	N.D
34	Beta Emitters	bq/L	1	N.D
35	Polynuclear aromatic hydrocarbons	g/L	------	N.D

NDWQS: National Drinking Water Quality Standards
N.D = Not Detected : Source = Tab Water

Note:

- *Selected measurement units were mg/L otherwise stated.*
- *Quality was assured through self calibration of the instrument.*
- *The values were representing of monitoring conditions prevailing during the monitoring hours.*
- *The measurements were carried out on client request.*
- *The client is responsible lawful usage of reported data in future.*
- *The report is not valid for court.*

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DRINKING WATER ANALYSIS REPORT

Client Name:	Creative Engineering Consultants	**Address:**	Creative Engineering Pvt, Ltd, Hayatabad, Phase-I Khyber Pakhtunkhwa Peshawar
Monitoring Date:	05-2-2018	**Reporting Date:**	15-2-2018
Source:	Drinking Water	**Monitoring**	APHA/USEPA Standard
Location:	**Shahbaz Garhi**	**Instrument:**	Methods

Sr. No.	Parameters	Units	NDWQS	Results
1	pH	--	6.5-8.5	7.1
2	Taste & Odor	--	Non Objectionable	Non Objectionable
3	Color	TCU	<15	43
4	Turbidity	NTU	<5	6
5	Total Coliform	Number/100 mL	0 Number/100 mL	120
6	E-Coli	Number/100 mL	0 Number/100 mL	0
7	Total Dissolved Solids (TDS)	mg/L	<1000	170
8	Total Hardness	mg/L	<500	09
9	Chromium	mg/L	≤0.05	N.D.
10	Selenium	mg/L	≤0.5	N.D.
11	Zinc	mg/L	5	0.004
12	Boron	mg/L	0.7	N.D.
13	Mercury	mg/L	0.001	N.D.
14	Iodine	mg/L	---	0.004
15	Aluminum	mg/L	≤0.2	N.D.
16	Manganese	mg/L	≤0.5	N.D.
17	Chloride	mg/L	250	1.03
18	Fluoride	mg/L	<1.5	0.01
19	Antimony	mg/L	<0.005	N.D.
20	Barium	mg/L	0.7	N.D.
21	Ammonia	mg/L	---	0.04
22	Arsenic	mg/L	<0.05	0.001
23	Nitrate	mg/L	≤50	1.04
24	Nitrite	mg/L	≤3	0.02
25	Cadmium	mg/L	0.01	N.D
26	Copper	mg/L	2	N.D
27	Cyanide	mg/L	≤ 0.05	N.D

Sr. No.	Parameters	Units	NDWQS	Results
28	Lead	mg/L	≤ 0.05	N.D
29	Nickel	mg/L	≤ 0.02	N.D
31	Pesticides	mg/L	-----	N.D
32	Phenolic Compounds	mg/L	-----	N.D
33	Alpha Emitters	bq/L	0.1	N.D
34	Beta Emitters	bq/L	1	N.D
35	Polynuclear aromatic hydrocarbons	g/L	------	N.D

NDWQS: National Drinking Water Quality Standards
N.D = Not Detected : Source = Hand Pump Water

Note:

- *Selected measurement units were mg/L otherwise stated.*
- *Quality was assured through self calibration of the instrument.*
- *The values were representing of monitoring conditions prevailing during the monitoring hours.*
- *The measurements were carried out on client request.*
- *The client is responsible lawful usage of reported data in future.*
- *The report is not valid for court.*

Signature In charge Environmental Monitoring

WASTE WATER ANALYSIS REPORT

Client Name:	Creative Engineering Consultants	**Address:**	Creative Engineering Pvt, Ltd, Hayatabad, Phase-I Khyber Pakhtunkhwa Peshawar
Monitoring Date:	05-2-2018	**Reporting Date:**	15-2-2018
Source:	Waste Water	**Monitoring**	APHA/USEPA Standard
Location:	**Swabi Bazaar**	**Instrument:**	Methods

Sr. No.	Parameters	Units	NEQS	Results
1	pH	---	6-9	8.44
2	Total Dissolved Solids (TDS)	mg/L	3500	980
3	Total Hardness	mg/L	--	128
4	Chemical Oxygen Demand (COD)	mg/L	150	238
5	Biological Oxygen Demand (BOD_5) at 20 ^0C	mg/L	80	163.6
6	Phenolic Compounds as Phenols	mg/L	0.01	0.001
7	Chloride (Cl^-)	mg/L	1000	85
8	Copper (Cu^+)	mg/L	1.0	0.01
9	Total Iron (Fe+)	mg/L	8.0	0.22
10	Lead (Pb^+)	mg/L	1.0	N.D.
11	Magnesium (Mg^+)	mg/L	--	0.02
12	Sodium (Na^+)	mg/L	--	N.D.
13	Sulfate (SO_4)	mg/L	600	66
14	Zinc (Zn)	mg/L	5.0	0.03

NEQS: National Environment Quality Standards for Effluents
N.D = Not Detected

Note:

- *Selected measurement units were mg/L otherwise stated.*
- *Quality was assured through self calibration of the instrument.*
- *The values were representing of monitoring conditions prevailing during the monitoring hours.*
- *The measurements were carried out on client request.*
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Signature In charge Environmental Monitoring

WASTE WATER ANALYSIS REPORT

Client Name:	Creative Engineering Consultants	**Address:**	Creative Engineering Pvt, Ltd, Hayatabad, Phase-I Khyber Pakhtunkhwa Peshawar
Monitoring Date:	5-2-2018	**Reporting Date:**	15-2-2018
Source:	Waste Water	**Monitoring**	APHA/USEPA Standard
Location:	**Shahbaz Garhi**	**Instrument:**	Methods

Sr. No.	Parameters	Units	NEQS	Results
1	pH	---	6-9	8.7
2	Total Dissolved Solids (TDS)	mg/L	3500	769
3	Total Hardness	mg/L	--	45
4	Chemical Oxygen Demand (COD)	mg/L	150	109
5	Biological Oxygen Demand (BOD_5) at 20 ^0C	mg/L	80	89
6	Phenolic Compounds as Phenols	mg/L	0.01	0.011
7	Chloride (Cl^-)	mg/L	1000	62
8	Copper (Cu^+)	mg/L	1.0	0.01
9	Total Iron (Fe+)	mg/L	8.0	0.12
10	Lead (Pb^+)	mg/L	1.0	N.D.
11	Magnesium (Mg^+)	mg/L	--	0.001
12	Sodium (Na^+)	mg/L	--	N.D.
13	Sulfate (SO_4)	mg/L	600	54
14	Zinc (Zn)	mg/L	5.0	0.01

NEQS: National Environment Quality Standards for Effluents
N.D = Not Detected

Note:

- *Selected measurement units were mg/L otherwise stated.*
- *Quality was assured through self calibration of the instrument.*
- *The values were representing of monitoring conditions prevailing during the monitoring hours.*
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